Keith J. Polson
Senior Vice President and CNO

DTE Energy Company
6400 N. Dixie Highway, Newport, MI 48166
Tel: 734.586.6515 Fax: 734.586.1431
Email: keith.polson@dteenergy.com

June 12, 2018 10 CFR 50.73
NRC-18-0030

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. 2018-002

Pursuant to 10 CFR 50.73(a)(2)(iv)(A) and 10 CFR 50.73(a)(2)(v)(D), DTE Electric Company (DTE) is submitting LER No. 2018-002, "Loss of Division 1 Offsite Power Causes Partial Loss of Feedwater Leading to ECCS Injection and Reactor Scram."

No new commitments are being made in this submittal.

Should you have any questions or require additional information, please contact Mr. Scott A. Maglio, Manager – Nuclear Licensing, at (734) 586-5076.

Sincerely,

Keith J. Polson
Senior Vice President and CNO

Enclosure: LER No. 2018-002, "Loss of Division 1 Offsite Power Causes Partial Loss of Feedwater Leading to ECCS Injection and Reactor Scram"

cc: NRC Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 5, Region III
Regional Administrator, Region III
Michigan Public Service Commission
Regulated Energy Division (kindschl@michigan.gov)

Enclosure to
NRC-18-0030

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

LER No. 2018-002, "Loss of Division 1 Offsite Power Causes Partial Loss of Feedwater Leading to ECCS Injection and Reactor Scram"

NRC FORM 366
(04-2018)

U.S. NUCLEAR REGULATORY COMMISSION

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/)

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2020

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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@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

Loss of Division 1 Offsite Power Causes Partial Loss of Feedwater Leading to ECCS Injection and Reactor Scram

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
04	14	2018	2018 -	002 -	00	06	12	2018	Facility Name	Docket Number 05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☑ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. Power Level	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
100	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☑ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ Other (Specify in Abstract below or in NRC Form 366A)	

12. Licensee Contact for this LER

Licensee Contact	Telephone Number (Include Area Code)
Fermi 2 / Scott A. Maglio – Manager, Nuclear Licensing	(734) 586-5076

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

Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
E	EA	JA	G080	Y					

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 14 single-spaced typewritten lines)

On April 14, 2018 at approximately 1040 EDT, a reactor scram on low reactor water level occurred due to a partial loss of feedwater accompanied by a reactor recirculation system scoop tube lock. The High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) systems automatically started in order to restore reactor water level as designed. Reactor water level was subsequently maintained using RCIC. No Safety Relief Valves actuated and the Primary Containment Isolation System responded as expected. The partial loss of feedwater and scoop tube lock were caused by a loss of Division 1 electrical power which occurred following a trip of the normal feed to Transformer 64, the 13.8 kV Bus 11 Position D breaker. Division 1 Emergency Diesel Generators (EDGs), EDG-11 and EDG-12, automatically started and energized Division 1 buses. In addition, both Low Pressure Coolant Injection (LPCI) subsystems were declared inoperable while aligned to their alternate power source following loss of their normal power source. The LPCI subsystems were declared operable following realignment to their normal source after EDG-11 and EDG-12 were started. Investigation has determined the direct cause of this event to be moisture intrusion into the A6 cubicle of the Bus 1-2B enclosure, which caused a ground fault that tripped the Bus 11 Position D breaker. Immediate corrective actions were completed to eliminate moisture intrusion into the Bus 1-2B enclosure. The root cause evaluation determined that the organization failed to recognize the degradation of the Bus 1-2B enclosure as a failure mechanism of the A6 switchgear. Corrective actions to prevent recurrence include developing and implementing a Preventive Maintenance strategy for outdoor metal clad switchgear.

