



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE N.E., SUITE 1200
ATLANTA, GEORGIA 30303-1200

November 7, 2022

Steven M. Snider
Site Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION – INTEGRATED INSPECTION REPORT
05000269/2022003 AND 05000270/2022003 AND 05000287/2022003

Dear Steven Snider:

On September 30, 2022, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Oconee Nuclear Station. On October 26, 2022, the NRC inspectors discussed the results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

Two findings of very low safety significance (Green) are documented in this report. Two of these findings involved violations of NRC requirements. We are treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the Enforcement Policy.

If you contest the violations or the significance or severity of the violations documented in this inspection report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement; and the NRC Resident Inspector at Oconee Nuclear Station.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; and the NRC Resident Inspector at Oconee Nuclear Station.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,



Signed by Stamm, Eric
on 11/07/22

Eric J. Stamm, Chief
Reactor Projects Branch 1
Division of Reactor Projects

Docket Nos. 05000269 and 05000270 and 05000287
License Nos. DPR-38 and DPR-47 and DPR-55

Enclosure:
As stated

cc w/ encl: Distribution via LISTSERV

SUBJECT: OCONEE NUCLEAR STATION – INTEGRATED INSPECTION REPORT
05000269/2022003 AND 05000270/2022003 AND 05000287/2022003
DATED November 7, 2022

DISTRIBUTION:

M. Kowal, RII
S. Price, RII
N. Doiley, RII
M. Toth, RII
PUBLIC
RidsNrrPmOconee Resource
RidsNrrDro Resource

ADAMS ACCESSION NUMBER: **ML22308A180**

<input checked="" type="checkbox"/> SUNSI Review		<input checked="" type="checkbox"/> Non-Sensitive <input type="checkbox"/> Sensitive		<input checked="" type="checkbox"/> Publicly Available <input type="checkbox"/> Non-Publicly Available	
OFFICE	RII/DRP	RII/DRP	RII/DRP		
NAME	J. Nadel	D. Jackson	E. Stamm		
DATE	11/7/2022	11/7/2022	11/7/2022		

OFFICIAL RECORD COPY

**U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report**

Docket Numbers: 05000269, 05000270 and 05000287

License Numbers: DPR-38, DPR-47 and DPR-55

Report Numbers: 05000269/2022003, 05000270/2022003 and 05000287/2022003

Enterprise Identifier: I-2022-003-0026

Licensee: Duke Energy Carolinas, LLC

Facility: Oconee Nuclear Station

Location: Seneca, South Carolina

Inspection Dates: July 1, 2022, to September 30, 2022

Inspectors: J. Nadel, Senior Resident Inspector
A. Ruh, Resident Inspector
N. Smalley, Resident Inspector

Approved By: Eric J. Stamm, Chief
Reactor Projects Branch 1
Division of Reactor Projects

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee’s performance by conducting an integrated inspection at Oconee Nuclear Station, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC’s program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information.

List of Findings and Violations

Failure to Use a Procedure Appropriate to the Circumstances While Changing a Unit 3 Spent Fuel Cooling Filter			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Barrier Integrity	Green NCV 05000287/2022003-01 Open/Closed	[P.3] - Resolution	71111.06
A self-revealed Green finding and associated non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” was identified when the licensee failed to use a procedure appropriate to the circumstances for an activity affecting quality. Specifically, the maintenance procedure for changing the spent fuel cooling system filters was inadequate, which led to a filter gasket failure that leaked approximately 6,454 gallons of water from the spent fuel pool into the auxiliary building. This resulted in a 6-inch spent fuel pool level loss.			

Failure to Identify Degraded Flood Penetration Seals Following a Spent Fuel Pool Cooling System Leak			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000287/2022003-02 Open/Closed	[H.11] - Challenge the Unknown	71152A
The inspectors identified a Green finding and associated non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” when the licensee failed to identify a condition adverse to quality in the Unit 3 spent fuel cooler room (room 255). Specifically, several electrical cable floor penetrations were inadequate for flood protection and allowed water to transit to lower levels in the auxiliary building, including the low pressure injection (LPI) and reactor building spray (RBS) pump rooms.			

Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
LER	05000287/2022-002-00	Oconee Nuclear Station, Unit 3, Automatic Actuation of Emergency Feedwater System due to Malfunctioning Startup Feedwater Control Valve	71153	Closed

PLANT STATUS

Unit 1 operated at or near 100 percent rated thermal power (RTP) for the entire inspection period.

