



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

January 27, 2017

Ms. Tanya M. Hamilton
Site Vice President
Shearon Harris Nuclear Power Plant
M/C HNP01
New Hill, North Carolina 27562-0165

**SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT– NRC INTEGRATED
INSPECTION REPORT 05000400/2016004**

Dear Ms. Hamilton:

On December 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Shearon Harris Nuclear Power Plant Unit 1. On January 18, 2017, the NRC inspectors discussed the results of this inspection with Mr. Paul Fisk and other members of your staff. The results of this inspection are documented in the enclosed report.

No NRC-identified or self-revealing findings were identified during this inspection. However, inspectors documented a licensee-identified violation which was determined to be of very low safety significance in this report. The NRC is treating this violation as non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violation or significance of the NCV, 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 the Shearon Harris Nuclear Power Plant.

T. Hamilton

2

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 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Steven D. Rose, Chief
Reactor Projects Branch 4
Division of Reactor Projects

Docket No.: 05000400

License No.: NPF-63

Enclosure:

Inspection Report 05000400/2016004

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2

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3

Letter to Tanya M. Hamilton from Steven D. Rose dated January 27, 2017

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT– NRC INTEGRATED
INSPECTION REPORT 05000400/2016004

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-400

License Nos.: NPF-63

Report No.: 05000400/2016004

Licensee: Duke Energy Progress, Inc.

Facility: Shearon Harris Nuclear Power Plant, Unit 1

Location: 5413 Shearon Harris Road
New Hill, NC 27562

Dates: October 1, 2016 through December 31, 2016

Inspectors: C. Jones Acting Senior Resident Inspector
M. Riches, Resident Inspector
M. Bates, Senior Operations Engineer (Section 1R11)
R. Taylor, Senior Project Inspector (1R04, 1R05, 4OA1)
J. Dodson, Senior Project Engineer (Section 4OA2)
A. Butcavage, Reactor Inspector (Section 1R08)
A. Sengupta, Reactor Inspector (Section 1R08)
J. Rivera, Health Physicist (Sections 2RS2, 2RS4)
W. Loo, Senior Health Physicist (Sections 2RS1, 2RS3, 4OA1)
C. Dykes, Health Physicist (Sections 2RS5, 4OA1)

Approved by: Steven D. Rose, Chief
Reactor Projects Branch 4
Division of Reactor Projects

Enclosure

SUMMARY

Integrated Inspection Report 05000400/2016004; October 1, 2016, through December 31, 2016; Duke Energy Progress, Inc., Shearon Harris Nuclear Power Plant, Unit 1, Licensee Identified Violations.

The report covered a three-month period of inspection by resident inspectors, and regional inspectors. The significance of inspection findings are indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," (SDP) dated April 29, 2015. The cross-cutting aspects are determined using IMC 0310, "Aspects within the Cross-Cutting Areas" dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated November 1, 2016. The NRC's program for overseeing the safe operations of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

One violation of very low safety significance that was identified by the licensee has been reviewed by the NRC. Corrective action taken or planned by the licensee has been entered into the licensee's corrective action program (CAP). This violation and corrective action tracking number is listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Unit 1: The unit began the inspection period at 100 percent power. On October 8, 2016 the unit was shutdown to begin the refueling outage (RFO-20). The refueling outage was completed on November 6, 2016. The unit returned to 100 percent power on November 14, 2016 and remained there throughout the rest of the quarter.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 – 2 samples)

a. Inspection Scope

.1 Impending Adverse Weather Conditions

The inspectors reviewed the licensee's preparations to protect risk-significant systems from wind and rain effects from Hurricane Matthew expected during October 8, 2016. The inspectors evaluated the licensee's implementation of adverse weather preparation procedures and compensatory measures, including operator staffing, before the onset of and during the adverse weather conditions. The inspectors reviewed the licensee's plans to address the ramifications of potentially lasting effects that may result from the hurricane. The inspectors verified that operator actions specified in the licensee's adverse weather procedure maintain readiness of essential systems. The inspectors verified that required surveillances were current, or were scheduled and completed, if practical, before the onset of anticipated adverse weather conditions. The inspectors also verified that the licensee implemented periodic equipment walkdowns or other measures to ensure that the condition of plant equipment met operability requirements. Documents reviewed are listed in the Attachment.

.2 Readiness to Cope with External Flooding

The inspectors evaluated the licensee's implementation of flood protection procedures and compensatory measures during impending conditions of flooding or heavy rains. The inspectors reviewed the updated final safety analysis report (UFSAR) and related flood analysis documents to identify those areas containing safety related equipment that could be affected by external flooding and their design flood levels. The inspectors walked down flood protection barriers, reviewed procedures for coping with external flooding, and reviewed corrective actions for past flooding events. The inspectors verified that the procedures for coping with flooding could reasonably be used to achieve the desired results. For those areas where operator actions are credited, the inspectors assessed whether the flooding event could limit or preclude the required actions. Documents reviewed are listed in the Attachment.

The inspectors conducted walkdowns of the following plant areas containing risk-significant structures, systems, and components that are below flood levels or otherwise susceptible to flooding:

- Diesel Fuel Oil Storage Building
- Reactor Auxiliary Building (RAB), 286 ft. elevation
- RAB, 261 ft. elevation

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04 – 3 samples)

a. Inspection Scope

.1 Partial Walkdown

The inspectors verified that critical portions of the selected systems were correctly aligned by performing partial walkdowns. The inspectors selected systems for assessment because they were a redundant or backup system or train, were important for mitigating risk for the current plant conditions, had been recently realigned, or were a single-train system. The inspectors determined the correct system lineup by reviewing plant procedures and drawings. Documents reviewed are listed in the Attachment.

The inspectors selected the following systems or trains to inspect:

- Protected electrical equipment during 'A' train emergency bus outage
- 'A' Motor Driven Auxiliary Feedwater Pump following monthly testing
- 1A-SA Emergency Diesel Generator (EDG) Air Starting System after maintenance

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05A/Q – 4 samples)

a. Inspection Scope

.1 Quarterly Inspection

The inspectors evaluated the adequacy of selected fire plans by comparing the fire plans to the defined hazards and defense-in-depth features specified in the fire protection program. In evaluating the fire plans, the inspectors assessed the following items:

- control of transient combustibles and ignition sources
- fire detection systems
- water-based fire suppression systems
- gaseous fire suppression systems
- manual firefighting equipment and capability
- passive fire protection features
- compensatory measures and fire watches
- issues related to fire protection contained in the licensee's CAP

The inspectors toured the following fire areas to assess material condition and operational status of fire protection equipment. Documents reviewed are listed in the Attachment.

- ESW Intake Screening Structure, 5-S-BAL
- Demineralizer Access Area, 12-A-5-DIH
- RAB Exhaust Fan Area, 12-A-5-CHF
- RAB HVAC Equipment Area, 1-A-5-HV3

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07 – 2 samples)

a. Inspection Scope

.1 Annual Review

The inspectors verified the readiness and availability of the 'B' Component Cooling Water (CCW) heat exchanger and the 'B' EDG Jacket Water Cooler to perform its design function by reviewing reports of those tests, verifying the licensee uses the periodic maintenance method outlined in GL 89-13, verifying critical operating parameters by reviewing operating data, and verifying correct categorization and receipt of maintenance under the Maintenance Rule. Additionally, the inspectors verified that the licensee had entered any significant heat exchanger performance problems into the CAP and that the licensee's corrective actions were appropriate. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R08 Inservice Inspection Activities (71111.08) – 1 sample)a. Inspection ScopeNon-Destructive Examination Activities and Welding Activities

From October 17 – 21, 2016, the inspectors conducted an onsite review of the implementation of the licensee's in-service inspection (ISI) program for monitoring degradation of the reactor coolant system (RCS) boundary, risk-significant piping and component boundaries, and containment boundaries in Unit 1.

