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RA-24-0071

February 29, 2024 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 3
Docket Number: 50-287
Renewed Operating License: DPR-55

Subject: Licensee Event Report 287/2023-002, Revision 00 – Passive Containment Isolation Device Inoperability Results in Operation or Condition Prohibited by Technical Specifications

Licensee Event Report 287/2023-002, 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.

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

Sincerely,

David A. Wilson

dc=com, dc=duke-energy, dc=ent, dc=nam, ou=Accounts, ou=Personal, ou=PNTransitional, cn=DAWilso (252825), email=David.Wilson2@duke-energy.com
I attest to the accuracy and integrity of this document.
2024.02.29 18:12:09 -05'00'

David A. Wilson
Manager, Nuclear Support Services
Oconee Nuclear Station

Enclosure: Licensee Event Report 287-2023-002 Rev.00

cc (w/Enclosure):

Ms. Laura Dudes, Administrator, Region II
U.S. Nuclear Regulatory Commission
Marquis One Tower
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Atlanta, GA 30303-1257

Mr. Shawn Williams, Project Manager
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Mr. Jared Nadel
NRC Senior Resident Inspector
Oconee Nuclear Station

NRC FORM 366 (10-01-2023) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2024

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 FOIA, Library, and Information Collections Branch (T-6 A10M), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by email to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; email: oira_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.

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/)

1. Facility Name		2. Docket Number	3. Page
Oconee Nuclear Station Unit 3	■ 050 ☐ 052	00287	1 OF 4

4. Title

Passive Containment Isolation Device Inoperability Results in Operation or Condition Prohibited by Technical Specifications

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved		
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	☐ 050	Docket Number
06	23	2023	2023	- 002 -	00	02	29	2024	Facility Name	☐ 052	Docket Number

9. Operating Mode	10. Power Level
1	100

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)	**10 CFR Part 50**	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)	☐ 73.1200(a)
☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)	☐ 73.1200(b)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)	☐ 73.1200(c)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)	☐ 73.1200(d)
☐ 20.2203(a)(2)(i)	**10 CFR Part 21**	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(A)	**10 CFR Part 73**	☐ 73.1200(e)
☐ 20.2203(a)(2)(ii)	☐ 21.2(c)	☐ 50.69(g)	☐ 50.73(a)(2)(v)(B)	☐ 73.77(a)(1)	☐ 73.1200(f)
☐ 20.2203(a)(2)(iii)		☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(2)(i)	☐ 73.1200(g)
☐ 20.2203(a)(2)(iv)		☑ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(ii)	☐ 73.1200(h)
☐ 20.2203(a)(2)(v)		☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)		

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

12. Licensee Contact for this LER

Licensee Contact	Phone Number (Include area code)
Laura Boyce, Senior Nuclear Engineer, Oconee Regulatory Affairs	(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	KG	PSP	X000	Y						

14. Supplemental Report Expected		15. Expected Submission Date	Month	Day	Year
☑ No	☐ Yes (If yes, complete 15. Expected Submission Date)				

16. Abstract (Limit to 1326 spaces, i.e., approximately 13 single-spaced typewritten lines)

On June 22, 2023, Oconee Unit 3 was operating at approximately 100 percent power. At approximately 22:50 Eastern Daylight Time (EDT), an unexpected increase in Unit 3 Reactor Building Normal Sump (RBNS) input rate was identified. The source of the Unit 3 RBNS input was identified at approximately 21:45 EDT on June 24, 2023, as a 3/4-inch instrument line broken upstream of normally closed instrument valve 3LPS-IV-0081. The direct cause is associated with the physical failure of a short section of 3/4 inch carbon steel instrument piping due to internal corrosion of the carbon steel piping at a carbon steel (CS) to stainless steel (SS) weld. The most probable cause of the failure was a deficiency in either the design scope or implementation of a 1998 Engineering Change; resulting in small segments of small-bore CS instrument piping not being replaced with SS as intended. Immediate corrective actions included: replacing piping configuration at 3LPS-IV-0081 to resolve the leak and performing an extent of condition (EOC) review to identify additional small-bore instrument piping locations with CS to SS welds. Planned corrective actions include installation of alternate piping configurations for components with CS to SS welds identified during EOC review and revision of design documentation to reflect existing stainless steel pipe configurations.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2024

