



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

January 27, 2016

Benjamin C. Waldrep  
Site Vice President  
Shearon Harris Nuclear Power Plant  
5413 Shearon Harris Rd.  
M/C HNP01  
New Hill, NC 27562-0165

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT - NRC INTEGRATED  
INSPECTION REPORT 05000400/2015004

Dear Mr. Waldrep:

On December 31, 2015, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Shearon Harris Nuclear Power Plant, Unit 1. The enclosed inspection report documents the inspection results which were discussed on January 21, 2016, with you and other members of your staff.

Two self-revealing findings were identified during this inspection. Both of these findings involved violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Shearon Harris Power Plant, Unit 1.

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 Regional Administrator, Region II; and the NRC Resident Inspector at Shearon Harris facility.

In accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Agency Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

*/RA/*

George T. Hopper, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

Docket No.: 50-400  
License No.: NPF-63

Enclosure:  
NRC Inspection Report 05000400/2015004  
w/Attachment: Supplementary Information

cc Distribution via ListServ

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Sincerely,

/RA/

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Letter to Benjamin C. Waldrep from George T. Hopper dated January 27, 2016.

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT - NRC INTEGRATED  
INSPECTION REPORT 05000400/2015004

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**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket Nos.: 50-400

License Nos.: NPF-63

Report No.: 05000400/2015004

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, 2015 through December 31, 2015

Inspectors: J. Austin, Senior Resident Inspector  
M. Riches, Resident Inspector  
M. Bates, Senior Operations Engineer (Section 1R11.3)

Approved by: George T. Hopper, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

Enclosure

## SUMMARY

IR 05000400/2015004; October 1, 2015, through December 31, 2015; Duke Energy Progress, Inc., Shearon Harris Nuclear Power Plant, Unit 1, Flood Protection Measures and Post Maintenance Testing.

The report covered a three-month period of inspection by resident inspectors and a regional inspector. There were two self-revealing violations documented in this report. 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 February 4, 2015. The NRC's program for overseeing the safe operations of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5.

### **Cornerstone: Mitigating Systems**

Green. A self-revealing Green non-cited violation (NCV) of Criterion III, Design Control, Appendix B of 10 CFR Part 50, occurred due to the licensee's failure to maintain Class 1E (safety-related) electrical cables in an environment for which they are designed. Specifically, the low-voltage safety-related cables associated with the 'B' Essential Service Water (ESW) system were submerged in water, a condition for which they are not qualified. The licensee took immediate actions to lower the water levels in underground cable vaults where submerged cables were discovered, and conduct pump-downs of the safety-related underground cable vaults on an increased scheduled frequency. The licensee entered this issue into the corrective action program (CAP) as nuclear condition reports (NCRs) 1961933 and 1962664, respectively, and implemented actions to pump down the non-conforming vaults.

The licensee's failure to maintain the low-voltage safety-related cables associated with the 'B' ESW system in an environment for which they were designed was a performance deficiency. The performance deficiency was more than minor because the cables known to be submerged are part of the 'B' ESW system, which is a mitigating system and is associated with the Mitigating Systems Cornerstone. The performance deficiency was related to the equipment reliability attribute and failure to maintain the cables in the environment for which they were designed adversely impacted the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the submergence of the safety-related cables adversely impacted the service life of the cables and could cause the 'B' ESW system to be inoperable in the event a cable failed as a result of continuous submergence. The inspectors used Table 2 of Attachment 4, Initial Characterization of Findings, of Inspection Manual Chapter (IMC) 0609, Significance Determination Process (SDP), to determine that the finding was associated with the Mitigating Systems Cornerstone. Using the guidance provided in Table 3 of Attachment 4, the inspectors transitioned to Appendix A, SDP for Findings At-Power, of IMC 0609. The inspectors used Exhibit 2, Mitigating Systems Screening Questions, of the appendix, to determine that the finding was of very low safety significance (Green) because the finding did not represent an actual loss of function on the ESW system. The finding was assigned the cross-cutting aspect of work management, as described in the area of human performance, because the licensee failed to implement an adequate preventive maintenance program to monitor and maintain the sump pumping system associated with the safety-related cable vaults (H.5). (1R06)

Green. A self-revealing Green NCV of Criterion XI, Test Control, Appendix B of 10 CFR Part 50, occurred due to the licensee's failure to perform adequate post-maintenance testing on the essential services chilled water (ESCW) chillers. Specifically, on multiple occasions the licensee failed to perform section 7.8, Current Signal Input Resistor Adjustment, of procedure CM-I0014, York Essential Services Chilled Water Chiller Temperature Control Maintenance, following maintenance on the temperature controller associated with the ESCW chillers. The licensee took corrective actions to adjust the current limiters on the ESCW chillers to be at the correct setting of 65 amps. The licensee entered this issue into the CAP as NCRs 1944657 and 1950574.