Unit 2 operated at or near 100 percent RTP for the entire inspection period.

Unit 3 operated at or near 100 percent RTP for the entire inspection period.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors performed activities described in IMC 2515, Appendix D, "Plant Status," observed risk significant activities, and completed on-site portions of IPs. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

REACTOR SAFETY

71111.01 - Adverse Weather Protection

External Flooding Sample (IP Section 03.03) (1 Sample)

- (1) The inspectors evaluated that flood protection barriers, mitigation plans, procedures, and equipment are consistent with the licensee's design requirements and risk analysis assumptions for coping with external flooding on August 29, 2022.

71111.04 - Equipment Alignment

Partial Walkdown Sample (IP Section 03.01) (3 Samples)

The inspectors evaluated system configurations during partial walkdowns of the following systems/trains:

- (1) Unit 2 motor driven emergency feedwater (MDEFW) and turbine driven emergency feedwater (TDEFW) systems while the standby shutdown facility (SSF) was out of service for annual maintenance on July 19, 2022
- (2) 2A LPI system during 2B LPI system maintenance on August 31, 2022
- (3) Unit 3 MDEFW and TDEFW systems during feedwater valve testing on September 9, 2022

71111.05 - Fire Protection

Fire Area Walkdown and Inspection Sample (IP Section 03.01) (5 Samples)

The inspectors evaluated the implementation of the fire protection program by conducting a walkdown and performing a review to verify program compliance, equipment functionality, material condition, and operational readiness of the following fire areas:

- (1) Fire zone 6: Unit 3 main feedwater pump area on July 11, 2022
- (2) Fire zone 106: Unit 1 cable room on July 26, 2022
- (3) Fire zone 29: Unit 3 4160V switchgear on July 26, 2022
- (4) Fire zone 110: Units 1 and 2 main control room on July 26, 2022
- (5) Fire zone 81: Unit 2 auxiliary building 200 level hallway on July 27, 2022

71111.06 - Flood Protection Measures

Inspection Activities - Internal Flooding (IP Section 03.01) (1 Sample)

The inspectors evaluated internal flooding mitigation protections in the:

- (1) Unit 3 spent fuel pool cooler room 255

71111.11Q - Licensed Operator Requalification Program and Licensed Operator Performance

Licensed Operator Performance in the Actual Plant/Main Control Room (IP Section 03.01) (1 Sample)

- (1) The inspectors observed and evaluated licensed operator performance during control rod drive breaker testing on September 1, 2022.

Licensed Operator Requalification Training/Examinations (IP Section 03.02) (1 Sample)

- (1) The inspectors observed and evaluated simulator training for an operating crew using simulator exercise guide SEG 2222 PSE-2(1) on September 20, 2022.

71111.12 - Maintenance Effectiveness

Maintenance Effectiveness (IP Section 03.01) (2 Samples)

The inspectors evaluated the effectiveness of maintenance to ensure the following structures, systems, and components (SSCs) remain capable of performing their intended function:

- (1) Nuclear condition report (NCR) 2434502, B7T-2 protected service water (PSW) breaker failed to close from remote operating switch during quarterly testing in accordance with PT/0/A/0500/020
- (2) NCR 2433065, 1LPSW-139 failed stroke during nine year planned maintenance diagnostic testing

71111.13 - Maintenance Risk Assessments and Emergent Work Control

Risk Assessment and Management Sample (IP Section 03.01) (3 Samples)

The inspectors evaluated the accuracy and completeness of risk assessments for the following planned and emergent work activities to ensure configuration changes and appropriate work controls were addressed:

- (1) Units 1, 2, and 3 yellow risk due to an annual SSF outage, on July 18 and 19, 2022
- (2) Units 1, 2, and 3 elevated green risk due to CT-4 maintenance affecting the Keowee underground power path, on July 26, 2022
- (3) Unit 2 yellow risk due to planned maintenance on the 2C LPI pump, on September 8, 2022

71111.15 - Operability Determinations and Functionality Assessments

Operability Determination or Functionality Assessment (IP Section 03.01) (4 Samples)

The inspectors evaluated the licensee's justifications and actions associated with the following operability determinations and functionality assessments:

- (1) NCR 2436160, elevated temperatures in the Unit 2 high pressure injection pump room
- (2) NCRs 2428753 and 2428934 for multiple failures to meet acceptance criteria during 4160V bus transfer testing in accordance with PT/3/A/0610/029
- (3) NCR 2430796, void found near 1HP-542 in the high pressure injection system
- (4) NCR 2421303, severe degradation on bolting of valve LPSW-2 inlet and outlet flange discovered after insulation was removed

71111.18 - Plant Modifications

Temporary Modifications and/or Permanent Modifications (IP Section 03.01 and/or 03.02) (1 Sample)

The inspectors evaluated the following temporary or permanent modifications:

- (1) Engineering change (EC) 414403 - Unit 1/2/3 HP-5 alternate letdown isolation on high temperature for seismic risk improvement

Severe Accident Management Guidelines (SAMG) Update (IP Section 03.03) (1 Sample)

- (1) The inspectors verified the site SAMGs were updated in the technical support center (TSC) and the alternate TSC in accordance with the Babcock and Wilcox generic severe accident technical guidelines and validated in accordance with NEI 14-01, "Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents," Revision 1.

71111.19 - Post-Maintenance Testing

Post-Maintenance Test Sample (IP Section 03.01) (4 Samples)

The inspectors evaluated the following post-maintenance testing activities to verify system operability and/or functionality:

- (1) PT/0/A/0620/009, Keowee hydro operation of KHU-2 following ACB-4 maintenance, work order (WO) 20490588
- (2) PT/3/A/0600/012, turbine driven emergency feedwater pump test following maintenance, WO 20484635
- (3) PT/2/A/0203/006A, 2C LPI pump test following motor inspection, WO 20541600
- (4) PT/0/A/0620/009, Keowee hydro operation of KHU-1 following ACB-3 maintenance, WO 20503899

71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance testing activities to verify system operability and/or functionality:

Surveillance Tests (other) (IP Section 03.01) (2 Samples)

- (1) PT/3/A/0610/029, 4160V AC bus transfer test, on May 25, 2022
- (2) IP/2/A/0315/014 A, TXS RPS interposing relay test and control rod drive breaker trip timing test, on September 1, 2022

71114.06 - Drill Evaluation

Drill/Training Evolution Observation (IP Section 03.02) (1 Sample)

The inspectors evaluated:

- (1) Training drill ONS 2022-03 on September 12, 2022, which included operations shift C, emergency response organization teams 1 and 4 with participation from the fleet emergency operations facility

OTHER ACTIVITIES – BASELINE

71151 - Performance Indicator Verification

The inspectors verified licensee performance indicators submittals listed below:

MS06: Emergency AC Power Systems (IP Section 02.05) (3 Samples)

- (1) Unit 1 (October 1, 2021, through June 30, 2022)
- (2) Unit 2 (October 1, 2021, through June 30, 2022)
- (3) Unit 3 (October 1, 2021, through June 30, 2022)

MS09: Residual Heat Removal Systems (IP Section 02.08) (3 Samples)

- (1) Unit 1 (July 1, 2021, through June 30, 2022)
- (2) Unit 2 (July 1, 2021, through June 30, 2022)
- (3) Unit 3 (July 1, 2021, through June 30, 2022)

BI01: Reactor Coolant System (RCS) Specific Activity Sample (IP Section 02.10) (3 Samples)

- (1) Unit 1 (July 1, 2021, through June 30, 2022)
- (2) Unit 2 (July 1, 2021, through June 30, 2022)
- (3) Unit 3 (July 1, 2021, through June 30, 2022)

71152A - Annual Follow-up Problem Identification and Resolution

Annual Follow-up of Selected Issues (Section 03.03) (1 Sample)

The inspectors reviewed the licensee's implementation of its corrective action program related to the following issues:

- (1) NCRs 2208750, 2190684, and 2429972, Unit 3 loss of spent fuel pool level due to filter gasket leaks in May of 2018 and June of 2022

71153 - Follow Up of Events and Notices of Enforcement Discretion

Event Report (IP Section 03.02) (1 Sample)

The inspectors evaluated the following licensee event report (LER):

- (1) LER 05000287/2022-002-00, Automatic Actuation of Emergency Feedwater System due to Malfunctioning Startup Feedwater Control Valve (ADAMS Accession No. ML22182A501). The inspectors determined that it was not reasonable to foresee or correct the cause discussed in the LER, therefore, no performance deficiency was identified. The inspectors did not identify a violation of NRC requirements.