NARRATIVE

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INITIAL PLANT CONDITIONS:

Mode 1
Reactor Power: 100 percent

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

On April 14, 2018 at approximately 1040 EDT, an automatic reactor scram on low reactor water level (Level 3) occurred due to a partial loss of feedwater [SJ] accompanied by a reactor recirculation system [AD] scoop tube lock. All control rods [AC] fully inserted, and the lowest reactor water level reached was approximately 102 inches above top of active fuel. Division 1 Emergency Diesel Generators (EDGs) [EK], EDG-11 and EDG-12, automatically started and energized Division 1 buses. The High Pressure Coolant Injection (HPCI) [BJ] and Reactor Core Isolation Cooling (RCIC) [BN] systems automatically started as designed on low-low reactor water level (Level 2) and restored reactor water level. Reactor water level increased until it reached high water level (Level 8), resulting in the HPCI, RCIC, and north reactor feed pump automatically tripping as designed at approximately 1043 EDT on April 14, 2018. Reactor operators subsequently maintained reactor water level in the normal level band by restarting and using RCIC. Reactor pressure was controlled using the main turbine bypass system [JI] to the main condenser [SJ]. The maximum pressure measured was approximately 1030 psig and no Safety Relief Valves [RV] actuated. Primary Containment Isolation System (PCIS) [JM] Groups 2, 4, 10, 11, 12, 13, 14, 15, 16, 17, and 18 associated with reactor water Levels 3 and 2 isolated as expected. Reactor cool down was controlled within Technical Specification and administrative limits.

The partial loss of feedwater and scoop tube lock were caused by a loss of Division 1 electrical power which occurred following a trip of the normal feed to Transformer 64, the 13.8 kV Bus 11 Position D breaker [FK]. The result of the bus trip was a loss of power to Transformer 64, which then caused a loss of power to Division 1 emergency safety system Buses 64B and 64C [EB] and balance of plant (BOP) Bus 64A [EA]. The Division 1 Offsite Circuit was declared inoperable, requiring entry into Technical Specification (TS) Limiting Condition for Operation (LCO) 3.8.1 under Condition D. The loss of BOP Bus 64A led to a trip of the center condenser pump, center heater feed pump, and both north and center heater drains pumps. As a result, the operating south reactor feed pump [SJ] tripped. The north reactor feed pump continued to operate. As designed, Division 1 power loss also caused reactor recirculation scoop tube locks and an automatic start of EDG-11 and EDG-12. The plant is designed with an automatic runback of the recirculation system to allow continued operation following the loss of a single feed pump. However, the loss of Division 1 power also resulted in the locking of the reactor recirculation pump speeds (scoop tube lock), disabling the runback feature. The south reactor feed pump trip and the reactor recirculation scoop tube locks led to a reactor scram on reactor water Level 3 since a single feed pump is not able to maintain reactor water level at 100% power operation. In addition, the loss of Division 1 power caused a trip of the North Reactor Building Closed Cooling Water (RBCCW) pump, resulting in initiation of Divisions 1 and 2 of Emergency Equipment Cooling Water (EECW) and Emergency Equipment Service Water (EESW).

During this event, at approximately 1050 EDT on April 14, 2018 it was discovered that the Division 2 EECW Temperature Control Valve (TCV) controller was found in Emergency Bypass instead of staying in Auto mode as expected. In the Emergency Bypass configuration, the TCV operates in the Full Open position, which provides the maximum level of

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cooling. With the valve full open, continuous cooling of the EECW system and its supported components was assured, with the exception of Division 2 Control Center Heating, Ventilation, and Air Conditioning (CCHVAC) [VI] which has minimum temperature requirements that cannot be assured with maximum cooling applied. This rendered Division 2 CCHVAC inoperable and, as a result, TS LCO 3.7.4 was entered under Condition A with corresponding Required Action A.1 due to one control center air conditioning subsystem being inoperable which required Division 2 CCHVAC be restored to operable status within 30 days. Also, due to loss of Division 1 offsite power and Division 2 CCHVAC being inoperable, TS 3.8.1 Required Action D.2 required Division 1 CCHVAC to be declared inoperable within 24 hours. However, by approximately 1120 EDT on April 14, 2018 the controller was placed in auto and proceeded to control normally, resulting in Division 2 CCHVAC being declared operable and TS 3.7.4 Required Action A.1 and TS 3.8.1 Required Action D.2 being completed. This was well within the Completion Times of the associated Required Actions, and was therefore allowable by plant TS.