The inspectors either directly observed or reviewed the following non-destructive examinations (NDEs) mandated by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code of Record: 2001 Edition with 2003 Addenda) to evaluate compliance with the ASME Code, Section XI and Section V requirements and, if any indications or defects were detected, to evaluate if they were dispositioned in accordance with the ASME Code or an NRC-approved alternative requirement. The inspectors also reviewed the qualifications of the NDE technicians performing the examinations to determine whether they were current and in compliance with the ASME Code requirements.

- Ultrasonic Examination (UT), RCS Hot Leg B to SI Valve Connection Line, MRP-146, ASME Code Class 1 (observed and reviewed)
- UT, Feed water Vent Line, Flow Accelerated Corrosion (observed)
- UT, RCS Loop A CL Inlet to Chemical Volume and Control System (CVCS) Alternate Charging, MRP-146, ASME Code Class 1 (reviewed)
- UT, Risk-informed ISI, Pressurizer Discharge to Power Operated Relief Valve/Pipe to Elbow, ASME Code Class 1 (reviewed)
- UT, FAC, Feed water System Elbow (reviewed)
- Liquid Penetrant Examination (PT), Control Rod Drive Mechanism (CRDM) Housing Weld, ASME Code Class 1 (observed)
- PT, RVCH Lifting Lug 1@60 (RPVH), ASME Code Class 1 (reviewed)
- PT, Outlet Nozzle to Vessel Weld/BIT, ASME Code Class 2 (reviewed)
- Visual Examination (VT-1), Water Chiller WC-2, B Welded Attachment, ASME Code Class 3 (reviewed)
- Visual Examination (VT-2), Reactor Vessel BMI Penetrations, N-722-1, ASME Code Class 1 (reviewed)
- Visual Examination (VT-3), Welded Dual Horizontal Rigid Strut, Component Cooling Water, ASME Code Class 3 (reviewed)

The inspectors either directly observed or reviewed the following welding activities, qualification records, and associated documents in order to evaluate compliance with procedures and the ASME Code, Section XI and Section IX requirements. Specifically, the inspectors reviewed the work order (WO), repair and replacement plan, weld data sheets, welding procedures, procedure qualification records, welder performance qualification records, and NDE reports.

- Replacement of RHR, 1RH54 valve, ASME Code Class 2 (observed and reviewed)
- Replacement of 1RC-124 safety valve B Water Seal Drain Line, ASME Code Class 2 (reviewed)
- Replacement of RCS Connection to Charging Pump, ASME Code Class 2 (reviewed)

During non-destructive surface and volumetric examinations performed since the previous refueling outage, the licensee did not identify any relevant indications that were analytically evaluated and accepted for continued service; therefore, no NRC review was completed for this inspection procedure (IP) attribute.

Pressurized Water Reactor Vessel Upper Head Penetration Inspection Activities

The inspectors verified that for the Unit 1 reactor vessel head, a bare metal visual examination and a volumetric examination were performed during this outage, in accordance with the requirements of ASME Code Case N-729-1 and 10 CFR 50.55a(g)(6)(ii)(D).

The inspectors reviewed sample results of the NDE activities associated with the UT volumetric examination of the reactor closure head control rod drive penetrations and VT of the reactor vessel upper head outer surface at the penetration numbers listed below. The inspectors used the samples to determine if the activities, including the disposition of indications and defects, were conducted in accordance with the requirements of ASME Code Case N-729-1 as incorporated by reference in 10 CFR 50.55a (g)(6)(ii)(D). Additionally, the inspectors' review of the UT examinations also determined whether essentially 100 percent of the required examination volumes and surfaces were examined, and whether a volumetric or surface leakage path examination was completed.

- UT, Rx Closure Head CRDM Penetration 30, ASME Code Class 1
- UT, Rx Closure Head CRDM Penetration 40, ASME Code Class 1
- UT, Rx Closure Head CRDM Penetration 51, ASME Code Class 1
- VT, Rx Closure Head CRDM Penetration 17, ASME Code Class 1
- VT, Rx Closure Head CRDM Penetration 23, ASME Code Class 1
- VT, Rx Closure Head CRDM Penetration 30, ASME Code Class 1

The Unit 1 reactor vessel closure head contains nine previously repaired CRDM nozzles. As such, additional NDE inspections such as for penetration #23, were also included in the inspection sample documentation review, in order to verify that the required eddy current (EC) and/or (PT) examinations were completed on the previously repaired CRDM locations listed below.

- PT, EC, Reactor Vessel Closure Head (RVCH), CRDM Penetration 23, ASME Code Class 1
- PT, EC, RVCH CRDM Penetration 37, ASME Code Class 1
- PT, RVCH CRDM Penetration 49, ASME Code Class 1

The inspectors also reviewed a sample of NDE records for the three CRDM penetration weld repairs listed below which were completed during the current 2016 outage, to evaluate if the licensee applied the post-welding inspection requirements described in the NRC Safety Evaluation for Relief Request 13R-16.

- UT,PT, CRDM Penetration No. 30, Repair Weld ASME Code Class 1
- PT, CRDM Penetration No. 40, Repair Weld, ASME Code Class 1
- PT, CRDM Penetration No. 51, Repair Weld, ASME Code Class 1

Boric Acid Corrosion Control Inspection Activities

The inspectors reviewed the licensee's boric acid corrosion control (BACC) program activities to determine if the activities were implemented in accordance with the commitments made in response to NRC Generic Letter (GL) 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," and applicable industry guidance documents. Specifically, the inspectors performed an onsite records review of procedures and the results of the licensee's containment walkdown inspections performed during the current refueling outage. The inspectors also interviewed the BACC program owner; conducted an independent walkdown of containment to evaluate compliance with licensee's BACC program requirements; and verified that degraded or non-conforming conditions, such as boric acid leaks, were properly identified and corrected in accordance with the licensee's BACC and CAPs.

The inspectors reviewed the following condition reports (CRs) / engineering evaluations, completed for evidence of boric acid leakage, to determine if the licensee properly applied applicable corrosion rates to the affected components; and properly assessed the effects of corrosion induced wastage on structural or pressure boundary integrity in accordance with the licensee procedures.

- CR 745568, Packing Leak at 5 dpm
- CR 749212, 1IC-J-5 (calibration path, fuel assembly J5)
- CR 1947554, 1SP-952 (post-accident sampling system supply)
- CR 1959684, 3SF-E004 (2&3B-SB fuel pool heat exchanger)
- CR 2018206, 1NI-109 (N2 DISTR seal water inject A backflush inlet valve)
- CR 1986840, FT-01CS-0122SW (CVCS charging)

The inspectors reviewed the following condition reports and associated corrective actions related to evidence of boric acid leakage to evaluate if the corrective actions completed were consistent with the requirements of the ASME Code and 10 CFR Part 50, Appendix B, Criterion XVI.

- CR 1986840, Boric Acid Buildup on FT-01CS-0122 SW
- CR 749045, 1RC-1016, Slight Boric Leak
- CR 2050223, PMCH-boric acid transfer pump EQ PM
- CR 749764, Boric Acid on ISP-1138

- CR 749855, ISI-952 Has a Bonnet and Packing leak
- CR 2034968, 1ED-145 Is Leaking By

Steam Generator Tube Inspection Activities

The inspectors verified that for the Unit 1 steam generator tubes, no inspection activities were required this refueling outage, in accordance with the requirements of the ASME Code, the licensee's Technical Specifications (TS), and Nuclear Energy Institute (NEI) 97-06, "Steam Generator Program Guidelines."