INSPECTION RESULTS

Failure to Use a Procedure Appropriate to the Circumstances While Changing a Unit 3 Spent Fuel Cooling Filter			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Barrier Integrity	Green NCV 05000287/2022003-01 Open/Closed	[P.3] - Resolution	71111.06
A self-revealed Green finding and associated non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified when the licensee failed to use a procedure appropriate to the circumstances for an activity affecting quality. Specifically, the maintenance procedure for changing the spent fuel cooling system filters was inadequate, which led to a filter gasket failure that leaked approximately 6,454 gallons of water from the spent fuel pool into the auxiliary building. This resulted in a 6-inch spent fuel pool level loss.			

Description: On June 3, 2022, operators responded to indications of a major leak in the auxiliary building. Responding operators witnessed water flooding the spent fuel cooler room (room 255) on the 200 level of the Unit 3 auxiliary building. The water was identified as coming from the spent fuel filter room (room 254), which is connected to room 255 but is not normally accessible because it is a locked high radiation area. The specific source of the leakage in room 254 was not immediately apparent.

Operators took immediate action to secure the purification alignment for the Unit 3 spent fuel pool, which isolated all the components in the spent fuel pool filter room. Reports from operators in the field were that the leakage substantially decreased after the isolation was completed. The leakage was secured after about 31 minutes and the leak rate was estimated at 208 gallons per minute. Approximately seven hours before the leak developed, the 3A spent fuel filter had been replaced by maintenance personnel in room 254. Subsequent investigation confirmed that the gasket on the 3A spent fuel filter had failed.

Inspectors reviewed the licensee's response to the event and subsequent reports looking into the cause, including a material lab report and prompt investigation report. Both reports identified past issues with parts quality for the gaskets and a lack of appropriate torquing guidance in the filter replacement maintenance procedure.

In March and May of 2018, fleet operating experience communicated to Oconee indicated that a plant had experienced similar gasket failures in their primary system seal water injection filters (SWIF). The filter type was the same that is used for the spent fuel filters at Oconee. Also in May of 2018, Oconee experienced an identical but less severe failure of the 3B spent fuel filter gasket. The cause of these failures was attributed to inadequate torquing of the hold down bolts that secure the filter and gasket to the rest of the filter assembly. In 2018, the licensee recognized that the exact same filters and gaskets were used in the primary letdown system filters and spent fuel filters at Oconee. The maintenance procedure that governs the changeout of the primary letdown system filters, MP/0/A/1600/005 B, "Filter - Letdown Storage - Drum Method - Removal and Replacement," Revision 40, has a specific four pass torque method with torque measurement criteria to ensure exact torque values on the filter hold down bolts were known and verified during replacement. This torque guidance was not present in the maintenance procedure (MP) that replaces the spent fuel filters, MP/0/A/1600/019, "Filters - Spent Fuel - Removal and Replacement," Revision 31.

The licensee intended to add the specific torque guidance present in the letdown filter MP to the spent fuel filter MP in the 2018 timeframe per a procedure revision request (PRR), which was created as a corrective action to the May 2018 failure of the 3B spent fuel filter at Oconee. However, the PRR was not implemented and was still open at the time of the 2022 gasket failure. As a result, the "skill of the craft" torquing method historically used during spent fuel filter replacements, which does not measure or verify applied torque, continued until the 2022 failure. Inspectors considered this performance deficiency to be reflective of present performance because, despite initial identification in 2018, the licensee had the ability to foresee and correct the deficient procedure up until the June 3, 2022, gasket failure. Inspectors did not identify a specific human performance error associated with the maintenance personnel that installed the 3A filter on June 3, 2022.

The licensee's cause determination in NCR 2429972 attributed the failure to a small dimensional change to the gasket's production specifications that Duke requested, erroneously, of the vendor in March of 2021. The inadequate torquing guidance was identified as an "opportunity for improvement" item. Inspectors concluded, based on a review of the

available history and facts, that while the dimensional change and the lack of specific torque guidance were both potentially contributors to the leak, the lack of specific torque guidance in MP/0/A/1600/019, Revision 31 was the more significant contributor to the failure that occurred on June 3, 2022. Inspectors noted that the fleet operating experience SWIF leaks from 2018 were ultimately attributed to excessive torquing and caused some of the filter hold down bolts to yield (elongate). This resulted in a gap on the filter lid to gasket interface that caused the gasket to fail. Oconee did not investigate this failure mechanism in their review of the June 3, 2022, leak. They did decide that the bolts would be replaced in the near term.

