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RA-23-0016

January 12, 2023

10 CFR 50.73

Attn: Document Control Desk
U. S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2746

Duke Energy Carolinas, LLC
Oconee Nuclear Station Unit 1
Docket Number: 50-269
Renewed Operating Licenses: DPR-38

Subject: Licensee Event Report 269/2022-002, Revision 00 – Unit 1 Reactor Coolant System
Pressure Boundary Leak on Reactor Coolant Pump Lower Bearing Thermowell

Licensee Event Report 269/2022-002, Revision 00, is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

There are no regulatory commitments associated with this LER.

There are no unresolved corrective actions necessary to restore compliance with NRC requirements.

If there are questions, or further information is needed, contact Laura Boyce, Regulatory Affairs, at (864) 873-6774.

Sincerely,

A handwritten signature in black ink, appearing to read "Steven M. Snider", written in a cursive style.

Steven M. Snider
Vice President
Oconee Nuclear Station

Enclosure: Licensee Event Report 269/2022-002 Rev. 00

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cc (w/Enclosure):

Ms. Laura Dudes, Administrator, Region II
U.S. Nuclear Regulatory Commission
Marquis One Tower
245 Peachtree Center Ave., NE, Suite 1200
Atlanta, GA 30303-1257

Mr. Shawn Williams, Project Manager
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Mail Stop O-08B1A
Rockville, MD 20852-2738

Mr. Jared Nadel
NRC Senior Resident Inspector
Oconee Nuclear Station



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-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk ail: oir_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name

Oconee Nuclear Station Unit 1

2. Docket Number

0500000269

3. Page

1 OF 4

4. Title

Reactor Coolant System Pressure Boundary Leak on Reactor Coolant Pump Lower Bearing Thermowell

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
11	14	2022	2022	002	00	01	12	2023	NA	05000
									Facility Name	Docket Number
									NA	05000

9. Operating Mode 6	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input checked="" 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)
10. Power Level 000	<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)
	<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)
	<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 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 type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(iii)
<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

Licensee Contact

Laura Boyce, Oconee Regulatory Affairs

Telephone Number (Include Area Code)

(864) 873-6774

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
B	AB	TW	W120	Y	N/A				

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

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

During a scheduled refueling outage, a walkdown inside containment discovered a small amount of boron on the 1B2 Reactor Coolant Pump (RCP) lower bearing temperature instrument. At 0730 EST on November 14, 2022, with Unit 1 in Mode 6, disassembly of the instrument indicated the source of the boron was from a leak in the instrument thermowell.

The leak appeared inactive upon discovery and the boron deposit was estimated to be less than 1 cup in quantity and dry. A leak from the thermowell is considered a pressure boundary leak. The existing thermocouple assembly was replaced with a high-pressure assembly which moved the pressure boundary from the outer surface of the existing thermowell to the pressure boundary fittings at the top face of the pump main flange.

At the time that the source of the boron leak was identified, Unit 1 was in a refueling outage in Mode 6. No significant structures, systems or components were out of service at the time of this event that contributed to the event. Units 2 and 3 were not affected by this event.

This event was reported to the NRC on November 14, 2022, in Event Notification (EN) number 56221, as an 8-hour non-emergency notification under 10 CFR 50.72(b)(3)(ii)(A) – Degraded Condition. The event is also reportable under 10 CFR 50.73(a)(2)(i)(B) - Operation or Condition Prohibited by Technical Specifications (TS) and 10 CFR 50.73(a)(2)(ii)(A) - Degraded Condition.

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

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Oconee Nuclear Station Unit 1	0500000269	2022	002	00

NARRATIVE

Energy Industry Identification System (EIS) codes are identified in the text as [XX].

BACKGROUND

Oconee Nuclear Station is a Babcock & Wilcox (B&W) Pressurized Water Reactor [EIS: RCT].

The primary function of the Reactor Coolant System (RCS) [EIS: AB] is removal of the heat generated in the fuel due to the fission process, and transfer of this heat, via the Steam Generators (SG) [EIS: SG], to the secondary plant. The RCS configuration for heat transport uses two RCS loops. Each RCS loop contains a SG and two reactor coolant pumps (RCP) [EIS: PJ]. The RCPs for Unit 1 are Westinghouse Model 93A pumps. Instruments are installed to provide indication of pump parameters, including pump radial bearing temperature. The pump radial bearing temperature instrument utilizes a pressure retaining thermowell [EIS: TW] welded to the pump main flange which extends downward into the cavity above the pump radial bearing. A thermocouple installed in the thermowell provides the pump radial bearing temperature indication.

Technical Specification (TS) 3.4.13 specifies that in Modes, 1, 2, 3, and 4, RCS operational leakage shall be limited to: No pressure boundary leakage, 1 gallon per minute (gpm) unidentified leakage, 10 gpm identified leakage; and 150 gallons per day primary to secondary leakage through any one SG.

EVENT DESCRIPTION

During an outage in September 2001, boron accumulation was identified on the 1B1 RCP lower bearing temperature instrument. Follow-up inspections did not detect an active leak or an exact leak location. Based on a Westinghouse Technical Bulletin (ESBU-TB-96-01-R1), corrective actions were generated to modify the 1B1 temperature instrument in the next refueling outage (1EOC20) with an updated design provided by Westinghouse.