Identification and Resolution of Problems

The inspectors reviewed a sample of ISI-related issues entered into the CAP to determine if the licensee had appropriately described the scope of the problem and had initiated corrective actions. The review also included the licensee's consideration and assessment of operating experience events applicable to the plant. The inspectors performed this review to ensure compliance with 10CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requirements. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification Program and Licensed Operator Performance (71111.11 – 3 samples)

a. Inspection Scope

.1 Resident Inspector Quarterly Review of Licensed Operator Regualification

On November 17, 2016, the inspectors observed an evaluated simulator scenario administered to an operating crew as part of the annual requalification operating test required by 10 CFR 55.59, "Requalification." The simulator scenario focused on the crews' response to a seismic event that required a manual shutdown, steam generator tube rupture and safety injection. Event notifications were evaluated as part of the scenario.

The inspectors assessed the following:

- licensed operator performance
- the ability of the licensee to administer the scenario and evaluate the operators
- the quality of the post-scenario critique
- simulator performance

Documents reviewed are listed in the Attachment.

.2 Resident Inspector Quarterly Review of Licensed Operator Performance in the Main Control Room

On October 8, 2016, the inspectors observed licensed operator performance in the main control room during response to a safety injection actuation and reactor trip that occurred during downpower activities in preparation for the refueling outage.

The inspectors assessed the following:

- use of plant procedures
- control board manipulations
- communications between crew members
- use and interpretation of instruments, indications, and alarms
- use of human error prevention techniques
- documentation of activities
- management and supervision

Documents reviewed are listed in the Attachment.

.3 Annual Review of Licensee Requalification Examination Results:

On February 19, 2016, the licensee completed the comprehensive biennial requalification written examinations, and on July 8, 2016, the licensee completed the annual requalification operating examinations, which are required to be administered to all licensed operators in accordance with Title 10 of the Code of Federal Regulations 55.59(a)(2), "Requalification Requirements," of the NRC's "Operator's Licenses." The inspectors performed an in-office review of the overall pass/fail results of the individual operating examinations and the crew simulator operating examinations in accordance with IP 71111.11, "Licensed Operator Requalification Program." These results were compared to the thresholds established in Section 3.02, "Requalification Examination Results," of IP 71111.11.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12 – 1 sample)

a. Inspection Scope

The inspectors assessed the licensee's treatment of the issues listed below to verify the licensee appropriately addressed equipment problems within the scope of the maintenance rule (10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"). The inspectors reviewed procedures and records to evaluate the licensee's identification, assessment, and characterization of the problems as well as their corrective actions for returning the equipment to a satisfactory condition.

- Commercial grade dedication of Permanent Reactor Cavity Seal Rings

Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 2 samples)

a. Inspection Scope

.1 Operability and Functionality Review

The inspectors selected the operability determinations or functionality evaluations listed below for review based on the risk-significance of the associated components and systems. The inspectors reviewed the technical adequacy of the determinations to ensure that TS operability was properly justified and the components or systems remained capable of performing their design functions. To verify whether components or systems were operable, the inspectors compared the operability and design criteria in the appropriate sections of the TS and UFSAR to the licensee's evaluations. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. Additionally, the inspectors reviewed a sample of corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with operability evaluations.

- Low Lube Oil Pressure on Turbine Driven Auxiliary Feedwater Pump, CR 2062465
- Service Water Pipe leak on Containment Cooler AH-2, CR 2076109

Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 4 samples)

a. Inspection Scope

The inspectors either observed post-maintenance testing or reviewed the test results for the maintenance activities listed below to verify the work performed was completed correctly and the test activities were adequate to verify system operability and functional capability.

- WO 13506167, "B" CCW Heat Exchanger Functional Testing, 10/19/2016
- FPT-3222, Fire Detector Functional Testing, 10/21/2016

- WO 12230406-03, 1B35-SB-13C Operability Testing, 11/15/2016
- WO 20091262-01, Turbine Driven Auxiliary Feedwater Pump Testing, 12/13/2016

The inspectors evaluated these activities for the following:

- Acceptance criteria were clear and demonstrated operational readiness
- Effects of testing on the plant were adequately addressed
- Test instrumentation was appropriate
- Tests were performed in accordance with approved procedures
- Equipment was returned to its operational status following testing
- Test documentation was properly evaluated

Additionally, the inspectors reviewed a sample of corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with post-maintenance testing. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20 – 1 sample)

a. Inspection Scope

For the Unit 1 refueling outage from October 8, 2016 through November 9, 2016, the inspectors evaluated the following outage activities:

- outage planning
- shutdown, cooldown, refueling, heatup, and startup
- reactor coolant system instrumentation and electrical power configuration
- reactivity and inventory control
- decay heat removal and spent fuel pool cooling system operation
- containment closure
- rod drop testing
- reactor startup

The inspectors verified that the licensee:

- considered risk in developing the outage schedule
- controlled plant configuration in accordance with administrative risk reduction methodologies
- developed work schedules to manage fatigue
- developed mitigation strategies for loss of key safety functions
- adhered to operating license and TS requirements

Inspectors verified that safety-related and risk-significant structures, systems, and components not accessible during power operations were maintained in an operable condition. The inspectors also reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with outage activities. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 3 samples)

a. Inspection Scope

The inspectors reviewed the surveillance tests listed below and either observed the test or reviewed test results to verify testing adequately demonstrated equipment operability and met TS and licensee procedural requirements. The inspectors evaluated the test activities to assess for preconditioning of equipment, procedure adherence, and equipment alignment following completion of the surveillance. Additionally, the inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with surveillance testing. Documents reviewed are listed in the Attachment.

Routine Surveillance Tests

- Operations Surveillance Test (OST)-1175, Turbine Trip Test
- OST-1119, Containment Spray Operability Train B Quarterly Interval Modes 1-4

Containment Isolation Valve

- Engineering Surveillance Test (EST)-212, Local Leak Rate Test

b. Findings

No findings were identified.

2. RADIATION SAFETY (RS)

Cornerstones: Public Radiation Safety and Occupational Radiation Safety

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 – 7 samples)

a. Inspection Scope

Hazard Assessment and Instructions to Workers: During facility tours, the inspectors directly observed radiological postings and container labeling for areas established within the radiologically controlled area (RCA) of the Unit 1 (U1) reactor building, turbine building, containment, and radioactive waste (radwaste) processing and storage

locations. The inspectors independently measured radiation dose rates or directly observed conduct of licensee radiation surveys for selected RCA areas. The inspectors reviewed survey records for several plant areas including surveys for airborne radioactivity, gamma surveys with a range of dose rate gradients, surveys for alpha-emitters and other hard-to-detect radionuclides, and pre-job surveys for upcoming tasks. The inspectors also discussed changes to plant operations that could contribute to changing radiological conditions since the last inspection. The inspectors attended pre-job briefings and reviewed Radiation Work Permit (RWP) details to assess communication of radiological control requirements and current radiological conditions to workers.

Control of Radioactive Material: The inspectors observed surveys of material and personnel being released from the RCA using small article monitor, personnel contamination monitor, and portal monitor instruments. The inspectors discussed equipment sensitivity, alarm setpoints, and release program guidance with licensee staff. The inspectors also reviewed records of leak tests on selected sealed sources and discussed nationally tracked source transactions with licensee staff.

Hazard Control: The inspectors evaluated access controls and barrier effectiveness for selected High Radiation Area (HRA), Locked High Radiation Area (LHRA), and Very High Radiation Area (VHRA) locations and discussed changes to procedural guidance for LHRA and VHRA controls with Radiation Protection (RP) supervisors. The inspectors reviewed implementation of controls for the storage of irradiated material within the spent fuel pool. Established radiological controls, including airborne controls and electronic dosimeter (ED) alarm setpoints, were evaluated for selected U1 Refueling Outage tasks. In addition, the inspectors reviewed licensee controls for areas where dose rates could change significantly as a result of plant shutdown and refueling operations. The inspectors also reviewed the use of personnel dosimetry including extremity dosimetry and multibadging in high dose rate gradients.