Corrective Actions: Specific torque pass requirements identical to those used in the letdown system maintenance procedure were added to MP/0/A/1600/019 in Revision 32. Purchasing specifications were also updated for the gaskets to ensure their dimensional properties were correct and could be verified upon receipt.

Corrective Action References: NCR 2429972

Performance Assessment:

Performance Deficiency: The licensee's failure to use a procedure appropriate to the circumstances during spent fuel filter changeout on June 3, 2022, was a performance deficiency.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Procedure Quality attribute of the Barrier Integrity cornerstone and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the failure to use a procedure appropriate to the circumstances when replacing a spent fuel filter resulted in a gasket leak that lowered the level in the spent fuel pool by 6 inches and caused a 6,454 gallon loss from the system.

Significance: The inspectors assessed the significance of the finding using IMC 0609 Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." Using exhibit 3, "Barrier Integrity Screening Questions," inspectors determined the finding to be of very low safety significance (Green). Specifically, in section E, "Spent Fuel Pool," the finding did not affect the neutron absorber, fuel bundle misplacement, or soluble boron concentration.

Cross-Cutting Aspect: P.3 - Resolution: The organization takes effective corrective actions to address issues in a timely manner commensurate with their safety significance. In this case, the organization had multiple opportunities to correct the known discrepancy with torquing requirements in the spent fuel filter maintenance procedure but failed to implement the corrective action.

Enforcement:

Violation: 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," states, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Contrary to the above, on June 3, 2022, the licensee failed to use a procedure appropriate to the circumstances for an activity affecting quality. Specifically, the procedure for replacing the spent fuel filters, MP/0/A/1600/019, Revision 31, lacked specific torque requirements.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with section 2.3.2 of the Enforcement Policy.

Failure to Identify Degraded Flood Penetration Seals Following a Spent Fuel Pool Cooling System Leak

Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000287/2022003-02 Open/Closed	[H.11] - Challenge the Unknown	71152A

The inspectors identified a Green finding and associated non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," when the licensee failed to identify a condition adverse to quality in the Unit 3 spent fuel cooler room (room 255). Specifically, several electrical cable floor penetrations were inadequate for flood protection and allowed water to transit to lower levels in the auxiliary building, including the low pressure injection (LPI) and reactor building spray (RBS) pump rooms.

Description: On June 3, 2022, operators responded to indications of a major leak in the auxiliary building. Responding operators witnessed water flooding from the spent fuel cooler room on the 200 level of the Unit 3 auxiliary building. The water was identified as coming from the spent fuel filter room (room 254), which is connected to room 255 but is not normally accessible because it is a locked high radiation area. The specific source of the leakage in room 254 was not immediately apparent.

Operators took immediate action to secure the purification alignment for the Unit 3 spent fuel pool, which isolated all the components in room 254. Reports from operators in the field were that the leakage substantially decreased after the isolation was completed. The leakage was secured after about 31 minutes and the leak rate was estimated at 208 gallons per minute. Approximately seven hours before the leak developed, the 3A spent fuel filter had been replaced by maintenance personnel in room 254. Subsequent investigation confirmed that the gasket on the 3A spent fuel filter had failed.

The licensee discovered that water had leaked on top of electrical motor control centers behind the passive flood curb on the 100 level (elevation 771 feet) of the auxiliary building and that water had traveled down electrical cables and entered the junction box of the 3A RBS pump, which is co-located with the train A LPI pump in a pit area below the 100 level elevation. The licensee initiated NCR 2430008 to document these conditions.

