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Manager
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504-739-6028

W3F1-2022-0036 10 CFR 50.73

June 13, 2022

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

Subject: Licensee Event Report 50-382/2022-003-00, Operation Prohibited by Technical Specifications Due to Radiation Monitor Calibration Error

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) 50-382/2022-003-00 for Waterford Steam Electric Station, Unit 3. This event is 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 (TSs). The LER describes a non-compliance with TS 3.3.3.1 due to a radiation monitor calibration error.

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/jkb/cdm

Enclosure: Licensee Event Report 50-382/2022-003-00

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 to

W3F1-2022-0036

Licensee Event Report 50-382/2022-003-00

NRC FORM 366 (08-2020) U.S. NUCLEAR REGULATORY COMMISSION

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

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2023

1. Facility Name	2. Docket Number	3. Page
Waterford Steam Electric Station, Unit 3	05000 - 0382	1 OF 4

4. Title

Operation Prohibited by Technical Specifications Due to Radiation Monitor Calibration Error

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	13	2022	2022	003	00	06	13	2022		05000
									Facility Name	Docket Number
										05000

9. Operating Mode	10. Power Level
6	000

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

10 CFR Part 20	☐ 20.2203(a)(2)(vi)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(A)	**10 CFR Part 73**
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.69(g)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(4)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(i)	**10 CFR Part 21**	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(1)(i)
☐ 20.2203(a)(2)(ii)	☐ 21.2(c)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(i)
☐ 20.2203(a)(2)(iii)	**10 CFR Part 50**	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)	☐ 73.77(a)(2)(ii)
☐ 20.2203(a)(2)(iv)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)	
☐ 20.2203(a)(2)(v)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)	

☐ **Other** (Specify here, in Abstract, or in NRC 366A).

12. Licensee Contact for this LER

Licensee Contact	Phone Number (Include Area Code)
John D. Lewis / Manager, Regulatory Assurance	(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		15. Expected Submission Date	Month	Day	Year
☒ No	☐ Yes (If yes, complete 15. Expected Submission Date)		N/A	N/A	N/A

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

On April 13, 2022, while operating in Mode 6 at 0% power, Waterford 3 Steam Electric Station Unit 3 (Waterford 3) personnel discovered that the calibration procedure for Containment High Range Radiation Monitor A (ARMIRE5400A) contained incorrect procedural guidance following detector replacement, which could cause an incorrect indication. This resulted in ARMIRE5400A being inoperable. During subsequent troubleshooting, additional subcomponents were discovered to be malfunctioning. 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 3.3.3.1, Action b, and TS Table 3.3-6, Action 27, required 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. ARMIRE5400A exceeded the allowed outage time required by TS Table 3.3-6, Action 27. A special report was not submitted because the inoperability went undetected for approximately 10 years.

The procedure was corrected. The faulty subcomponents were replaced, and the radiation monitor was recalibrated using the corrected procedure guidance.

This condition is being reported pursuant to 10 CFR 50.73(a)(2)(i)(B) – any operation or condition that was prohibited by the plant's Technical Specifications.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Waterford Steam Electric Station, Unit 3	05000-0382	2022	003	00

NARRATIVE

PLANT STATUS

On April 13, 2022, Waterford Steam Electric Station, Unit 3 (Waterford 3) was operating at 0% power in Mode 6. There were no other structures, systems, or components that were inoperable at the time that contributed to the event.

EVENT DESCRIPTION

On April 13, 2022, while troubleshooting an issue with opposite train Containment High Range Radiation Monitor B (ARMIRE5400B) [IL, RI], engineering discovered that the keep alive source decay was not considered when the original Log Pico-ammeter and analog-to-digital converter (ADC) circuit board was replaced in Containment High Range Radiation Monitor A (ARMIRE5400A) [IL, RI]. This resulted in ARMIRE5400A being declared inoperable. 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 3.3.3.1, Action b, and TS Table 3.3-6, Action 27, required 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.

During subsequent troubleshooting on April 18, 2022, it was discovered that the ARMIRE5400A signal fluctuations began coincident with the July 10, 2012 replacement of the Log Pico-ammeter and ADC circuit board. ARMIRE5400A has indicated outside of its Regulatory Guide 1.97, Revision 3, factor of 2 accuracy requirement since July 10, 2012. Troubleshooting and repairs were completed on May 14, 2022, and ARMIRE5400A was declared operable.

ARMIRE5400A was inoperable for approximately 10 years without submitting a special report, which exceeded the allowed outage time required by TS Table 3.3-6, Action 27. A special report was not submitted because the inoperability was due to a latent condition that had not been previously identified.

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.

This event is being reported under 10 CFR 50.73(a)(2)(i)(B) which requires submittal of a Licensee Event Report within 60 days after the discovery of any operation or condition that was prohibited by the plant's Technical Specifications.