In addition, the loss of the Division 1 electrical power resulted in the expected automatic transfer from the normal (Division 1) to alternate (Division 2) power source for the Low Pressure Coolant Injection (LPCI) [BO] swing bus. Certain LPCI valves are powered from the LPCI swing bus such that it must remain energized to support operability of both LPCI subsystems. Fermi 2 Surveillance Requirement (SR) 3.5.1.1 requires verification that the swing bus is energized from its normal source. As a result of not meeting SR 3.5.1.1, both LPCI subsystems were declared inoperable and TS LCO 3.5.1 was entered under Condition K at approximately 1040 EDT on April 14, 2018, which required immediate entry into LCO 3.0.3. With the plant already in Mode 3, LCO 3.0.3 required placing the unit in Mode 4 within 37 hours. However, during this event, the alternate power source continued to energize the LPCI swing bus until the bus was realigned to its normal power source at approximately 1239 EDT on April 14, 2018. At this time, LCO 3.5.1 and LCO 3.0.3 were exited. This was well within the allowable TS Completion Time and the alternate power source alignment would have ensured LPCI was capable of performing its associated functions if required.

At the time of the scram, all of the Emergency Core Cooling System (ECCS) and the Emergency Diesel Generators were operable. No safety related equipment was out of service. EDG-11 and EDG-12 performed all their functions and provided power to the Division 1 AC buses. Division 2 Offsite Power was available throughout the event.

A non-emergency notification was made to the NRC Operations Center at 1434 EDT on April 14, 2018 (Event Notification 53336) in accordance with 10 CFR 50.72(b)(2)(iv)(A) and 10 CFR 50.72(b)(2)(iv)(B). An update to this notification was made at 1838 EDT on April 14, 2018 to provide additional information and clarification of reportability under 10 CFR 50.72(b)(3)(iv)(A). A second update to this notification was made at 1950 EDT on April 15, 2018 to provide further information and clarification of reportability under 10 CFR 50.72(b)(3)(v)(D).

This Licensee Event Report (LER) is being made pursuant to 10 CFR 50.73(a)(2)(iv)(A) as an event or condition that resulted in manual or automatic actuation of any of the systems listed in 10 CFR 50.73(a)(2)(iv)(B). The event resulted in actuation of the reactor protection system including a reactor scram, general containment isolation signals affecting containment isolation valves in more than one system, HPCI, RCIC, EDG-11, EDG-12, and EESW. In addition, this report is being made pursuant to 10 CFR 50.73(a)(2)(v)(D) as an event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident due to the inoperability of both subsystems of LPCI.

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SAFETY SIGNIFICANCE CONSEQUENCES AND IMPLICATIONS

This event posed no significant safety implications since the reactor protection and safety related systems functioned as required following the automatic reactor trip. Important safety-related and non-safety related equipment performed as discussed in the description of the event and plant transient response was as expected and consistent with UFSAR Chapter 15 accident analysis. The reactor scrammed as designed from the reactor water Level 3 signal and HPCI and RCIC automatically started as designed from the reactor water Level 2 signal. Reactor water Level 3 and Level 2 PCIS isolations occurred as expected. There was no increase in reactor pressure, and the reactor core was adequately covered and cooled throughout the event. EDG-11 and EDG-12 automatically started and performed all their functions as designed following loss of Division 1 offsite power. After the unit trip, reactor pressure was adequately controlled using the main turbine bypass valves and reactor water level was controlled using RCIC. Therefore, the health and safety of the public were not affected by this event. There were no radiological releases associated with this event.

