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July 1, 2021  
NRC-21-0035

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. 2021-001

Pursuant to 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(ii)(B), 10 CFR 50.73(a)(2)(v), 10 CFR 50.73(a)(2)(vii), and 10 CFR 50.72(a)(2)(ix)(A), DTE Electric Company (DTE) is submitting LER No. 2021-001, Unrecognized Impact of Opening of Barrier Doors on High Energy Line Break Analysis.

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 read "PTZDD".

Peter Dietrich  
Senior Vice President and Chief Nuclear Officer

Enclosure: Licensee Event Report No. 2021-001, Unrecognized Impact of Opening of Barrier Doors on High Energy Line Break Analysis

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

**Enclosure to  
NRC-21-0035**

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

**Licensee Event Report (LER) No. 2021-001  
Unrecognized Impact of Opening of Barrier Doors on High Energy Line Break Analysis**

(08-2020)



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 http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

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1. Facility Name: Fermi 2; 2. Docket Number: 05000; 3. Page: 1 OF 7

4. Title: Unrecognized Impact of Opening of Barrier Doors on High Energy Line Break Analysis

Table with 8 columns: 5. Event Date, 6. LER Number, 7. Report Date, 8. Other Facilities Involved. Includes Facility Name and Docket Number for other facilities.

9. Operating Mode: 1; 10. Power Level: 100

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

Table for 10 CFR Part 20, 21, 50, and 73. Includes checkboxes for various regulatory requirements.

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

12. Licensee Contact for this LER

Licensee Contact: Ertman Bennett III – Manager, Nuclear Licensing; Phone Number: 734-586-4273

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

Table with 10 columns: Cause, System, Component, Manufacturer, Reportable to IRIS. Row 1: A, N/A, N/A, N/A, N/A.

14. Supplemental Report Expected; 15. Expected Submission Date. Includes checkboxes for 'No' and 'Yes'.

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

The Fermi 2 Reactor Building Steam Tunnel (RBST) has a normally closed door which is credited as a hazard barrier for certain high energy line break (HELB) scenarios. On May 3, 2021, while Fermi 2 was operating at 100% reactor power in MODE 1, it was determined that the RBST door had been open on seven occasions within the past three years for longer than required for ingress/egress and that this condition was not bounded by site analyses.

The cause of this event was the failure of Operations personnel to properly follow site procedures which prohibited the opening of the door (other than during ingress/egress) without prior evaluation by site engineering. Immediate corrective action was taken to restrict opening of the RBST door to ingress/egress only.



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

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1. FACILITY NAME  Fermi 2	2. DOCKET NUMBER  05000- 341	3. LER NUMBER		
		YEAR 2021	SEQUENTIAL NUMBER 001	REV NO. 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 0930 EDT on 5/3/2021, it was determined that, during entries into the Fermi 2 Reactor Building [NG] Steam Tunnel (RBST) on 4/17/2021, 4/18/2021, and 4/21/2021, the RBST door (R1-11) [DR] was not controlled according to site procedures. Door R1-11, when closed, is credited as a hazard barrier for certain high-energy line break (HELB) scenarios. On the identified dates, the RBST door was open for brief periods, but longer than needed for ingress/egress, while personnel were performing maintenance-related activities in the RBST. These brief periods with the door open are not bounded by existing analyses as the door is assumed to be closed throughout HELB events where the postulated break is inside the RBST. The time period that the door was open was less than one hour in each case, as stay times in the room were inherently limited by industrial and radiological conditions. Individuals remained in the area to close the door if needed, but existing analyses do not address the feasibility of performing those actions under the conditions that may be expected following one of the applicable HELB scenarios.

The three dates in April 2021 where the door was left opened all occurred during MODE 1 with reactor power at 100%. On those dates, it was not recognized what the impact would be of having the door open. Due to questions raised by the NRC Resident Inspector, an investigation was performed with support by engineering personnel. After reviewing design basis information, it was determined on 5/3/2021 that the plant analyses did not support the opening of the RBST door for more than ingress/egress. Following the identification of this issue on 5/3/2021, a review of the extent of this condition identified other RBST entries during the past three years where the conditions may also not have been bounded by existing analyses. The additional occasions where the door may have been open for longer than needed for ingress/egress were on 9/22/2018 (MODE 3), 10/26/2018 (MODE 1), 11/2/2018 (MODE 1), and 3/21/2020 (MODE 3). Per unit logs, each of these entries were also less than one hour with the exception of the occurrence beginning on 10/26/2018 which lasted approximately 10 hours to support packing leak repairs on a High Pressure Coolant Injection (HPCI) [BJ] Outboard Isolation Valve [ISV]. Although few specifics about these occurrences are available due to the time elapsed, these previous occurrences are included in this LER. The narrative below, while written specifically for the more recent (i.e., April 2021) occurrences, is also generally applicable to these older occurrences.

