

**Enclosure 1 to  
NRC-18-0042**

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

**Licensee Event Report (LER) No. 2018-003  
Inoperability of Reactor Water Cleanup System Isolation Differential Flow-High Function**



# 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/>)

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](mailto: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.

<b>1. Facility Name</b> Fermi 2	<b>2. Docket Number</b> 05000 341	<b>3. Page</b> 1 OF 3
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**4. Title**  
Inoperability of Reactor Water Cleanup System Isolation Differential Flow-High Function

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
05	27	2018	2018	003	00	07	25	2018	N/A	05000
									Facility Name	Docket Number
									N/A	05000

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

**12. Licensee Contact for this LER**

<b>Licensee Contact</b> Fermi 2 / Scott A. Maglio – Manager, Nuclear Licensing	<b>Telephone Number (Include Area Code)</b> (734) 586-5076
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**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
B	CE	CAP	X999	Yes	N/A	N/A	N/A	N/A	N/A

<b>14. Supplemental Report Expected</b>	<b>15. Expected Submission Date</b>	Month	Day	Year
<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> No				

**Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)**  
 On May 27, 2018 at 0630 EDT, the Reactor Water Cleanup (RWCU) System Isolation Differential Flow - High function was declared inoperable as a result of the RWCU Differential Flow Indicator reading downscale. This condition would have prevented the primary containment isolation valves for the RWCU system from automatically isolating on a high differential flow signal. The cause of the downscale reading was due to a capacitor failure within the square root converter. Corrective actions were taken to replace the capacitors within the square root converter and return the RWCU System Isolation Differential Flow - High function to operable on May 28, 2018 at 0046 EDT. The safety related function of the RWCU System is to provide primary containment isolation upon receipt of a primary containment isolation signal, or upon indication of a high-energy line break (HELB) in the RWCU System piping in response to the following signals: low reactor water level 2; high RWCU equipment temperatures; high RWCU pump room differential temperature; or high RWCU System differential flow. Due to the availability of other automatic RWCU isolation functions as well as the ability to manually isolate RWCU, the safety significance of this event is very low. There were no radiological releases associated with this event.



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

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1. FACILITY NAME  Fermi 2	2. DOCKET NUMBER  05000- 341	3. LER NUMBER		
		YEAR 2018	SEQUENTIAL NUMBER 003	REV NO. 00

**NARRATIVE**

**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 May 27, 2018 at 0630 EDT, the Reactor Water Cleanup (RWCU) [[CE]] System Isolation Differential Flow - High function was declared inoperable as a result of the RWCU Differential Flow Indicator [[FI]] reading downscale; which would have prevented the primary containment isolation valves [[ISV]] for the RWCU system from automatically isolating on a high differential flow condition. At 0753, RWCU was shutdown and the affected penetration flow paths were isolated in accordance with station procedures as required by Fermi 2 Technical Specification 3.3.6.1. All other RWCU primary containment isolation instrumentation functions remained operable and the associated RWCU system primary containment isolation valves were capable of being remotely closed by the control room operators throughout the event.

The high differential flow signal is initiated from transmitters that are connected to the RWCU pump outlet and RWCU system discharge to condenser and feedwater. The outputs of the transmitters are compared (in a common summer) and the resulting output is sent to two high flow trip systems. If the difference between the inlet and outlet flow is too large, each trip unit generates an isolation signal. Inoperability of the non-redundant circuitry causes the channels in both trip systems to be inoperable. The remainder of the circuit is redundant and can be considered on a per trip system basis. The square root converter [[CNV]] is within the non-redundant portion of this string.

The RWCU system is non-safety; however, the isolation valves provide a safety function to provide primary containment isolation upon receipt of a primary containment isolation signal, or upon indication of a high-energy line break (HELB) in the RWCU system piping in response to the following signals; low reactor water level 2; high RWCU equipment temperatures; high RWCU pump room differential temperature; or high RWCU system differential flow. The differential flow isolation signal is designed to detect the leaks below the capacity of the reactor coolant makeup and within the cold leg portion (approx. 120F) of the system, which would not change ambient air conditions.