Radiation Worker Performance and RP Technician Proficiency: Occupational workers' adherence to selected RWPs and RP technician proficiency in providing job coverage were evaluated through direct observations and interviews with licensee staff. Jobs observed included maintenance and refueling activities in U1 containment, reactor building, and refueling floor that were in high radiation and contaminated areas, such as NI excore detector removal and reactor head set. The inspectors also evaluated worker responses to dose and dose rate alarms during selected work activities.

Problem Identification and Resolution: The inspectors reviewed and assessed condition reports associated with radiological hazard assessment and control. The inspectors evaluated the licensee's ability to identify and resolve the issues in accordance with licensee procedures. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: Radiation protection activities were evaluated against the requirements of UFSAR Section 12, TS Section 6, 10 CFR Parts 19 and 20, and approved licensee procedures. Licensee programs for monitoring materials and personnel released from the RCA were evaluated against 10 CFR Part 20 and IE

Circular 81-07, "Control of Radioactively Contaminated Material". Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

2RS2 As Low As Reasonably Achievable (ALARA) (71124.02 - 5 samples)

a. Inspection Scope

Work Planning and Exposure Tracking: The inspectors reviewed work activities and their collective exposure estimates for the U1RFO20 outage. The inspectors reviewed ALARA planning packages for activities related to the following high collective exposure tasks: reactor head nozzle repairs, NI excore detector removal and replacement, seal table activities, and refueling activities (reactor head lift and head set). For the selected tasks, the inspectors reviewed established dose goals and discussed assumptions regarding the bases for the current estimates with responsible ALARA planners. The inspectors evaluated the incorporation of exposure reduction initiatives and operating experience, including historical post-job reviews, into RWP requirements. Day-to-day collective dose data for the selected tasks were compared with established dose estimates and evaluated against procedural criteria (work-in-progress review limits) for additional ALARA review. Where applicable, the inspectors discussed changes to established estimates with ALARA planners and evaluated them against work scope changes or unanticipated elevated dose rates.

Source Term Reduction and Control: The inspectors reviewed the collective exposure three-year rolling average from 2013 – 2015. The inspectors evaluated historical dose rate trends for reactor coolant system piping and compared them to current U1RFO20 outage trends. Source term reduction initiatives, including cobalt reduction and zinc injection, were reviewed and discussed with RP staff. The inspectors also reviewed temporary shielding packages for the U1RFO20 outage.

Radiation Worker Performance: As part of IP 71124.01, the inspectors observed pre-job ALARA briefings and radiation worker performance for various HRA jobs in the auxiliary building and containment. While observing job tasks, the inspectors evaluated the use of remote technologies to reduce dose including teledosimetry and remote visual monitoring.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with ALARA program implementation. The inspectors evaluated the licensee's ability to identify and resolve the issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: ALARA program activities were evaluated against the requirements of UFSAR Section 12.1, TS Section 6.11, 10 CFR Part 20, and approved licensee procedures. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03 – 4 samples)

a. Inspection Scope

Engineering Controls: The inspectors reviewed the use of temporary and permanent engineering controls to mitigate airborne radioactivity during U1RFO20 activities. The inspectors observed the use of portable air filtration units for work in contaminated areas of the RCA and reviewed filtration unit testing certificates. The inspectors evaluated the effectiveness of continuous air monitors to provide indication of increasing airborne levels and the placement of air samplers in work area “breathing zones.” Accounting for alpha emitting nuclides inclusion in setpoint determination.

Respiratory Protection Equipment: The inspectors reviewed the use of respiratory protection devices to limit the intake of radioactive material. This included review of devices used for routine tasks and devices stored for use in emergency situations. The inspectors reviewed ALARA evaluations for the use of respiratory protection performed since the last inspection. Selected Self-Contained Breathing Apparatus (SCBA) units and negative pressure respirators (NPR)s staged for routine and emergency use in the Main Control Room and other locations were inspected for material condition, SCBA bottle air pressure, number of units, and number of spare masks and availability of air bottles. The inspectors reviewed maintenance records for selected SCBA units for the past two years and evaluated SCBA and NPR compliance with National Institute for Occupational Safety and Health certification requirements. The inspectors also reviewed records of air quality testing for supplied-air devices and SCBA bottles.

The inspectors observed the use of respirators for U1RFO20 activities that included reactor head nozzle repairs and NI excore detector removal. The inspectors discussed training for various types of respiratory protection devices with licensee staff and interviewed radworkers and control room operators on use of the devices including SCBA bottle change-out and use of corrective lens inserts. The inspectors reviewed respirator qualification records (including medical qualifications) for several Main Control Room operators and emergency responder personnel. In addition, inspectors evaluated qualifications for individuals responsible for testing and repairing SCBA vital components.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with airborne controls and respiratory protection activities. The inspectors evaluated the licensee’s ability to identify and resolve the issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: Radiation protection program activities associated with airborne radioactivity monitoring and controls were evaluated against details and requirements documented in the UFSAR Section 12; TS Section 6, 10 CFR Part 20; Regulatory Guide

(RG) 8.15, "Acceptable Programs for Respiratory Protection" and approved licensee procedures. Documents reviewed are listed in the Attachment.

b. Findings

No Findings were identified.

2RS4 Occupational Dose Assessment (71124.04 – 5 samples)

a. Inspection Scope

Source Term Characterization: The inspectors reviewed the plant radiation characterization (including gamma, beta, alpha, and neutron) being monitored verified the use of scaling factors to account for hard-to-detect radionuclides in internal dose assessments.

External Dosimetry: The inspectors reviewed National Voluntary Accreditation Program (NVLAP) certification data for the licensee's Thermoluminescent Dosimeter (TLD) processor for the current year for Ionizing Radiation Dosimetry. The inspectors observed and evaluated onsite storage of TLDs. Comparisons between ED and TLD results, including correction factors, were reviewed and discussed. The inspectors also evaluated licensee procedures for unusual dosimetry occurrences. ED alarm logs were reviewed as part of IP 71124.01.

Internal Dosimetry: The inspectors reviewed and discussed the in vivo bioassay program with the licensee. Inspectors reviewed procedures that addressed methods for determining internal or external contamination, releasing contaminated individuals, and the assignment of dose. The inspectors evaluated the licensee's program for in vitro monitoring and in vivo monitoring. The inspectors also reviewed contamination logs and evaluated events with the potential for internal dose.

Special Dosimetric Situations: The inspectors reviewed records for declared pregnant workers (DPW)s from April 2015 through October 2016 and discussed guidance for monitoring and instructing DPWs. Inspectors reviewed the licensee's program for monitoring external dose in areas of expected dose rate gradients, including the use of multi-badging and extremity dosimetry. The inspectors evaluated the licensee's neutron dosimetry program including instrumentation used to perform neutron surveys. In addition, the inspectors reviewed the licensee's program for evaluation of shallow dose equivalent (SDE). The inspectors also reviewed contamination logs and evaluated events with the potential for SDE.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with occupational dose assessment including self-assessments. The inspectors evaluated the licensee's ability to identify and resolve issues.

Inspection Criteria: The licensee's occupational dose assessment activities were evaluated against the requirements of UFSAR Section 12.4; TS Section 6.11; 10 CFR Parts 19 and 20; and approved licensee procedures. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation (71124.05 – 3 samples)

a. Inspection Scope

The inspectors reviewed the licensee's radiation monitoring instrumentation programs to verify the accuracy and operability of radiation monitoring instruments used to monitor areas, materials, and workers to ensure a radiologically safe work environment during normal operations and under postulated accident conditions.