(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/)

1. FACILITY NAME		2. DOCKET NUMBER	3. LER NUMBER		
	■ 050		YEAR	SEQUENTIAL NUMBER	REV NO.
Oconee Nuclear Station Unit 3	☐ 052	00287	2023	- 002	- 00

NARRATIVE

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

BACKGROUND

The Low Pressure Service Water (LPSW) system [BI, KG] provides cooling for essential and non-essential components in the Turbine Building (TB)[NM], Auxiliary Building (AB)[NF], and the Reactor Building (RB)[NH] and is required to be operable per Technical Specification (TS) 3.7.7. Unit 3 has two LPSW pumps which can supply multiple combinations of pathways.

One of the non-essential cooling functions performed by the LPSW system is to provide cooling water to the Reactor Coolant Pump (RCP) motor coolers [KG]. A common header supplies LPSW to all four RCP motors and LPSW flow can be isolated to individual RCPs using pairs of motor-operated isolation valves located inside the Unit 3 Reactor Building outside the secondary shield wall. LPSW supply to the RCP motor coolers enters the Unit 3 Reactor Building through Penetration 21 and exits through Penetration 22.

While the normal function of this portion of the Unit 3 LPSW system is not safety-related, the Reactor Coolant Pump (RCP) motor cooling piping has a safety related function to serve as a closed-loop mechanical piping system inside containment forming the inside containment isolation barrier for Penetrations 21 and 22. Redundant containment isolation for Penetrations 21 and 22 is provided by motor-operated Containment Isolation Valves (CIVs) located immediately outside the Unit 3 Reactor Building (valves 3LPSW-6 and 3LPSW-15). These CIVs automatically close on Engineered Safety Feature Actuation Signal (ESFAS) channels 5 and 6 [JM] for High Reactor Building Pressure.

EVENT DESCRIPTION

On June 22, 2023, Oconee Unit 3 was operating at approximately 100 percent power. At approximately 22:50 Eastern Daylight Time (EDT), an unexpected increase in Unit 3 Reactor Building Normal Sump (RBNS)[IJ] input rate was identified, with RBNS input rate increasing from approximately 0.013 gallons per minute (gpm) to approximately 0.36 gpm. Reactor Coolant System (RCS)[AB] leakage calculations were performed, and RCS leakage was ruled out, but a Reactor Building [NH] entry was needed to determine the leak source. Over the next three shifts, Operators and Maintenance technicians systematically isolated and inspected all possible sources of the RBNS input that were accessible with Unit 3 at 100% power. During this time, on June 23, 2024, at approximately 13:00 EDT, the Unit 3 RBNS input rate abruptly increased from approximately 0.3-0.4 gpm to approximately 6 gpm. At 14:00 EDT on June 24, 2023, with no source of the Unit 3 RBNS input identified on any components accessible with Unit 3 at 100% power, Operators began reducing Unit 3 reactor power to allow for investigation of possible leak sources inside the Steam Generator cavities. By approximately 20:33 EDT on June 24, 2023, Unit 3 reactor power was reduced to approximately 20% and inspections inside the Steam Generator cavities were initiated. The source of the Unit 3 RBNS input was identified at approximately 21:48 EDT as a 3/4-inch instrument line broken upstream of normally closed instrument valve 3LPS-IV-0081. The instrument location is for taking pressure readings on the LPSW cooling water header for the 3A1 RCP and is valved out when the Unit is Online. With the source of the leak identified, Operators determined that leak isolation would require the 3A1 RCP to be removed from service. To minimize potential reactor power perturbations that may occur during shutdown of an RCP with the reactor in Mode 1, Operators decided to shut down Unit 3 to Mode 3 prior to securing the 3A1 RCP. This shutdown was completed by 05:40 EDT on June 25, 2023. The 3A1 RCP was subsequently secured at 08:12 EDT, and the leak was isolated at approximately 08:34 EDT by isolating the LPSW cooling water supply and return piping associated with the 3A1 RCP. The broken instrument pipe repairs were completed by 23:00 EDT on June 25, 2023. Repairs consisted of installing a modified instrument connection design. Unit 3 reactor startup was initiated on June 26, 2023, and Unit 3 was returned to approximately 100% power on June 27, 2023.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(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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REPORTABILITY