As a result of long lead times for parts and other issues, the updated radial bearing temperature instrument could not be installed in 1EOC20 refueling outage. Instead, an engineering change was performed to remove the thermocouple and a pressure retaining plug was installed in the thermowell. During 1EOC21 (Fall 2003), the 1B1 pump was replaced, which resolved any existing thermowell issues. The pump removed from the 1B1 location was then designated as a spare RCP assembly for Unit 1 and was refurbished in 2005/2006.

Leading up to a refueling outage in 2018 (O1R30), the 1B2 RCP was identified as requiring replacement. Prior to being installed as the 1B2 RCP in 2018, the spare RCP assembly was sent to a vendor for additional refurbishments. The existing thermowell exhibited no issues visually and passed a pressure test. Following this vendor refurbishment, the spare RCP assembly was installed as the 1B2 RCP during the O1R30 refueling outage in the fall of 2018.

During a scheduled refueling outage in November 2022 (O1R32), a walkdown inside containment discovered a small amount of boron on the 1B2 RCP lower bearing temperature instrument. At 0730 EST on November 14, 2022, with Unit 1 in Mode 6, disassembly of the instrument indicated the source of the boron was from a leak in the instrument thermowell.

The leak appeared inactive upon discovery and the boron deposit was estimated to be less than 1 cup in quantity and dry. A leak from the thermowell is considered a pressure boundary leak. The existing thermocouple assembly was replaced with a high-pressure assembly which moved the pressure boundary from the outer surface of the existing thermowell to the pressure boundary fittings at the top face of the pump main flange.

At the time that the source of the boron leak was identified, Unit 1 was in a refueling outage in Mode 6. No significant structures, systems or components were out of service at the time of this event that contributed to the event. Units 2 and 3 were not affected by this event.



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Oconee Nuclear Station Unit 1	0500000269	YEAR 2022	SEQUENTIAL NUMBER 002	REV NO. 00

Reportability

This event was reported to the NRC on November 14, 2022, in Event Notification (EN) number 56221, as an 8-hour non-emergency notification under 10 CFR 50.72(b)(3)(ii)(A) – Degraded Condition. The event is also reportable under 10 CFR 50.73(a)(2)(i)(B) - Operation or Condition Prohibited by Technical Specifications (TS) and 10 CFR 50.73(a)(2)(ii)(A) - Degraded Condition.

CAUSAL FACTORS

Westinghouse issued a Product Update (P-008) in October 1997 and a Technical Bulletin (ESBU-TB-96-01-R1) in February 1998 to their RCP customers that discussed the vulnerability of certain vintage radial bearing thermowells in Westinghouse 93A pumps. These documents listed specific RCP serial numbers known by Westinghouse to be affected. The thermowells were fabricated by machining a long rod and center boring from both ends to meet in the middle. Westinghouse determined that in some cases the two bores did not meet exactly and left a thin spot. The thermowell was not removed from the 1B2 RCP, so an exact cause is not known. However, based on the results of the temperature instrument disassembly and the information in the Westinghouse Product Update and Technical Bulletin, the leak observed on the 1B2 RCP was most likely due to the same condition described in the Product Update/Technical Bulletin.

Factors resulting in refurbishment of a spare RCP with an unmitigated vulnerability include weaknesses in operating experience, vendor technical information, and corrective action programs in the late 1990s and early 2000s.

CORRECTIVE ACTIONS

Immediate:

1. Replaced the existing thermocouple assembly with an upgraded assembly which moved the pressure boundary from the outer surface of the existing thermowell to the pressure boundary fittings at the top face of the pump main flange.
2. Extent of condition review completed to identify other affected RCPs. One spare RCP was identified.

Planned:

1. Replace/upgrade thermocouple assembly on spare RCP.
2. Provide training on the operating experience and lessons learned from this event to Engineering and Maintenance personnel responsible for equipment health and major equipment refurbishment.

SAFETY ANALYSIS

The thermowell leakage appeared inactive at time of discovery based on the boron being dry. Visual evidence indicates the leak was intermittent and then self-arrested. RCS Leakage is monitored daily via an RCS Leakage calculation and trending of reactor building parameters. The amount of boron discovered on the thermowell is well below the threshold the RCS Leakage calculation can identify. If the leakage had continued to increase, the RCS Leakage calculation would have eventually identified the rise in Unidentified RCS Leak rate. Catastrophic failure of the thermowell is considered unlikely but if it were to have occurred, the loss of RCS inventory would be bounded by design basis safety analysis. The leak rate from the thermowell would be limited by the outlet from the thermowell at the pipe cap which was 1/2". This size leak is bounded by analyses in the ONS UFSAR regarding mitigation of a small break Loss of Coolant Accident.

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Oconee Nuclear Station Unit 1		0500000269		YEAR	SEQUENTIAL NUMBER	REV NO.
				2022	002	00

The risk significance of this event was reviewed and determined to be very low based on the low likelihood of a catastrophic failure of the thermowell. Even if the leak had been active and continued to degrade, the most likely outcome would have been an unplanned plant shutdown when the leak reached a detectable leakage rate. Thus, the potential increase in the small-break LOCA initiating event frequency is considered very small and the increase in core damage frequency (CDF) is also very small. Therefore, it is concluded that the impact of this event on overall plant risk was very low, and had no impact on public health and safety.

ADDITIONAL INFORMATION

A review of Duke Energy's Corrective Action Program did not identify any Oconee LERs or events in the last three years that involved the same underlying concerns or reasons as this event.

This event is considered INPO IRIS Reportable. There were no releases of radioactive materials, radiation exposures or personnel injuries associated with this event.