Indications of a steam leak in the RBST led to the decision for personnel to access the RBST and investigate the source of the leak and perform repairs if possible. Since door R1-11 opens into the room, a steam leak in the room could pressurize the room and make it difficult to open from the inside. For this reason, station personnel made the decision to leave the R1-11 door open while any personnel were inside the room. Door R1-11 was not disabled from closing but remained open to facilitate personnel safety to allow for prompt egress if needed.



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**NARRATIVE**

In the Fermi 2 Updated Final Safety Analysis (UFSAR) Section 3.6.2, pipe breaks are postulated to occur in high energy piping systems passing through the RBST. Environmental and flooding analyses were performed for these pipe breaks, assuming that the R1-11 door between the RBST and Reactor Building (RB) first floor is in the closed position. This assumption is valid since the door is normally locked closed during power operation to prevent access into a locked high radiation area. Door R1-11 is designed to prevent steam tunnel pipe break environmental effects and flooding from having direct access to the RB first floor. The door is also a fire-rated separation barrier governed under the Fermi 2 Technical Requirements Manual (TRM). There were personnel stationed outside the steam tunnel to satisfy the fire watch function while the fire-rated barrier (i.e., door) was open. Although the fire-rated function of the barrier was properly addressed by the fire watch, the other barrier functions of the door were not formally addressed. The Fermi 2 procedure for barrier identification/classification does list all the barrier functions associated with door R1-11. This procedure also identifies that doors such as R1-11 should remain closed in MODES 1, 2, and 3 except for ingress and egress and shall not be blocked open for work activities without prior evaluation. Contrary to the procedure, the RBST door was open in MODE 1 (and also in MODE 3 for some of the older occurrences) without prior evaluation. The full impact of the door remaining open, specifically the consequences during postulated HELBs in the RBST, was not understood by plant personnel at the times the door was open.

The main steam line break (MSLB) and feedwater line break (FWLB) are considered the bounding HELBs that could occur in the RBST and are analyzed in site calculations supporting UFSAR Chapter 15. The analysis credits R1-11 to form the boundary between the RB and the RBST, protecting the equipment in the RB from the consequences of the break. With door R1-11 open at the time of a postulated MSLB or FWLB in the RBST, equipment in the RB could be exposed to high temperatures, humidity, and possible submergence. There is no existing site analysis that considers these effects on RB equipment. Although personnel were stationed in the door area (to perform the fire watch function) and could have acted to try to close the RBST door as needed, there is no existing site analysis that verifies the feasibility of those actions. Therefore, each brief period when the door was open for longer than necessary for ingress/egress is considered an unanalyzed condition. In each case, closure of the door when personnel exited the room restored the plant conditions to within existing analyses.

As described above, there is no existing site analysis that considers the effects of high temperatures, humidity, and possible submergence on RB equipment due to a HELB in the RBST with door R1-11 open. Preliminary scoping of such an analysis determined that it could not be completed for several months (i.e., well after the required LER due date). Given these constraints, a conservative evaluation was performed by assuming that all RB equipment associated with the mitigation of these HELB events would have been unable to perform its function under the post-HELB conditions. The Fermi 2 Updated Final Safety Analysis Report (UFSAR) Table 3.6-1 provides a list of structures, systems, and components (SSCs) needed to mitigate the limiting MSLB and FWLB events. Significant SSCs in the RB that would be assumed impacted include the Reactor Protection System (RPS) [JD], HPCI, and Residual Heat Removal (RHR) [BO]. Although other significant SSCs in the RB such as Reactor Core Isolation Cooling (RCIC) [BN] and Core Spray (CS) [BM] would also be assumed to be impacted, they are not identified in UFSAR Table 3.6-1. Under this conservative evaluation, reporting criteria may be conservatively assessed as described below. Although it is expected that a more detailed evaluation could be performed to reduce the scope of impacted RB SSCs, no credit is taken for performing such an evaluation at this time.