The safety function of the LPCI mode of the RHR system is to inject water from the suppression pool into the reactor vessel via injection lines connected to the reactor recirculation piping following a large break Loss of Coolant Accident (LOCA). Since a large break LOCA could occur in either one of the two reactor recirculation loops, the LPCI loop select logic function is designed to select the undamaged reactor recirculation loop for LPCI injection. By design, the valves associated with LPCI loop select in both subsystems are powered by the LPCI swing bus. To ensure the LPCI swing bus remains energized during a loss of power, such as is postulated to occur during the Design Basis Accident (DBA) LOCA, an automatic throwover scheme is provided to transfer to the alternate power source if the normal power source is lost. Under the conditions of this event with the LPCI swing bus energized from the alternate power source after a successful automatic throwover, the automatic LPCI injection to the reactor vessel remained capable of performing its function. Also, due to the successful start of the Division 1 EDGs, had a subsequent loss of Division 2 power occurred, the LPCI swing bus was capable of being automatically realigned to be energized by Division 1 power by the automatic throwover scheme. Therefore, LPCI injection, including loop select, would have been capable of performing its function had a large break LOCA and loss of all offsite power occurred during the time period of this event.

CAUSE OF EVENT

Investigation has determined the direct cause of this event to be moisture intrusion into the A6 cubicle of the Bus 1-2B enclosure, which caused a ground fault that tripped the 13.8 kV Bus 11 Position D breaker. The Bus 11 Position D breaker is the normal feed to Transformer 64. The result of the bus trip was a loss of power to Transformer 64, which resulted in loss of power to Division 1 emergency safety system Buses 64B and 64C and BOP Bus 64A.

The root cause evaluation determined that the organization failed to recognize the degradation of the Bus 1-2B enclosure as a failure mechanism of the A6 switchgear. The 13.8 kV outdoor metalclad switchgear material condition had degraded over time and there were missing floor penetration seals. In addition, the Preventive Maintenance Program, the Maintenance Rule Program, and the Aging Management Program did not consider outdoor metalclad switchgear enclosures.

The cause of the inoperability of both LPCI subsystems was the LPCI swing bus being energized from the alternate power source (Division 2) as a result of the loss of the normal power source (Division 1) described above.

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/)

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, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@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. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Fermi 2	05000- 341	2018	- 002	- 00

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CORRECTIVE ACTIONS

This event has been entered into the Corrective Action Program. Immediate corrective actions were completed to eliminate moisture intrusion into the A6 cubicle of the Bus 1-2B enclosure.

Other corrective actions include: establish a Preventive Maintenance Strategy for all outdoor metal clad switchgear enclosures including appropriate Maintenance Rule functions; add an inspection requirement to the Metal Enclosed Bus Aging Management Program (AMP) and implementing documents; create and implement a monthly Operations walkdown checklist for outdoor metal clad switchgear; revise the System Engineering 120 kV Switchyard walkdown checklist to include outdoor metal clad switchgear; replace conduit seals for Bus 11, breaker D termination cabinet; and install conduit seals in the Bus 1-2B breaker A6 termination cabinet. Additional corrective actions were identified and entered into the Corrective Action Program to address contributing causes for this event.

No corrective actions were necessary for the inoperability of both LPCI subsystems because the LPCI loop select functioned as designed. The operators realigned the LPCI swing bus to the normal power source (Division 1) following successful start of the Division 1 EDGs.

ADDITIONAL INFORMATION

A. Failed Component:

Component: Outdoor Metal Clad Switchgear Enclosure
Function: Protect the switchgear components from the environment
Manufacturer: General Electric
Model Number: M-26,36
Failure Cause: Moisture Intrusion

B. Previous Licensee Event Reports (LERs) on Similar Problems:

LER 2012-005, "Reactor Scram Due to Loss of 120 kV Power," was submitted when the loss of Transformer 1 caused a loss of power to Transformer 64. The transient is similar to this event; however, the cause was determined to be animal intrusion that caused a phase to ground fault. Therefore, the corrective actions associated with this LER would not have prevented the current event.

LER 2015-002, "Loss of both Divisions of the Residual Heat Removal Low Pressure Coolant Injection Functions due to 480 Volt Swing Bus Inoperable," was submitted when the loss of the LPCI swing bus caused inoperability of LPCI loop select and both subsystems of LPCI. This is similar to the loss of the LPCI subsystems in this event; however, in the current event the LPCI swing bus functioned as designed under the event conditions. Therefore, the corrective actions associated with this LER would not have prevented the current event.