At the time of the leak identification, ONS personnel (Operations, Engineering, and Regulatory Affairs) evaluated applicability of various Technical Specifications and determined that no existing Technical Specifications appropriately addressed the leak. This was entered into the Corrective Action Program to drive out resolution, but this did not delay actions to identify and isolate the leakage. During a discussion with NRC headquarters personnel on January 17, 2024, ONS was verbally informed that NRC interpretation of ONS technical specifications was that Limiting Condition of Operation (LCO) 3.6.3, Containment Isolation Valves, was not met and the Conditions and Required Actions in TS 3.6.3 only apply to containment isolation valves (i.e., there are no CONDITIONS in TS 3.6.3 that apply to a leak in the pressure boundary on a closed loop containment isolation barrier). Thus, LCO 3.0.3 should have been entered. Per LCO 3.0.3: "When an LCO is not met and the associated ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS, the unit shall be placed in a MODE or other specified condition in which the LCO is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable, in (a) MODE 3 within 12 hours; (b) MODE 4 within 18 hours; and (c) MODE 5 within 37 hours."

While the time from leak identification to leak isolation would have met Required Action times for LCO 3.0.3, there is firm evidence that there was a LPSW leak on this closed loop penetration piping longer than the LCO 3.0.3 Required Action times. A LPSW leak large enough to question operability of the closed loop piping as a containment isolation barrier existed since at least approximately 1300 on June 23, 2023, when the leak rate increased above approximately 0.6 gpm LPSW allowable leakage per station calculations. The approximately 43.5 hours it took to isolate the LPSW leak after it was large enough to question operability of the closed loop piping exceeded the LCO 3.0.3 Required Action times. Therefore, this event is reportable as an Operation or Condition Prohibited by Technical Specifications 10CFR50.73(a)(2)(i)(B).

CAUSAL FACTORS

The direct cause is associated with the physical failure of a short section of 3/4 inch carbon steel instrument piping due to internal corrosion of the carbon steel piping at a carbon steel (CS) to stainless steel (SS) weld.

The LPSW supply and return piping to the RCP motors was originally installed as carbon steel piping. An Engineering Change implemented in 1998 replaced most of this piping with stainless steel. The cause investigation was unable to determine why the Engineering Change scope did not result in replacement of the small-bore CS instrument piping that failed in this case. However, the most probable cause of the failure was a deficiency in either the design scope or implementation of the 1998 Engineering Change; resulting in small segments of small-bore CS instrument piping not being replaced with SS as intended.

CORRECTIVE ACTIONS

Immediate:

1. Performed RCS leakage calculation and concluded leakage was not from RCS.
2. Performed Reactor Building entry to determine leak source by direct observation/sump sample.
3. Replaced piping configuration at 3LPS-IV-0081 to resolve the leak.
4. Performed an extent of condition (EOC) review to identify additional small-bore instrument piping locations with CS to SS welds and replaced piping configuration at 3LPS-IV-0082 to resolve a degraded condition.

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NARRATIVE

CORRECTIVE ACTIONS (CONT'D)

Planned:
1. For Unit 3 components with CS to SS welds identified during the EOC review, install alternate piping configurations at identified components during Spring 2024 Unit 3 Refueling Outage.
2. Complete EOC walkdowns for areas that are inaccessible at power at the next available opportunity (Spring 2024 Unit 3 Refueling Outage and Fall 2024 Unit 1 Refueling Outage)
3. Revise design documentation to reflect existing stainless steel pipe configurations.

SAFETY ANALYSIS

The Unit 3 LPSW leak resulting in the requirements of TS 3.6.3 not being met was evaluated for its risk impact. It was determined the condition had a negligible impact to public health and safety. The applicable risk metric is LERF as the condition resulted in failing to satisfy the requirements established in TS 3.6.3 pertaining to operability of the containment isolation devices. A leak rate more than allowable overall containment leakage limits existed for a period of approximately 44 hours. An accident occurring during this limited window of time is very unlikely. Additionally, throughout the duration of the event the ability to isolate containment was maintained. Penetrations 21 and 22 affected by the condition were capable of being isolated via closure of valves 3LPSW-6 and 3LPSW-15. Both valves close automatically on ES signal. Therefore, it has been concluded this event had a negligible impact to the health and safety of the public.

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 involve 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.