The direct cause of the event is that the Log Pico-ammeter and ADC board was incorrectly calibrated in September 2013 which produced an inconsistent, nonlinear output.

Timeline of Events

07/10/2012 – The incorrect model Log Pico-ammeter and ADC circuit board was installed in ARM1RE5400A. Signal fluctuations were observed following the Log Pico-ammeter and ADC board replacement and continued despite replacement of other ARM1RE5400A subcomponents.

09/01/2013 – Installed the correct model Log Pico-ammeter and ADC circuit board in ARM1RE5400A. It was not recognized at the time that the Log Pico-ammeter and ADC circuit board that was replaced had been an incorrect model. This error was not identified until April 2022.

04/13/2022 – During the spring 2022 refueling outage (RF24), maintenance and engineering were discussing issues encountered with the ARMIRE5400B calibration, which ultimately led to the ARMIRE5400B detector replacement. This discussion also led to an engineering review of the calibration guidance, previously completed calibration packages, and trends for both ARMIRE5400A and ARMIRE5400B. The review revealed a significant indication difference between both containment high range radiation monitors. The difference should be small because both use similar quantities of Uranium-234/Uranium-238 isotopes for their keep alive sources. The calibration procedure guidance did not account for keep alive source decay, which caused incorrect count rates to be used in the calibration procedure.

04/18/2022 – While troubleshooting the ARMIRE5400A signal fluctuations, engineering discovered that the signal fluctuations began with the replacement of the Log Pico-ammeter and ADC circuit board in July 2012. Two potential causes of the fluctuations were determined in a troubleshooting plan: degraded signal connector [CON] between the detector [RE] and the signal processor [CPU]; and a faulty Log Pico-ammeter and ADC circuit board.

05/02/2022 – Replaced the signal connector to the ARMIRE5400A Log Pico-ammeter and ADC board, and the Log Pico-ammeter and ADC circuit board was replaced.

05/14/2022 – ARMIRE5400A repairs and calibrations were completed using the corrected procedure, and AREMIRE5400A was declared operable.

SAFETY ASSESSMENT

The actual consequences were that the ARMIRE5400A was indicating outside of its Regulatory Guide 1.97, Revision 3, factor of 2 accuracy requirement resulting in the channel being incapable of performing its TS 3.3.3.1 specified functions. There were no other actual consequences to general safety of the public, nuclear safety, industrial safety, and radiological safety for this event.

The potential consequence to general safety of the public, nuclear safety, industrial safety, and radiological safety of this event are the inability to enter applicable emergency action levels when those criteria are met. However, the safety significance of an inability to enter an emergency action level and take appropriate action varies depending on the emergency action level severity.

The risk if no action is taken is Low based on the multiple mitigating or overlapping emergency action levels incorporated in the emergency planning procedures and requirements.

EVENT CAUSES

The incorrect model Log Pico-ammeter and ADC circuit board was installed in ARMIRE5400A in July 2012 because the material request contained the incorrect replacement model number. This resulted in ARMIRE5400A operating outside a factor of 2 accuracy. This error was latent from July 2012 and the details could not be obtained due to its age and the unavailability of the personnel involved. This causal factor was corrected September 1, 2013.

Following replacement of the Log Pico-ammeter and ADC circuit board in September 2013, the Log Pico-ammeter and ADC circuit board was incorrectly calibrated which produced an inconsistent, nonlinear output. The calibration procedure guidance did not account for keep alive source decay, which caused incorrect count rates to be used in the calibration procedure. This causal factor was corrected on May 2, 2022.

The integrity of the signal connector to the ARMIRE5400A Log Pico-ammeter and ADC circuit board was compromised. Continuous manipulation of the cable connector to the Log Pico-ammeter board caused signal degradation such that the indication of ARMIRE5400A displayed lower than actual and resulted in operation outside a factor of 2 accuracy. This causal factor was corrected on May 2, 2022.

Inadequate Post Maintenance trending to ensure system engineering reviews detector output deviations from previous successful performance resulted in missed opportunities to identify monitors that were not capable of performing monitoring.

CORRECTIVE ACTIONS

Installed the correct model Log Pico-ammeter and ADC circuit board. This action was completed on September 1, 2013.

Revised calibration procedure to account for keep alive source dose-rate. This action was completed on April 24, 2022.

Replaced ARMIRE5400A Log Pico-ammeter and ADC circuit board. This action was completed on May 2, 2022.

Replaced the signal connector to the ARMIRE5400A Log Pico-ammeter and ADC circuit board. This action was completed on May 2, 2022.

Revise ARMIRE5400A work orders to include a post-maintenance test for system engineering to review resulting output indications and compare to previous output indications to determine if output is appropriate to return to service. This action to be completed by December 20, 2022.

PREVIOUS SIMILAR EVENTS

None