

W3F1-2022-0038

10 CFR 50.73

June 23, 2022

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

Subject: Licensee Event Report 50-382/2022-004-00, Operation Prohibited by
Technical Specifications Due to Inadequate Radiation Monitor Calibration
Procedures

Waterford Steam Electric Station, Unit 3
NRC Docket No. 50-382
Renewed Facility Operating License No. NPF-38

Entergy Operations, Inc. (Entergy) submits the enclosed Licensee Event Report (LER) 50-382/2022-004-00 for Waterford Steam Electric Station, Unit 3 (Waterford 3). The events reported herein are reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) as any operation or condition that was prohibited by the plant's Technical Specifications (TS) and 10 CFR 50.73(a)(2)(vii)(D) as any event where a single cause or condition caused two independent trains or channels to become inoperable in a single system designed to mitigate the consequences of an accident. The LER describes non-compliances with Waterford 3 TS 3.3.3.1, "Radiation Monitoring Instrumentation," and the inoperability of both containment high range radiation monitor channels.

This letter contains no new commitments.

Should you have any questions concerning this issue, please contact John D. Lewis, Manager, Regulatory Assurance, at 504-739-6028.

Respectfully,



John D. Lewis

JDL/cdm

Enclosure: Licensee Event Report 50-382/2022-004-00

cc: NRC Region IV Regional Administrator
NRC Senior Resident Inspector – Waterford Steam Electric Station, Unit 3
NRC Project Manager – Waterford Steam Electric Station, Unit 3
Louisiana Department of Environmental Quality

Enclosure

W3F1-2022-0038

Licensee Event Report 50-382/2022-004-00



LICENSEE EVENT REPORT (LER)

(See Page 3 for required number of digits/characters for each block)
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1. Facility Name: Waterford Steam Electric Station, Unit 3
 2. Docket Number: 05000 - 0382
 3. Page: 1 OF 4

4. Title: Operation Prohibited by Technical Specifications Due to Inadequate Radiation Monitor Calibration Procedures

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
04	24	2022	2022	004	00	06	23	2022	Facility Name	05000
									Facility Name	05000

9. Operating Mode: 6
 10. Power Level: 000

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

<input checked="" 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 checked="" 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 checked="" type="checkbox"/> 10 CFR Part 21	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input 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 checked="" type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input checked="" 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 in NRC 366A).

12. Licensee Contact for this LER
 Licensee Contact: John D. Lewis / Manager, Regulatory Assurance
 Phone Number (Include Area Code): (504) 739-6028

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
D	IL	RI	G063	Y	N/A	N/A	N/A	N/A	N/A

14. Supplemental Report Expected: No
 15. Expected Submission Date: Month: N/A, Day: N/A, Year: N/A

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

On April 24, 2022, while operating in Mode 6 at 0 percent power, Containment High Range Radiation Monitor B (ARMIRE5400B) was declared inoperable due to the use of an incorrect engineering conversion factor and not accounting for the keep alive source. On April 30, 2022, while operating in Mode 6 at 0 percent power, Main Steam Line High Range Radiation Monitor A (ARMIRE5500A) was declared inoperable due to use of incorrect ion chamber output dose rate reference values. These inoperability conditions were the result of inadequate calibration procedural guidance. The impact on the radiation monitors was not previously identified and the allowed outage times for the Actions required by Technical Specification (TS) 3.3.3.1 and TS Table 3.3-6 were exceeded. These events are being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as any operation or condition that was prohibited by the plant's TSs. In addition, as reported on June 13, 2022 in LER 2022-003-00, Containment High Range Radiation Monitor A (ARMIRE5400A) had been inoperable due to the calibration procedure not accounting for the keep alive source. The calibration procedure not accounting for the keep alive source is considered a common cause that contributed to the inoperability of both containment high range radiation monitor channels and, as required by 10 CFR 50.73(a)(2)(vii)(D), this event is also being reported as any event where a single cause or condition caused two independent trains or channels to become inoperable in a single system designed to mitigate the consequences of an accident.

The calibration procedures were corrected, and ARMIRE5500A, ARMIRE5400A, and ARMIRE5400B were recalibrated using the corrected procedure guidance. These radiation monitor channels were restored to operable status.



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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Waterford Steam Electric Station, Unit 3	05000-0382	YEAR	SEQUENTIAL NUMBER	REV NO.
		2022	004	00

NARRATIVE

EVENT DESCRIPTION

On April 24, 2022, while Waterford Steam Electric Station, Unit 3 (Waterford 3), was operating in Mode 6 at 0 percent power, it was discovered that Containment High Range Radiation Monitor B (ARMIRE5400B) [JL, RI] has used an incorrect engineering conversion factor due to the vendor incorrectly calculating the conversion factor during plant construction. The engineering conversion factor value transforms the radiation monitor ion chamber output (amps) into conventional scalable units (dose rate in engineering units). The use of the incorrect engineering conversion factor was discovered while revising the calibration procedure for the containment high range radiation monitors following the discovery on April 13, 2022 that the procedure guidance did not account for keep alive source dose rate. The small keep alive source is installed to ensure the containment high range radiation monitor ion chamber is functioning when the containment radiation levels are below the ion chamber's detectable range. After correcting the engineering conversion factor and accounting for the keep alive source dose rate, ARMIRE5400B was successfully calibrated. The incorrect engineering conversion factor resulted in ARMIRE5400B indicating incorrect dose rates since at least December 27, 1984.