Immediately following the event, inspectors determined that more than 2,000 gallons had likely leaked through multiple electrical floor penetrations in rooms 254 and 255 which provided a flow path for water to ultimately enter the LPI pump rooms. In NCR 2429972, Engineering was initially assigned to determine how this water was able to enter the LPI pump rooms with a due date of June 9, 2022. This due date was later extended to June 17, then June 24, and finally June 30, 2022. Inspectors met with engineering on June 22, 2022, to understand the delays and the planned response to the action. The delays were partially attributable to a misunderstanding among engineers regarding the Unit 3 floor drain system and a misconception that flood waters from the 200 level were to be expected in the pump rooms. Similar rooms on Units 1 and 2 drained to the LPI pump room sumps; however, the Unit 3 floor drains connected to the low activity waste tank. Therefore, the flood waters that entered the Unit 3 LPI pump rooms needed to bypass flood barriers between the 200 and 100 level rather than simply enter the floor drains. Initial licensee inspections on June 22, 2022,

were limited to the 100 level and pump rooms and failed to recognize that flood barriers on the 200 level were bypassed. Until NRC inspectors raised attention to the matter, the licensee's staff did not identify that penetration flood seals were degraded and required corrective action. The above issues were documented in NCR 2432468.

On September 7, 2022, inspections by licensee civil engineering personnel determined that at least three of the penetration seals were not installed in accordance with the design specification OSS-0282.00-00-0001, Mechanical and Electrical Penetration Fire, Flood, and Radiation Seals. Specifically, the specification requires eight inches of foam to seal the penetration, and several were found to have no foam installed. These included an unlabeled penetration in room 254 and penetrations 3-S-F-5 and 3-S-F-7 in room 255. Selected Licensee Commitments (SLC) 16.9.11a, condition D was entered on October 3, 2022, for these degraded penetrations following specific prompting by NRC inspectors. SLC required actions included a risk assessment and compensatory measures to protect the penetrations until final repairs could be completed. The above issues were documented in NCR 2444071.

Inspectors reviewed AD-PI-ALL-0100, "Corrective Action," Revision 27, and noted that section 2.0, "Scope," subsection 1.a, requires that, "personnel working at or supporting the nuclear plants have the responsibility to identify conditions adverse to quality." Also, attachment 2, "Guidelines for Determining Condition Adverse to Quality," section 2.2, "Examples," subsection 10 discusses, in part, that a condition adverse to quality would include, "A condition adversely affecting performance in Barrier Integrity, which includes issues involving flood protection."

It was determined that the above flood seal penetrations not meeting design specifications for installation and allowing thousands of gallons of water to pass through to the LPI pump areas are both examples of conditions adverse to quality that were identified by NRC inspectors.

Corrective Actions: WO 20545328 was written to repair the electrical cable penetrations

Corrective Action References: NCRs 2429972, 2432468, 2430008, 2432468, 2444071

Performance Assessment:

Performance Deficiency: The licensee's failure to identify a condition adverse to quality associated with degraded electrical penetrations that protect the LPI and RBS pumps was a performance deficiency.

Screening: The inspectors determined the performance deficiency was more than minor because if left uncorrected, it would have the potential to lead to a more significant safety concern. Specifically, continued operation without taking corrective action to repair the degraded flood seal penetrations could result in more significant impacts to the LPI and RBS safety functions due to internal flooding.

Significance: The inspectors assessed the significance of the finding using IMC 0609 Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." Using exhibit 2, "Mitigating Systems Screening Questions," and then exhibit 4, "External Events Screening Questions," inspectors determined the finding to be of very low safety significance (Green). Specifically, the finding was determined not to involve the total loss of any probabilistic risk assessment (PRA) function that contributes to external event initiated core damage accident sequences.

Cross-Cutting Aspect: H.11 - Challenge the Unknown: Individuals stop when faced with uncertain conditions. Risks are evaluated and managed before proceeding. In this case, the licensee failed to challenge assumptions about where and what volume of water had bypassed installed flooding barriers and therefore the risk present to plant mitigating systems was unrecognized because the extent of flooding barrier degradation was not fully evaluated.

Enforcement:

Violation: 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," states, in part, that measures shall be established such that conditions adverse to quality are promptly identified and corrected. These requirements are implemented, in part, by Duke administrative procedure AD-PI-ALL-0100, "Corrective Action," which requires in section 2.1.a that, "personnel working at or supporting the nuclear plants have the responsibility to identify conditions adverse to quality." Further, in attachment 2, "Guidelines for Determining Condition Adverse to Quality," section 2.2.10 provides examples of conditions adverse to quality which include, "a condition adversely affecting performance in Barrier Integrity, which includes issues involving flood protection." Contrary to the above, from June 2022, until at least September 2022, the licensee failed to identify conditions adverse to quality in the Unit 3 spent fuel cooler and filter rooms. Specifically, several electrical cable floor penetrations were inadequate for flood protection, were not designed in accordance with site requirements for flood seals and allowed a substantial amount of water to transit to lower levels in the auxiliary building, including to the LPI pump rooms.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On October 26, 2022, the inspectors presented the integrated inspection results to Steven Snider and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71111.04	Corrective Action Documents		2396667, 2396702, 2306141, 2306154, 2426484	
	Drawings	OFD-102A-2.1	Flow Diagram of Low Pressure Injection System Borated Water Supply and LPI Pump Suction	63
		OFD-102A-2.2	Flow Diagram of Low Pressure Injection System LPI Pump Discharge	54
		OFD-121A-3.7	Flow Diagram of Condensate System (Upper Surge Tanks 3A & 3B, Upper Surge Tank Dome, and Condensate Storage Tank)	47
		OFD-121A-3.8	Flow Diagram of Condensate System Condensate Make-up and Emergency Feedwater Pump Suction	21
		OFD-121D-3.1	Flow Diagram of Emergency Feedwater System	47
		OFD-122A-3.4	Flow Diagram of Main Steam System (Emergency FDW Pump Turbine Steam Supply & Exhaust)	28
		OFD-128A-3.1	Flow Diagram of Auxiliary Steam System Main Supply Header	41
	Procedures	OP/2/A/1104/004	Low Pressure Injection System	175
		PT/3/A/0152/009	Feedwater System Valve Stroke Test	018
Work Orders		204221460, 20455219		
71111.05	Calculations	OSC-9375	ONS Fire PRA – Fire Scenario Report	009
		OSC-9375	ONS Fire PRA – Fire Scenario Report	010
	Corrective Action Documents		NCR 2435923	
	Fire Plans	CSD-ONS-PFP-2AB-0783	Unit 2, Auxiliary Building, Elevation 783	001
		CSD-ONS-PFP-3TB-0775	Pre-Fire Plan for Unit 3 Turbine Building Elevation 775	001
		O-0310-FZ-027	Turbine Building Unit 3 Fire Protection Plan Fire Area and Fire Zone Boundaries Plan at EL 775+0	1
		O-0310-K-005	Fire Protect Aux Bldg Unit 2 EL 783+9	013
		O-0310-L-003	Turbine Building Unit 3 Fire Protection Plan and Fire Barrier, Flood, and Pressure Boundaries Plan at EL 775+0	8

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Miscellaneous	MP/0/A/1705/032	Fire Hose Stations – Common Areas – SLC Related - Inspections	045
		O-0310-S3-6	Unit 3 Boiler Feed Pumps 3A and 3B and Seal Oil Unit	1
		OFD-124C-02-03	Flow Diagram of High Pressure Service Water System Auxiliary Building	008
		OFD-124C-3.2	Flow Diagram of High Pressure Service Water System Turbine Building	39
		OP/0/A/1104/041	Auxiliary Building Ventilation	046
	Procedures	MP/0/A/1705/032 A	Fire Extinguishers – Auxiliary Building – Monthly Inspection	003
		MP/0/A/1705/032 B	Fire Extinguishers – Turbine Building – Monthly Inspection	004
71111.06	Drawings	O-2151 K	Auxiliary Building - Unit 3 Floor At EL. 758'-0" Miscellaneous Steel	1
		O-2151L	Auxiliary Building Unit 3 Floor Drain layout EL. 758+0 - EL. 838+8	12
		O-2153A	Auxiliary Building - Unit 3 Plan at EL.783'+9" Concrete SH.1	25
		O-310 KE-01	Penetration Seal Configuration Electrical Fire Penetration Seal Designs Details E-1 & E-2	4
		O-310 KR-301	Auxiliary Building - Unit 3 Fire, Flood, Pressure & Radiation Table of Penetrations	3B
		O-310 KR-303	Auxiliary Building - Unit 3 Fire, Flood, Pressure & Radiation Table of Penetrations	4
	Engineering Changes	109548	Unit 3 BWST Recirc Isolation Valves	2
	Procedures	MP/3/A/1705/018	Fire Protection - Penetration - Fire and Flood Barrier - Inspection and Minor Repair	46
		OSS-0282.00-00-0001	Mechanical and Electrical Penetration Fire, Flood, Pressure and Radiation Seals	11
	Work Orders		20140808, 20225807, 20273853, 20377960	
	71111.11Q	Corrective Action Documents		2414449, 2421992, 2430746
Miscellaneous		AD-OP-ALL-0203	Reactivity Management	14
		AD-OP-ALL-1000	Conduct of Operations	20