Walkdowns and Observations: During tours of the site areas, the inspectors observed installed radiation detection equipment including the following instrument types: area radiation monitors (ARMs), continuous air monitors (CAMs), personnel contamination monitors (PCMs), small article monitors (SAMs), and portal monitors (PMs). The inspectors observed the calibration status, physical location, material condition and compared TSs for this equipment with UFSAR requirements. In addition, the inspectors observed the calibration status and functional checks of selected in-service portable instruments and discussed the bases for established frequencies and source ranges with RP staff personnel. The inspectors reviewed periodic source check records for compliance with plant procedures and manufacturer's recommendation for selected instruments and observed the material condition of sources used.

Calibration and Testing Program: The inspectors reviewed calibration data for selected ARMs, PCMs, PMs, SAMs, and laboratory instruments as well as the last calibration and methodology for the whole body counter. The inspectors reviewed calibration data, methodology used and the source certification for the containment high range monitor. The current output values for the portable instrument calibrator and the instrument certifications used to develop them were reviewed by the inspectors. The inspectors reviewed the licensee's process for investigating instruments that are removed from service for calibration or response check failures and discussed specific instrument failures with plant staff. In addition, the inspectors reviewed 10 CFR Part 61 data to determine if sources used in the maintenance of the licensee's radiation detection instrumentation were representative of radiation hazards in the plant and scaled appropriately for "hard to detect" nuclides.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with radiological instrumentation including licensee sponsored assessments. The inspectors evaluated the licensee's ability to identify and resolve issues.

Inspection Criteria: Operability and reliability of selected radiation detection instruments were reviewed against details documented in the following: 10 CFR Part 20; NUREG-0737, "Clarification of TMI Action Plan Requirements"; UFSAR Chapters 12, TS Sections 3/4.3.3, "Radiation Monitoring for Plant Operations", 6.8, "Procedure and Programs", 6.11, "Radiation Protection Program", and applicable licensee procedures. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151 – 4 samples)

a. Inspection Scope

The inspectors reviewed a sample of the performance indicator (PI) data, submitted by the licensee, for the Unit 1 PIs listed below. The inspectors reviewed plant records compiled between October 2015 and September 2016 to verify the accuracy and completeness of the data reported for the station. The inspectors verified that the PI data complied with guidance contained in NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," and licensee procedures. The inspectors verified the accuracy of reported data that were used to calculate the value of each PI. In addition, the inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with PI data. Documents reviewed are listed in the Attachment.

Cornerstone: Mitigating Systems

- heat removal system
- cooling water system

Cornerstone: Occupational Radiation Safety

The inspectors reviewed the Occupational Exposure Control Effectiveness PI results for the Occupational Radiation Safety Cornerstone from April 2015 through September 2016. For the assessment period, the inspectors reviewed electronic dosimeter alarm logs and CRs related to controls for exposure significant areas. Documents reviewed are listed in the Attachment.

Cornerstone: Public Radiation Safety

The inspectors reviewed the Radiological Control Effluent Release Occurrences PI results for the Public Radiation Safety Cornerstone from May 2015 through September 2016. For the assessment period, the inspectors reviewed cumulative and projected doses to the public contained in liquid and gaseous release permits and CRs related to

Radiological Effluent TSs/ODCM issues. The inspectors also reviewed licensee procedural guidance for collecting and documenting PI data. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 3 samples)

.1 Routine Review

The inspectors screened items entered into the licensee's CAP to identify repetitive equipment failures or specific human performance issues for follow up. The inspectors reviewed condition reports, attended screening meetings, or accessed the licensee's computerized corrective action database.

.2 Semi-Annual Trend Review

a. Inspection Scope

The inspectors reviewed issues entered in the licensee's CAP and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors focused their review on issues associated with plant status control, but also considered the results of inspector daily condition report screenings, licensee trending efforts, and licensee human performance results. The review nominally considered the 6-month period of July 2016 through December 2016 although some examples extended beyond those dates when the scope of the trend warranted. The inspectors compared their results with the licensee's analysis of trends. Additionally, the inspectors reviewed the adequacy of corrective actions associated with a sample of the issues identified in the licensee's trend reports. The inspectors also reviewed corrective action documents that were processed by the licensee to identify potential adverse trends in the condition of structures, systems, and/or components as evidenced by acceptance of long-standing non-conforming or degraded conditions. Documents reviewed are listed in the Attachment.

b. Findings and Observations

The inspectors evaluated a sampling of CRs generated over the course of the past two quarters related to Plant Status Control (PSC), and the related trend CR for PSC issues. The inspectors determined that, in most cases, the issues were appropriately categorized and evaluated by licensee staff and resolved within the scope of the CAP.

The inspectors noted on the following occasions that there were issues related to attention to detail and procedure adherence:

- Operators focused on permanent recirculation flow gauge with installed test gauge not responding as described in NCR 02081048.
- Inadvertent turbine latch as described in NCR 02077459.
- Jumper installed in wrong cabinet as described in NCR 02072469.
- Unexpected transfer of water from the RWST to the containment sump as described in NCR 02073741.
- Pump control switch taken to wrong position as described in NCR 02067609.

The inspectors also noted that not all of these issues were included in the Plant Status Control negative trend NCR (02069084).

No findings were identified.

.3 Safety Conscious Work Environment

a. Inspection Scope

NRC inspectors conducted a followup assessment of the Safety Conscious Work Environment (SCWE) for one of the onsite contract companies. During the inspection, inspectors were sensitive to areas and issues that would represent challenges to the free flow of information, such as areas where employees may be reluctant to raise concerns or report issues in the CAP.

NRC inspectors also conducted a status review of actions taken to improve the SCWE for that contract company. This included but was not limited to related nuclear condition reports (NCRs), corrective action plan status, Firewatch records, and fitness for duty (FFD). Documents reviewed are listed in the Attachment.

b. Assessment

The Inspectors discussed the SCWE and FFD issues documented in inspection report 05000400/2016-003, and the related NCRs, investigations and action plans.

The corrective actions taken and planned by the licensee to date are appropriate. The effectiveness of these corrective actions will be assessed by the licensee on a routine basis. Contract personnel have been using the Duke Employee Concerns Program (ECP).

Based on inspection insights obtained from this status review, the inspectors concluded that the corrective actions taken and planned appear to be appropriate. The effectiveness of the corrective actions taken by licensee will be evaluated during a future inspection.

c. Findings

No findings were identified.

.4 Annual Followup of Selected Issues

a. Inspection Scope

The inspectors conducted a detailed review of the following two condition reports:

- AR 2047870, 'A' Chiller oil leak caused chiller trip (this was a subsequent trip following a trip a week earlier due to failure of the same fitting)
- AR 2063783, Containment High Range Radiation Monitors Inoperable (this is a longstanding issue addressed in information notice (IN) 97-45 wherein temperature transients cause thermally-induced currents in cabling potentially resulting in unacceptable readings on the radiation monitors)

The inspectors evaluated the following attributes of the licensee's actions:

- complete and accurate identification of the problem in a timely manner
- evaluation and disposition of operability and reportability issues
- consideration of extent of condition, generic implications, common cause, and previous occurrences
- classification and prioritization of the problem
- identification of root and contributing causes of the problem
- identification of any additional condition reports
- completion of corrective actions in a timely manner

Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4OA3 Followup of Events (71153 – 5 samples)

.1 (Closed) Licensee Event Report (LER) 05000400/2016003-00; Containment High-Range Radiation Monitors Declared Inoperable Due to Potential for Temperature Induced Current

In 1997, the NRC issued Information Notice (IN) 97-45 concerning the potential for moisture intrusion into the cables of the containment high range radiation monitors (CHRRMs), which could cause partial shorting of the radiation monitor signal, causing erroneous or erratic readings, or a complete failure of CHRRM indication in the control room. In 1998, the US NRC issued Supplement 1 to the information notice which notified licensees that an additional mechanism had been identified by which temperature-induced current could provide false indication on the CHRRMs during an accident inside containment. While the licensee was aware of the information in IN 97-45, they failed to adequately evaluate the impact of this information on the operability of the CHRRMs, until additional operating experience was received in September 2016.