The calibration procedure for the containment high range radiation monitors did not require an update to the engineering conversion factor for a new detector. The containment high range radiation monitors (ARMIRE5400A and ARMIRE5400B) are used to detect and indicate containment radiation levels following an accident. These monitors are capable of detecting a maximum range of 10E8 Rem/hour. This extended range of activity requires a factor of 2 accuracy over the entire instrument range and is monitored during normal and post-accident operations to comply with NUREG-0737 and Regulatory Guide 1.97, Revision 3. The use of an incorrect engineering conversion factor in ARMIRE5400B and not accounting for the keep alive dose rate caused the radiation monitor to not meet the factor of 2 accuracy requirement. This out of calibration condition resulted in ARMIRE5400B not being capable of performing its specified function of accurately measuring radiation levels in containment, and ARMIRE5400B was declared inoperable on April 24, 2022.

On April 30, 2022, while Waterford 3 was operating in Mode 6 at 0% power, it was identified that Main Steam Line High Range Radiation Monitor A (ARMIRE5500A) [SB, RI] had failed numerous calibrations since the detector was replaced on January 1, 2000. Although the engineering conversion factor was updated at the time the new detector was installed, a review of the calibration procedure for the main steam line high range radiation monitors revealed that the procedure did not include steps to record the new ion chamber output dose rate reference values for use during subsequent calibrations. This was discovered during the extent of condition review for the incorrect engineering conversion factor issue identified for the containment high range radiation monitors on April 24, 2022.

Based on the results of the extent of condition review, it was concluded that the engineering conversion factor used for ARMIRE5500A was correct, but the calibration procedure reference values were incorrect. The use of these incorrect reference values for detector calibration caused the indicated dose rates to have exceeded the allowable range of +/-15 percent since January 1, 2000, when the detector was last replaced. Two main steam line high range radiation monitors (ARMIRE5500A and ARMIRE5500B) are provided to estimate the radiological releases which may occur as a result of the actuation of the steam generator secondary relief valves (SRVs) [SB, RV] and atmospheric steam dump valves (ADVs) [SB, PCV]. Only ARMIRE5500A was found to be out of calibration. Since ARMIRE5500A could not meet its +/-15 percent calibration tolerance requirement, it was not capable of performing its specified function of accurately measuring the radiation levels for dose assessment, and ARMIRE5500A was declared inoperable on April 30, 2022.



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REPORTABILITY

Waterford 3 Technical Specification (TS) 3.3.3.1, Action b, and TS Table 3.3-6 require the minimum number of Effluent Accident Monitor channels to be operable in Modes 1, 2, 3, and 4. TS Table 3.3-6, Action 27, requires that the radiation monitors be restored to operable status within 72 hours, or initiate the preplanned alternate method of monitoring the appropriate parameter(s), and if the monitor is not restored to operable status within 72 hours after the failure, a special report is required to be submitted in accordance with TS 6.9.2 within 14 days after the failure. The containment high range radiation monitors (two channels) and main steam line high range radiation monitors (one channel per main steam line) are credited as effluent accident monitors in TS Table 3.3-6, and Action 27 applies to these monitors. These radiation monitors are not described in Chapter 6, "Engineered Safety Features," or Chapter 15, "Accident Analyses," of the Waterford 3 Updated Final Safety Analysis (UFSAR) for accident mitigation. Because of the latency of the events described above affecting the past operability of ARMIRE5400B and ARMIRE5500A, the required actions were not completed within the allowed outage times. Considering the 3-year limit (from date of discovery) for reportability as allowed by 10 CFR 50.73(a)(1), ARMIRE5400B was in non-compliance with TS 3.3.3.1, Action b, and TS Table 3.3-6, Action 27, from April 24, 2019 to April 24, 2022 while in Modes 1, 2, 3, and 4 and ARMIRE5500A was in non-compliance with TS 3.3.3.1, Action b, and TS Table 3.3-6, Action 27, from April 30, 2019 to April 30, 2022 while in Modes 1, 2, 3, and 4. In accordance with 10 CFR 50.73(a)(2)(i)(B), these events are being reported as any operation or condition that was prohibited by the plant's Technical Specifications.