Troubleshooting identified that a capacitor [[CAP]] within the square root converter had failed, which caused the output signal to fail downscale thus removing the inlet flow signal from the summer. As described above, this failure in the non-redundant portion of the circuitry affected the channels in both trip systems. Following replacement of the capacitor within the square root converter, the RWCU System Isolation Differential Flow - High function was declared operable on May 28, 2018 at 0046 EDT. Therefore, the non-redundant RWCU System Isolation Differential Flow - High function was inoperable for approximately 18 hours.

Event Notification 53429 was made at 1242 EDT on May 27, 2018 pursuant to 10CFR 50.72 (b)(3)(v)(C) and 10CFR 50.72 (b)(3)(v)(D). This report is being made pursuant to 10CFR50.73(a)(2)(v)(C) as a condition that could have prevented the fulfillment of a safety function needed to control the release of radioactive material and 10CFR50.73(a)(2)(v)(D) as a condition that could have prevented the fulfillment of a safety function needed to mitigate the consequences of an accident. The Updated Final Safety Analysis Report (UFSAR), the TS Bases, and NRC reporting requirements were reviewed as part of an evaluation regarding event reportability. Based on this review, it was determined that the RWCU Differential Flow leak detection function is credited to mitigate a break in the RWCU system piping accident as described in UFSAR Chapter 6.



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**NARRATIVE**

Technical Specification 3.3.6.1, Primary Containment Isolation requires the RWCU Differential Flow-High to be operable in Modes 1, 2, and 3. The high differential flow signal is provided to detect a break in the RWCU System. This will detect leaks in the RWCU System when area or differential temperature would not provide detection (i.e., a cold leg break). This Function is not assumed in any UFSAR transient or accident analysis, since bounding analyses are performed for large breaks such as Main Steam Line Breaks. However, UFSAR Section 6.2.4.2.6, Leak Detection, states "For systems penetrating the primary containment, major leaks in the pipe are located by increased temperature, radiation, sump level, changes in pressure, differential pressure, process line flow, etc. These indications are monitored in the control room to alert the operator when remote manual valves should be closed. In addition, certain indications of leakage will cause automatic valves to close in response to a system accident."

A review was performed and concluded that the RWCU Differential Flow-High Function was operable up to May 27, 2018 at 0630; this was identified via the plant computer system. RWCU Differential Flow-High is verified during Control Room Panel walk downs and was verified to be operable during the previous walk down.

**SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS**

Within the RWCU, system leakage is generally detected by high temperature sensing instrumentation which senses a leak before a line break by monitoring the temperature rise in the equipment compartment for a system. This is based upon having the leak within the hot portion of the system. However, temperature sensing does not detect leakage from the cold-water part of the RWCU System. In the Differential Flow Leak Detection System, leakage is detected by means of a flow comparison between RWCU system inlet and outlet. If the inlet flow exceeds outlet flow by approximately 55 gpm an alarm is actuated and the RWCU system is isolated automatically.

The RWCU isolation function (low reactor water level) and all other RWCU isolation functions remained operable throughout this event. In addition, the associated RWCU system primary containment isolation valves were capable of being remotely closed by the control room operators throughout this event. Based on this discussion, the safety significance of this event is very low. There were no radiological releases associated with this event.

**CAUSE OF THE EVENT**

The cause of this event was due to a lost signal from a flow input due to a failed capacitor within the square root converter.

Cause: Capacitor  
System: G33 – Reactor Water Cleanup  
Component: G33K602  
Manufacturer: Generic

**CORRECTIVE ACTIONS**

Corrective actions were taken to replace the capacitor within the square root converter and return the RWCU System Isolation Differential Flow - High function to operable on May 28, 2018 at 0046 EDT.

**PREVIOUS OCCURRENCES**

No previous site occurrences of reportable conditions of the RWCU isolation function were identified.