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**NARRATIVE**

An 8-hour event notification (EN 55231) was made to the NRC on 5/3/2021 based on meeting the reporting criteria of Title 10 Code of Federal Regulations (10 CFR) 50.72(b)(3)(ii)(B) as an event or condition that resulted in the nuclear power plant being in an unanalyzed condition that significantly degraded plant safety. This LER is being made under the corresponding criteria of 10 CFR 50.73(a)(2)(ii)(B); specifically, that existing analyses did not bound the condition where a postulated HELB occurs in the RBST for the brief periods where the RBST door was open.

Since it is postulated that multiple SSCs from UFSAR Table 3.6-1, and credited in the UFSAR Chapter 15 MSLB and FWLB analyses, are impacted by the postulated breaks inside the RBST with the door open, the brief periods where the RBST door was open are also reportable pursuant to:

10 CFR 50.73(a)(2)(v)(A) – An event or condition that could have prevented fulfillment of a safety function of structures or systems that are needed to shut down the reactor and maintain it in a safe shutdown condition. This criterion is met, at a minimum, due to potential impact on both divisions of RPS.

10 CFR 50.73(a)(2)(v)(B) – An event or condition that could have prevented fulfillment of a safety function of structures or systems that are needed to remove residual heat. This criterion is met, at a minimum, due to potential impact on HPCI, which is only a single train, and both divisions of RHR.

10 CFR 50.73(a)(2)(v)(D) – An event or condition that could have prevented fulfillment of a safety function of structures or systems that are needed to mitigate the consequences of an accident. This criterion is met, at a minimum, due to potential impact on HPCI, which is only a single train, and both divisions of RHR.

10 CFR 50.73(a)(2)(vii)(A) – An event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a single system designed to shut down the reactor and maintain it in a safe shutdown condition. This criterion is met, at a minimum, due to potential impact on both divisions of RPS.

10 CFR 50.73(a)(2)(vii)(B) – An event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a single system designed to remove residual heat. This criterion is met, at a minimum, due to potential impact on both divisions of RHR.

10 CFR 50.73(a)(2)(vii)(D) – An event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a single systems designed to mitigate the consequences of an accident. This criterion is met, at a minimum, due to potential impact on both divisions of RHR.

10 CFR 50.73(a)(2)(ix)(A) – An event or condition that as a result of a single cause could have prevented the fulfillment of a safety function for two or more trains or channels in different systems that are needed to (2) remove residual heat and (4) mitigate the consequences of an accident. This criterion is met, at a minimum, due to potential impact on HPCI and RHR.





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**NARRATIVE**

Many of the SSCs in the RB that would have been impacted are controlled under the Fermi 2 Technical Specifications (TS). The impact on these SSCs under these conditions would have required entry into the Limiting Condition for Operation (LCO) for each of the SSCs. No entry was made to the relevant LCOs during the periods the door was open. Due to the combination of SSCs that would have been impacted, it is likely that immediate entry to TS LCO 3.0.3 would have been required. TS LCO 3.0.3 requires initiating actions within 1 hour to move to the next lower MODE of operation. Although actions were not initiated to move to lower MODES of operation, all the periods where the door was open were less than one hour, with the exception of the occurrence beginning on 10/26/2018 which lasted approximately 10 hours. Based on the failure to enter and meet the TS LCO 3.0.3 action times, this event is also being reported under 10 CFR 50.73(a)(2)(i)(B) as a condition which was prohibited by the Fermi 2 TS.

The inoperability, loss of safety function, and unanalyzed condition in each case was limited strictly to the time that the RBST door was open, which was less than an hour in each case except for the case in October 2018 which was approximately 10 hours.

Since there was no actual piping failure at any point, none of the SSCs described above were required to actuate at any time and no actuations occurred.

**SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS**

The RBST door (R1-11) was opened on seven brief occasions over the past three years to allow personnel to enter the RBST for maintenance activities. The door remained open during the duration of the maintenance activities as a safety precaution so that it could be assured that the door would not fail closed, thus trapping personnel in the room. Personnel were stationed to attempt to close the door if plant conditions necessitated it be closed. With the door remaining open longer than for ingress/egress, a postulated HELB or pipe break in the RBST could have adversely impacted equipment outside the RBST that is credited to mitigate such a postulated event.