Upon receipt of the new operating experience, the licensee performed an operability determination that determined the potential for false indications due temperature gradients during an accident would prevent the CHRRMs from meeting their design function rendering the instruments inoperable. The inspectors reviewed the LER for accuracy and appropriateness of corrective actions. The licensee identified that they failed to identify the inoperability of the CHRRMs and take the required actions of LCO 3.3.3.6, action c, from 1998 until an operability determination was completed in September 2016. The enforcement aspects of this violation are discussed in Section 4OA7. This LER is closed.

.2 (Closed) Licensee Event Report (LER) 05000400/2016004-00; Reactor Trip and Safety Injection During Turbine Control Testing at Low Power

On October 8, 2016, the inspectors were observing a reactor downpower in preparation for reactor shutdown and start of the planned refueling outage. With the plant in Mode 1 at approximately 7 percent power, the plant experienced an unexpected reactor trip along with a safety injection (SI) and a main steam line isolation (MSLI). At the time of the trip, operators were performing a surveillance in preparation of testing the mechanical overspeed trip of the main turbine. As the operators attempted to swap control from the throttle valves to the governor valves, the governor valves rapidly opened with the throttle valves already full open. The resulting transient drew down main steam pressure at a sufficient rate to cause a rate-compensated low main steam line pressure signal, which caused both the SI and MSLI with a subsequent reactor trip. The inspectors observed the plant response to the transient as well as the operators' actions in response to the transient. All emergency safeguard (ESF) systems actuated as designed, and the operator's entered the Emergency Operating Procedures (EOPs) and correctly transitioned through the EOPs to secure the SI and stabilize the plant in Mode 3 at normal operating pressure and temperature. The licensee post-trip investigation determined that a malfunctioning pressure switch, PS-4140A1, which provides the turbine latching permissive, caused the turbine latching signal to drop in and out resulting in a cycling of control signal to the Governor and Throttle Valves. The inspectors reviewed the licensee's post-trip analysis including strip charts of key parameters associated with the digital electrohydraulic (DEH) hydraulic control system, the latching logic for the turbine valves and the licensee's fault table analysis. The inspectors determined that the licensee's conclusion was consistent with the observed events. The inspectors reviewed the LER for accuracy and appropriateness of corrective actions. No findings or violations of NRC requirements were identified. This LER is closed. Documents reviewed are listed in the Attachment.

.3 (Closed) LER 05000400/2016005-00 Offsite Power Undervoltage Caused Actuation of Several Systems

On October 8, 2016 at 1310 hours, the site experienced a loss of offsite power. At the time the plant was in Mode 4 in preparation for planned refueling outage. The plant was also experiencing strong winds and heavy rain associated with Hurricane Matthew. Both EDGs started as designed to power the site's safety-related loads. In addition, the Containment Ventilation Isolation system and the Auxiliary Feedwater system actuated

and performed as designed. An unusual event was declared at 1328 hours based on the loss of offsite power for greater than fifteen minutes. Inspectors responded to the site and evaluated the status of mitigating systems and fission product barriers, equipment and personnel performance, and plant management decisions to assist NRC management in making an informed evaluation of plant conditions. The loss of offsite power was caused by a line fault on the Cape Fear West End 230 kV line and degraded protective relays at the Cape Fear Substation that prevented clearing the fault. The unusual event was terminated at 2049 hours once the site had received confirmation of grid stability from the Energy Control Center and onsite indications. Offsite power was re-established at 2154 hours and the EDGs were secured. The inspectors reviewed the LER for accuracy and appropriateness of corrective actions. No findings or violations of NRC requirements were identified This LER is closed.

.4 (Closed) LER 05000400/2016006-00; Reactor Vessel Closure Head Penetration Nozzle Indications Attributed to Primary Water Stress Corrosion Cracking and a Weld Fabrication Void

On October 15, 2016, with the unit shutdown, the reactor vessel head penetration nozzles were examined during a scheduled refueling outage. Nondestructive examinations identified indications that required repairs to four head penetration nozzles (nozzles 23, 30, 40, and 51). This issue is discussed in more detail in Section 1R08 of this report. The inspectors reviewed the LER for accuracy and appropriateness of corrective actions. No findings or violations of NRC requirements were identified. This LER is closed.

.5 (Opened) LER 05000400/2016007-00; Containment Spray System Valve Actuation

On October 26, 2016, the licensee started B Containment Spray pump using portions of OST-1119, Containment Spray Operability B Train Quarterly Interval Modes 1-4 in order to set the throttling position of 1 CT-68, Containment Spray Pump B-SB Eductor Line Outlet Isolation Valve, which had been previously isolated as part of a local leak rate test. At the start of the evolution, the Refueling Water Storage Tank (RWST) level was at 22.2 percent, which is below the RWST low-low level setpoint of 23.4 percent that automatically causes a swapover of containment spray pump suction source from the RWST to the containment sump. Upon start of the B Containment Spray pump, an auto-swapover occurred resulting in the containment spray suction valves associated with the containment sump (1CT-102 and 1CT-105) to open. Once 1CT-102 and 1CT-105 were full open the containment spray suction valves associated with the RWST (1CT-71 and 1CT-26) started to stroke closed. During the time 1CT-71 and 1CT-26 were in the process of closing, approximately 34,000 gallons of water was transferred from the RWST to the basement of the containment building. A review of OST-1119 revealed that the procedure failed to require as either a prerequisite or precaution and limitation that RWST level be maintained above the RWST low-low level setpoint to prevent an inadvertent swapover upon the start of a containment spray pump. This LER will be kept open pending review of the licensee's apparent cause evaluation to determine if a performance deficiency exists.

4OA5 Other Activities

(Closed): Unresolved Item (URI) 05000400/2016003-01, Subsequent Loss of Safety-Related Chilled Water System Results in a Loss of Safety Function

During the third quarter inspection period, as documented in NRC Inspection Report 05000400/2016003, inspectors opened a URI regarding the subsequent trip of the 'A' Essential Services Chilled Water (ESCW) chiller on low oil pressure following a previous trip of the same chiller one week earlier on low oil pressure. The cause of both trips was due to the failure of the same brass fitting which resulted in the loss of oil pressure.

The licensee entered the issue into the CAP under action request (AR) 2047870 and performed an apparent cause evaluation (ACE) to investigate the issue. The investigation revealed that the original brass fitting had been in place for approximately ten years prior to failure. The replacement fitting was a like-for-like replacement, which lasted only six days. Metallurgical analysis indicated that vibration-induced stress had caused the failure of the second fitting. Trending analysis was also performed to analyze the vibration trend on the major components of the chiller. While higher vibrations were noted during the summer months, the change in vibration was not of a significant magnitude and did not explain the rapid degradation of the second brass fitting. Stress corrosion cracking was also noted during the metallurgical analysis as a secondary degradation mechanism on the failed fitting and was attributed to the type of primer that was used on the brass fitting, but did not explain the rapid degradation of the second fitting. The inspectors performed a review of the licensee's ACE, conducted a walkdown of both 'A' and 'B' ESCW chillers to verify configuration of the components in question on both chillers, as well as a review of the vendor's manual to determine if any bracing recommendations for the tubing had not been followed; no guidance was contained in the manual. The licensee determined the initial design to be inadequate and replaced the brass fitting with a stainless steel fitting and installed a spacer between the affected length of tubing and another run of tubing attached to the compressor to increase the rigidity of the affected tubing. An enhanced vibration monitoring program has also been implemented to allow for better future characterization of the vibration phenomenon observed on the compressor. The inspectors determined that the subsequent failure of the second brass fitting was beyond the licensee's ability to reasonably foresee. No findings or violations of NRC requirements were identified. This URI is closed.