On June 13, 2022, Waterford 3 submitted LER 2022-003-00 which reported that Containment High Range Radiation Monitor A (ARMIRE5400A) [IL, RI] was declared inoperable on April 13, 2022 due to indicating outside the NUREG-0737 and Regulatory Guide 1.97, Revision 3, factor of 2 accuracy requirement. As reported in the LER, the cause of the inoperability was that the calibration procedure for the containment high range radiation monitors contained incorrect procedural guidance to account for the keep alive source decay when the original Log Pico-ammeter and analog-to-digital converter (ADC) circuit board was replaced. Similarly, as described in the Event Description section of this LER, ARMIRE5400B was declared inoperable on April 24, 2022 due to indicating outside the NUREG-0737 and Regulatory Guide 1.97, Revision 3, factor of 2 accuracy requirement. The cause of the ARMIRE5400B inoperability was the use of an incorrect engineering conversion factor and not accounting for the keep alive source dose rate. Therefore, a common cause of the inoperability of both containment high range radiation monitor channels (ARMIRE5400A and ARMIRE5400B) was that the calibration procedure for the containment high range radiation monitors did not account for the keep alive source. Accordingly, as required by 10 CFR 50.73(a)(2)(vii)(D), this event is being reported as any event where a single cause or condition caused two independent trains or channels to become inoperable in a single system designed to mitigate the consequences of an accident.

SAFETY ASSESSMENT

The actual consequences of the inoperability of ARMIRE5500A, ARMIRE5400A, and ARMIRE5400B were that these radiation monitors were indicating outside of their allowable tolerance. The inoperability condition of these radiation monitor channels resulted in the individual channels being incapable of performing their TS 3.3.3.1 specified functions. These radiation monitors are not described in Chapter 6 or Chapter 15 of the Waterford 3 UFSAR for accident mitigation.

The potential consequence to general safety of the public, nuclear safety, industrial safety, and radiological safety of the inoperability of ARMIRE5400A and ARMIRE5400B is the impact on emergency planning. The inoperability of these containment high range radiation monitoring channels resulted in the inability to enter applicable emergency action levels (EALs) when those criteria are met. The safety significance of an inability to enter an EAL and take



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appropriate action varies depending on the EAL severity, and the risk if no action is taken is considered Low based on the multiple mitigating or overlapping EALs incorporated in the emergency planning procedures and requirements.

ARMIRE5500A is not safety related and is not used for determining EALs. It is used for dose assessment following actuation of the SRVs and ADVs, and alternative methods of dose assessment are available. Therefore, the inoperability of ARMIRE5500A is considered to have had minimal potential consequence to general safety of the public, nuclear safety, industrial safety, and radiological safety because the alternate methods of dose assessment would have been applied.

EVENT CAUSES

ARMIRE5400A and ARMIRE5400B were improperly calibrated due to inadequate calibration procedure guidance to account for the keep alive source and the use of an incorrect engineering conversion factor in ARMIRE5400B. A legacy causal factor was identified where the vendor incorrectly calculated the engineering conversion factor for ARMIRE5400B during plant construction, and inadequate procedural guidance for vendor oversight was attributed to ARMIRE5400B not having the correct engineering conversion factor installed. ARMIRE5500A was improperly calibrated due to the calibration procedure not including steps to record the new ion chamber output dose rate reference values for use during subsequent calibrations.

CORRECTIVE ACTIONS

As documented in Waterford 3 LER 2022-003-00 involving ARMIRE5400A, the calibration procedure for the containment high range radiation monitors was revised on April 24, 2022 to update the procedural guidance to account for the keep alive dose rate. ARMIRE5400A was calibrated using the corrected procedure on May 14, 2022. The correct engineering conversion factor was installed in ARMIRE5400B, and it was calibrated using the revised calibration procedure, which accounts for the keep alive dose rate. This was completed on May 11, 2022.

The calibration procedure for the main steam line high range radiation monitors was revised on May 4, 2022 to update the reference dose rates and dates to account for the replacement of ARMIRE5500A and to ensure the correct engineering conversion factors are installed in the radiation monitors for proper calibration in the future. ARMIRE5500A was calibrated using the corrected procedure on May 5, 2022.

Governance procedures for vendor supplied documents did not exist during plant construction when the vendor provided an incorrect engineering conversion factor for ARMIRE5400B. Procedures controlling acceptance of vendor documents, including controls on vendor supplied engineering change documents and calculations, have since been established.

PREVIOUS SIMILAR EVENTS

LER 2022-001-00 reported a non-compliance with TS 3.3.3.1, Action b, and TS Table 3.3-6, Action 27, due to incorrect conversion factors used in three gaseous radiation monitors. LER 2022-003-00 reported a non-compliance with TS 3.3.3.1, Action b, and TS Table 3.3-6, Action 27, due to the calibration procedure for the containment high range radiation monitors containing incorrect procedural guidance to account for the keep alive source decay when the original Log Pico-ammeter and ADC circuit board was replaced detector replacement. This LER (2022-004-00) was a direct result of the extent of condition reviews and activities conducted as part of the corrective actions for the two previous LERs.