No HELB or pipe break occurred during the time period that R1-11 was open, thus there were no safety consequences or radiological releases associated with this event. At no time during this event was there a potential for endangering the public health and safety.

As described previously, there is no existing deterministic analysis for the consequences of a postulated HELB or pipe break with the RBST open. Instead, a bounding risk evaluation was performed using probabilistic risk assessment (PRA) to determine the significance of the event.

Opening the RBST door does not affect the frequency of any initiating event. It does affect the ability of equipment to mitigate some initiating events, specifically those breaks postulated to occur in the RBST. As the effects on equipment outside of the steam tunnel have not been deterministically addressed, the PRA evaluation was performed assuming that all postulated pipe breaks in the RBST lead directly to core damage/large early release. This bounding evaluation removes the need to identify which specific equipment could have been affected as it is all assumed unavailable.



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**NARRATIVE**

The PRA evaluation then accounted for the limited time that the RBST door was actually open. The majority of instances where the RBST door was opened were less than an hour, with the exception of October 2018 where the door remained opened for approximately 10 hours. A maximum open time on a rolling year basis was used to bound all the occurrences, including October 2018. Using these assumptions, the Incremental Conditional Core Damage Probability (ICCDP) and Incremental Conditional Large Early Release Probability (ICLERP) were calculated. The results corresponded to a determination that the events described in this LER were of very low safety significance.

Closure of the RBST door at the conclusion of each of the periods identified in this LER restored the plant to within analyzed conditions, such that the significance and consequence of any subsequent postulated piping breaks would be bounded by those already considered in the Fermi 2 UFSAR.

**CAUSE OF THE EVENT**

The reason for leaving the RBST door open in each case was as a safety precaution during maintenance activities in RBST so that personnel could egress efficiently if warranted.

The cause of this event was determined to be the failure of Fermi 2 Operations personnel, including licensed personnel, to properly follow site procedures which prohibited the opening of the door (other than during ingress/egress) without prior evaluation by site engineering. Operations personnel also failed to identify that the RBST door performed functions other than a fire barrier. As a result, the actions taken to establish a fire watch did not address the other functions of the door.

In addition, during review of the recent RBST entries, it was identified that an older engineering evaluation previously (from 2002) had incorrectly assumed the RBST door could be open if personnel remained within the area to close the door as needed but did not establish sufficient controls to ensure the door was closed if needed. This older evaluation was referenced by Fermi 2 Engineering personnel without validating its accuracy or applicability. The past precedent contributed to a mindset that it was acceptable to leave the door open without performing a new engineering evaluation.

**CORRECTIVE ACTIONS**

Upon discovery of the impact of keeping the door open on 5/3/2021, immediate action was taken to restrict opening of the RBST door to ingress/egress only. Subsequent entries to the RBST to support maintenance activities were performed without leaving door R1-11 open.

To address the human performance aspects of this event, department-level resets were performed for Operations and Engineering personnel to communicate the lessons learned. In addition, expectations were communicated to Engineering personnel to perform new engineering evaluations when needed to support these types of conditions rather than rely on older analysis by informal reference.

As a long-term corrective action, engineering plans to perform an update of calculations associated with piping breaks in the RBST. The intent is to include analyses of the impacts of the RBST door remaining open during such breaks. If the results of the analysis are favorable, procedures will be updated to allow the RBST door to remain open during maintenance activities, as needed, provided that the analysis restrictions, if any, are observed.





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**NARRATIVE**

The reason for leaving the RBST door open in April of 2021 was as a safety precaution while personnel were inside the RBST to investigate a potential steam leak. The steam leak was identified and repaired during the week of May 17, 2021. The repairs were performed while the plant was shut down, which eliminated concerns regarding the RBST door being open. Repair of the steam leak has eliminated the need for entry to the RBST in the foreseeable future. This will allow the door to remain in its closed position, consistent with analysis assumptions.

In addition, further investigation is being performed under the Fermi 2 Corrective Action Program (CAP) to determine if other doors (i.e., other than R1-11) have also been improperly controlled during maintenance activities. The investigation is ongoing.

**PREVIOUS OCCURRENCES**

There have been no other previous reportable events concerning the RBST door. However, this report did include documentation of the previous occurrences in the past three years. As described above, an investigation is ongoing under the Fermi 2 CAP to determine if there may have been previous occurrences of a similar nature associated with other similar doors.