4OA6 Meetings, Including Exit

On January 18, 2017, the resident inspectors presented the inspection results to Mr. Paul Fisk and other members of the licensee's staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

4OA7 Licensee-Identified Violations

The following violations of very low safety significance (Green) or Severity Level IV were identified by the licensee and are violations of NRC requirements which meet the criteria of the NRC Enforcement Policy, for being dispositioned as a NCV.

TS limiting condition for operation (LCO) 3.3.3.6, Action C, Accident Monitoring Instrumentation, states in part that with the number of operable accident monitoring instrumentation channels for the radiation monitor(s), less than the minimum channels operable, initiate the preplanned alternate method of monitoring the appropriate parameter(s), within 72 hours, and either restore the inoperable channel(s) to operable status within 7 days or prepare and submit a Special Report to the Commission, pursuant to Specification 6.9.2, within the next 14 days. TS Table 3.3-10 indicates that a minimum of one channel of the Containment High Range Radiation Monitors (CHRRMs) is required to be operable.

Contrary to the above, the licensee identified that they failed to identify the inoperability of the CHRRMs and take the required actions of LCO 3.3.3.6, Action C, from 1998 until an operability determination was completed in September 2016. Using IMC 0609, Appendix B, Emergency Preparedness Significance Determination Process, inspectors determined that this violation was of very low safety significance (Green) because the finding was a failure to comply with a non-risk significant planning standard and no planning standard function failure occurred since other parameters could be used to validate the indications from the CHRRMs. This issue was documented in the licensee's CAP as AR 2063783.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel

R. Chezem, Boric Acid Program Owner
E. Fronteneau, Steam Generator Program Owner
L. Faulk, Director, Plant Security
P. Fisk, Plant Manager
D. Griffith, Manager, Training
T. Hamilton, Site Vice President
J. Keltner, Manager, Chemistry
S. O'Connor, General Manager, Engineering
M. Parker, Manager, Radiation Protection
J. Robertson, Manager, Regulatory Affairs
K. Rochelle, RP Scientist
A. Staller, ISI Program Owner
T. Stephens, Engineer, Licensing
T. Toler, Manager, Oversight
S. Volk, Reactor Pressure Vessel Head Replacement Engineer
C. Yarley, Engineer, Regulatory Affairs
A. Zimandy, Site Welding Engineer

NRC personnel

S. Rose, Chief, Reactor Projects Branch 4, Division of Reactor Projects, Region II

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000400/2016007-00	LER	Containment Spray System Valve Actuation. (4OA3)
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Opened and Closed

05000400/2016003-00	LER	Containment High-Range Radiation Monitors Declared Inoperable Due to Potential for Temperature Induced Current. (Section 4OA3)
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05000400/2016004-00	LER	Reactor trip and safety injection during turbine control testing at low power. (Section 4OA3)
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05000400/2016005-00	LER	Offsite power undervoltage caused actuation of several systems. (Section 4OA3)
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05000400/2016006-00	LER	Reactor Vessel head penetration nozzle indications attributed to primary water stress corrosion cracking. (Section 4OA3)
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Closed

05000400/2016003-01	URI	Subsequent Loss of Safety-Related Chilled Water System Results in a Loss of Safety Function (Section 4OA5)
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LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures

AP-300, Severe Weather

AP-301, Seasonal Weather Preparations and Monitoring

Action Requests

2080005

Other Documents

ACE 2043878, Water Intrusion into DFOSB, 8/9/2016, Rev. 0

UFSAR Sections 2.4.2, 2.4.10, 3.4.1.1

PMS-0001, Probable Maximum Storm Ponding on all Buildings, 10/9/2014

RCE 754721, RAB's High Energy Line Break Doors Propped Open, 8/12/2015

Section 1R04: Equipment Alignment

Procedures

OMM-001, Operations Administrative Requirements

OP-137, Auxiliary Feedwater System

OP-155, Diesel Generator Emergency Power System

OP-156.02, AC Electrical Distribution

Drawings

CAR 2166-G-0030, 480V Auxiliary One Line Wiring Diagram

CPL-2165-S-0544, Simplified Flow Diagram Feedwater System Unit 1

CPL-2165-S-633S04, Simplified Flow Diagram EDG 1A-SA & 1B-SB

Starting Air System Unit 1

Section 1R05: Fire Protection

Procedures

AD-EG-ALL-1520, Transient Combustible Control

FPP-001 Fire Protection Program Manual

FPP-013, Fire Protection – Minimum Requirements, Mitigating Actions and Surveillance Requirements

FPP-012-02-RAB261, Reactor Auxiliary Building Elevation 261 Fire Pre-Plan

FPP-012-04-DGB, Diesel Generator Building Fire Pre-Plan

FPP-012-01-CNMT, Containment Building Fire Pre-Plan

FPP-012-03-FHB, Fuel Handling Building Fire Pre-Plan

FPP-012-07-TB, Turbine Building Fire Pre-Plan

FPP-012-06-WPB, Waste Processing Building Fire Pre-Plan

FPP-012-08-SEC, Out Building Fire Pre-Plan

FPP-012-09-LAF, Large Area Fire Pre-Plan

FPP-012-02-RAB 236, RAB Elevation 236 Fire Pre-Plan

FPP-012-02-190-216, RAB Elevations 190 and 216 Fire Pre-Plan

FPP-012-02-RAB286, RAB Elevation 286 Fire Pre-Plan

FPP-012-02-RAB305-324, RAB Elevations 305 and 324 Fire Pre-Plan

Action Requests

2080284

Section 1R07: Heat Sink PerformanceProcedures

EPT- 163, GL 89-13 Inspections

PLP- 620, Service Water Program (GL 89-13)

Other

SW-0048, Heat Transfer Calculation of CCW Heat Exchangers

Action Requests

2070295

Section 1R08: Inservice Inspection ActivitiesProcedures:

AD-EG-PWR-1611, Boric Acid Corrosion Control Program Implementation, Rev. 1

AD-MN-ALL-0006, Fluid Leak Management, Rev. 0

EGR-NGGC-0210, ASME Section XI Inservice Inspection Examination Program/Plan Administration, Rev. 4

MMM-017, Valve Packing Manual, Rev. 14

NDE-NE-ALL-6106, Ultrasonic Examination of Mid or Large Diameter Piping Welds and Base Metals for Thermal Fatigue Damage, Rev. 0

NDE-NE-ALL-7203, Visual Examination of PWR Reactor Pressure Vessel Bottom Mounted Instrumentation Penetrations, Rev. 1

NDEP-101, Radiographic Examination, Rev. 20

NDEP-201, Liquid Penetrant Examination, Rev. 34

NDEP-425, Ultrasonic Examination of Austenitic Pipe Weld, PDI Temp. Rev. B, Rev. 13

NDEP-454, Digital Ultrasonic Thickness Measurements, Rev. 5

NDEP 613, VT-3 Visual Examination of Nuclear Power Plant Components, Rev. 24

NDEP-1012, Gridding of Components for Flow Accelerated Corrosion (FAC), Rev. 10

NGGM-PM-0011, NDE Radiographic Examination Acceptance Criteria, Rev. 4

PD-EG-ALL-1620, Nuclear Welding Program, Rev. 0

WLD-EG-ALL-1620, General Welding, Rev. 0

54-ISI-367, Visual Examination for Leakage of Reactor Head Penetrations, Rev. 12

54-PT-200, Color Contrast Solvent Removable Liquid Penetrant Examination of Components, Rev. 20

54-ISI-244, Liquid Penetrant Examination of the Reactor Vessel Head Penetrations from the Inside Surface, Rev.14

NRC-Identified Corrective Action Reports:

2071662, NRC 2016 ISI-Management of minimum wall thickness

2072060, NRC 2016 ISI: Minor Licensee Ident. Viol-ASME Section XI

2072041, NRC 2016 ISI: Observation-1RH40m Repeat Leaks

2072046, NRC 2016 ISI: Observation-BACP Backup Support

2071501, NRC 2016 ISI: Reactor Vessel Head Insulation, 10/19/2016

Corrective Action Reports:

1986840, Boric Acid Buildup on FT-01CS-0122 SW

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2050223, PMCH-boric acid transfer pump EQ PM

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749855, ISI-952 Has a Bonner and Packing leak
 2034968, 1ED-145 Is Leaking By
 2055515, Welded Attachments Excluded from ISI Program
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 2068771, Limited MRP-192 UT Examination Coverage
 2068757, ISI PT Examination Limitation
 2068760, ISI PT Examination Limitation
 2067721, ISI UT Examination Limited Coverage Weld
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 1976407, Weld Preheat
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 1972084, Align the Boric Acid Control program
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 Certificate of Qualification for Examiner: T. Wingfield, M. Saenz, R. Koster, J. Nahory, S. Bartrom, R. Porter, M. Hunt, M. Heeter, J. Watters, M. Hassel, S. Dean, G. Ransom, W. Leeper, C. Title, D. King, D. Foss, C. Kaminski, R. Tedder, W. Bollingmo, J. Rush, J. Shepard
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Procedures

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Procedures

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Procedures

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Using Computer

EST-923, Initial Criticality and Low Power Physics Testing

FHP-020, Refueling Operations

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Procedures

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HPS-NGGC-005-7-5, Form 7 Eberline RO-7 Calibration Record: Serial # 622, 02/17/14

Harris Passive Whole Body Sensitivity Study March 2014

ST3250 Station Health Reports: 7005/2105: Radiation Monitoring/ GFFD, Q3-2015

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Stand Up Whole Body Counter #1 Calibration, 06/10/2014

2015 Recalibration of the CANBERRA APEX-INVIVO FASTSCAN2 Counting System, 10/29/2015

2015 Recalibration of the CANBERRA APEX-INVIVO FASTSCAN Counting System, 09/10/2015

EnRad Laboratories CCF Cert of Calibration: Goose Neck Air Sampler #6403, 10/06/2016

EnRad Laboratories CCF Cert of Calibration: AMS-4 #2131, 09/09/2016

HPP-730 Operation of Portable Ventilation Units and Testing Portable Ventilation Units & Vacuums: Attachement 1 Percent Penetration and Bypass Leakage Test Record, 09/20/16

Station Health Reports, Radiation Monitoring/GFFD (7005/2105) Q4-2015, Q3-2015

CAP Documents

AR 02002992

AR 01998890

AR 01993542

AR 01977042

AR 01946949

AR 00758526

AR 00757000

AR 00753153

AR 00748870

AR 00743081

AR 20050862
 AR 20080865
 AR 02075809

Section 40A1: Performance Indicator Verification

NEI 99-02, Regulatory Assessment Performance Indicator Guideline
 Calculation HNP-F/PSA-0068, NRC Mitigating System Performance Index Basis Document for
 Harris Nuclear Plant

Procedures and Guidance Documents

AD-LS-ALL-0004, NRC PIs and Monthly Operating Report, Rev. 1
 AD-PI-ALL-0100, CAP, Rev. 7
 AD-RP-ALL-1101, PI for the Occupational and Public Radiation Safety
 Cornerstones, Rev. 0

Records and Data

AD-RP-ALL-1101: Attachment 2 Monthly Review and Evaluation of Occupational Radiation
 Safety Cornerstone Data for NRC PIs Worksheet, various sheets between
 05/2015 – 08/2016
 Approaching Dose Alarm – Date and Site Query, April 2015 to September 2016
 Attachment 2, Monthly Review and Evaluation of Occupational Radiation Safety Cornerstone
 Data for NRC PIs Worksheet, AD-RP-ALL-1101, PIs for the Occupational and Public
 Radiation Safety Cornerstones, Rev. 0, November 2015 to September 2016
 Attachment 13, Sheet 1 of 1, Occupational Exposure Control Effectiveness,
 April to October 2015
 Dose Rate Alarm, Site: HNP, Query from April 2015 to September 2016
 RST-111, Gaseous Effluent Radiochemistry Surveillance, Continuous Plant Vent Stack, Gas
 Permit Data, 06/28/2016
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 Processing, 06/10/2016
 RST-203, Liquid and Gaseous Radioactivity Dose Surveillance 2nd Quarter 2016, 06/08/2016
 RST-210, Liquid Effluent Radiochemistry Surveillance, Batch Releases Surveillance Test Data,
 06/18/2016

CAP Documents

Quick Hitter Self-Assessment Report, Self-Assessment No. 010984629 - 05, 2016 NRC RP
 ORS Inspection, Inspection Manual Procedure 71151, PI
 Verification, Undated

Action Requests

2079677

Section 40A2: Identification and Resolution of Problems

AD-OP-ALL-0202, Aggregate Operator Impact Assessment
 AD-PI-ALL-0100, CAPAD-PI-ALL-0101, Root Cause Evaluation
 AD-PI-ALL-0102, Apparent Cause Evaluation
 AD-PI-ALL-0103, Quick Cause Evaluation
 AD-PI-ALL-0104, Prompt Investigation Response Team
 AD-PI-ALL-0105, Effectiveness Reviews

Procedures and Guidance Documents

AD-PI-ALL-0100, CAP

AD-OP-ALL-0204, Plant Status Control, Revision 1

OPT-1075, Turbine Mechanical Overspeed Trip Test 18 Month Interval Mode 1-2, Revision 017

OPT-1509, Turbine Trip Tests Quarterly Interval Modes 1 and 2, Revision 25

OST-1118, Containment Spray Operability Train A Quarterly Interval Modes 1-4, Revision 51

OST-1119, Containment Spray Operability Train B Quarterly Interval Modes 1-4, Revision 55

OST-1807, Containment Spray System: ESF Response Time 18 Month Interval Modes 5, 6, Revision 022

OST-1825, Safety Injection: ESF Response Time, Train A 18 Month Interval on a Staggered Test Basis Mode 5-6, Revision 047

OST-1826, Safety Injection: ESF Response Time, Train B 18 Month Interval on a Staggered Test Basis Mode 5-6, Revision 048

AD-PI-ALL-0100, CAP

AD-SY-ALL-0460, Managing Fatigue and Work Hour Limits, Revision 0

FPP-005. Duties of a Fire Watch, Revision 21

Condition Reports / Action Requests

2038837	2044243	2045662	2053832	2062559	2067609
2068664	2069084	2072469	2073337	2073741	2074091
2074105	2074744	2075400	2075599	2076109	2076553
2077190	2077401	2077459	2077876	2078710	2078748
2080202	2080464	2081048	2081102	2082072	2082390
2082978	2083076				

Section 40A3: Follow-up of Events and Notices of Enforcement DiscretionProcedures

EOP-E-0, Reactor Trip or Safety Injection

EOP-ES-1.1, SI Termination

OPT-1075, Main Turbine Mechanical Overspeed Trip Test

AOP-025, Loss of One Emergency AC Bus (6.9 kV) or Loss of One Emergency DC Bus (125V)

PLP-201, Emergency Plan

OMM-004, Post-Trip / Safeguards Actuation Review

Other Documents

EN 52289

EN 52291

LER 05000400 2016-004-00, Reactor Trip and Safety Injection During Turbine Control Testing at Low Power

Failure Investigation Process, HNP Turbine Generator Overspeed Test and Reactor Trip, October 21, 2016

LER 05000400 2016-005-00, Offsite Power Undervoltage Caused Actuation of Several Systems

Condition Reports

CR 2068223

CR 2068336