Inspection Procedure	Type	Designation	Description or Title	Revision or Date	
		AD-OP-ONS-0002	Oconee Specific Abnormal Operations Guidance	006	
		AD-TQ-ALL-0420	Conduct of Simulator Training and Evaluation	19	
	Procedures	AP/0/A/1700/048	Loss of Startup Transformer	000	
		AP/1/A/1700/028	ICS Instrument Failures	025	
		AP/1/A/1700/029	Rapid Unit Shutdown	014	
		AP/1/A/1700/054	Abnormal Turbine Generator Operation	000	
		EP/1/A/1800/00100	Unit 1 EOP Immediate Manual Actions and Subsequent Actions	003	
		EP/1/A/1800/0010B	Unit 1 EOP Blackout	006	
		EP/1/A/1800/0010L	Unit 1 EOP Rules and Appendix	005	
		EP/1/A/1800/0010Q	Unit 1 EOP Enclosures 5.41-5.47	008	
71111.15	Calculations	OSC-6667	Auxiliary Building and Turbine Building Loss of Cooling and Ventilation Analysis	23	
		OSC-8209	Operation of Safety Related Auxiliary Building Pumps (HPI, LPI, RBS) at Elevated Ambient Temperature	006	
	Corrective Action Documents		NCR 2436160, 2145973, 1905810, 1824713, 1826086		
			PIP O-01-2804		
	Drawings	OFD-116G-1.1	Flow Diagram of AB Ventilation System Basement, 1st, 2nd, 3rd, and 4th Floors	11	
		OFD-116G-1.2	Flow Diagram of AB Ventilation System 5th and 6th Floors	13	
		OFD-116G-2.1	Flow Diagram of AB Ventilation System Basement, 1st, 2nd, 3rd, and 4th Floors	10	
	Miscellaneous	OSS-0254.00-00-1001	(Mech) HPI and Purification & Deborating Demineralizer Systems	062	
		OSS-0254.00-00-1019	(Mech) Design Basis Spec for the Auxiliary Building HVAC System	033	
	Procedures	AP/1-2/A/1700/037	Degraded HPI/LPI Room Cooling	002	
		PT/2/A/0600/001	Periodic Instrument Surveillance	318	
	71111.19	Corrective Action		1766606, 1757703, 2423770, 1873654, 2436936	

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Documents			
	Drawings	OEE-347-5	Emergency FWPT Sys EFWPT #3 Aux Oil Pump	6
	Miscellaneous	AD-HU-ALL-0003	Conduct of Pre-Job Briefs and Post-Job Critiques	11
		ONTC-3-121D-0002-002	Unit 3 Test Acceptance Criteria for Turbine Driven EFW Pump	001
		OSS-0254.00-00-1000	(Mech) Design Basis Specification for the Emergency Feedwater System	057
	Procedures	IP/0/A/2001/002	Inspection and Maintenance of Keowee Hydro Station Air Circuit Breakers	044
		PT/3/A/0600/012	Turbine Driven Emergency Feedwater Pump Test	096
Work Orders		20503899, 20483299, 20484635, 20451655, 20381148, 20381149, 20552071		
71151	Calculations	OSC-8901	Oconee PRA Input for MSPI Basis Document	10
		OSC-9606	MSPI Basis Document for the LPI and HPI Systems	18
	Corrective Action Documents		NCR 2405020, 2304474	
			NCR 2398383	
	Miscellaneous		Unit 1, Unit 2, Unit 3: MSPI Derivation Report (Residual Heat Removal System) - Performance Limit Exceeded (PLE)	
			Unit 1, Unit 2, Unit 3: MSPI Derivation Report (Residual Heat Removal System) - Unreliability Index (URI)	
			Unit 1, Unit 2, Unit 3: MSPI Derivation Report (Residual Heat Removal System) - Unavailability Index (UAI)	
		AD-EG-ALL-1217	Mitigating System Performance Index	2
		CP/0/A/2005/022	Determination of Reported Tech Spec Dose Equivalent Iodine-131	006
	CP/0/A/2005/022	Determination of Reported Tech Spec Dose Equivalent Iodine-131	007	