The licensee's failure to perform adequate post-maintenance testing on the, ESCW Chiller was a performance deficiency. Specifically, the failure to perform section 7.8 of procedure CM-I0014 to ensure the configuration of the temperature controllers were per design specifications resulted in the current limiters on each unit being out of calibration for extended periods of time. The performance deficiency was more than minor because if left uncorrected, it would have the potential to lead to a more significant safety concern. For the 'A' train, continued omission of section 7.8 following maintenance on its temperature controller, had the potential of the pre-rotation vanes pulling excessive load resulting in a trip of the 'A' train chiller. For the 'B' train, continued omission of section 7.8 following maintenance on its temperature controller had the potential of the pre-rotation vanes not picking up adequate load to meet the cooling demands during accident conditions. The inspectors used Table 2 of Attachment 4, Initial Characterization of Findings, of IMC 0609, Significance Determination Process, to determine that the finding was associated with the Mitigating Systems Cornerstone. Using the guidance provided in Table 3 of Attachment 4, the inspectors transitioned to Appendix A, Significance Determination Process (SDP) for Findings At-Power, of IMC 0609. Using Exhibit 2, Mitigating Systems Screening Questions, of the appendix, the inspectors determined that the finding was of very low safety significance (Green) because while the chillers were in a nonconforming condition, operability of the chillers was maintained. The finding was assigned the cross-cutting aspect of bases for decisions, as described in the area of human performance, because the licensee made the decision not to perform section 7.8 of maintenance procedure CM-I0014 without documenting a reason for omitting the section following maintenance on the ESCW temperature controllers (H.10). (1R19)

## REPORT DETAILS

### Summary of Plant Status

Unit 1: The unit began the period at 100 percent rated thermal power (RTP). On October 31, 2015, power was lowered to 75 percent for turbine valve testing. The unit returned to 100 percent RTP on November 1, 2015. On December 12, 2015, power was reduced to 90 percent RTP due to faulty level indication on the 1A feedwater heater. Once repairs were complete, the unit returned to 100 percent RTP on December 11, 2015, and remained there for the remainder 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 heavy rainfall expected during October 1, 2015, through October 4, 2015. The inspectors evaluated the licensee's implementation of adverse weather preparation procedures and compensatory measures, including operator staffing, before the onset of the adverse weather conditions. The inspectors reviewed the licensee's plans to address the ramifications of potentially lasting effects that may result from heavy rainfall. 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:

- Reactor Auxiliary Building (RAB), 286 ft. elevation
- RAB, 261 ft. elevation

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04 – 4 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:

- 'B' emergency diesel generator (EDG) during 'A' EDG maintenance outage
- 'B' ESCW chiller during 'A' ESCW chiller maintenance outage.
- 'A' and 'B' motor-driven auxiliary feedwater pumps with turbine-driven auxiliary feedwater (TDAFW) pump out for maintenance

.2 Complete Walkdown

The inspectors verified the alignment of the 1A ESCW train. The inspectors selected this system for assessment because it is a risk-significant mitigating system. The inspectors determined the correct system lineup by reviewing plant procedures, drawings, the UFSAR, and other documents. The inspectors reviewed records related to the system's outstanding design issues, maintenance work requests, and deficiencies. The inspectors verified that the selected system was correctly aligned by performing a complete walkdown of accessible components.

To verify the licensee was identifying and resolving equipment alignment discrepancies, the inspectors reviewed corrective action documents, including condition reports and outstanding work orders. The inspectors also reviewed periodic reports containing information on the status of risk-significant systems, including maintenance rule reports and system health reports. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05A/Q – 1A/5Q 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.

- RAB 286 elevation, fire zone 1-A-SWGRB
- RAB 286 elevation, fire zone 1-A-SWGRA
- RAB 286 elevation, fire zone 1-A-5-HVA
- RAB 286 elevation, fire zone 1-A-5-HVB
- Emergency Service Water Screening Structure, fire zone 5-S-BAL

.2 Annual Inspection

The inspectors evaluated the licensee's fire brigade performance during a drill on October 22, 2015, and assessed the brigade's capability to meet fire protection licensing basis requirements. The inspectors observed the following aspects of fire brigade performance:

- capability of fire brigade members
- leadership ability of the brigade leader
- use of turnout gear and fire-fighting equipment
- team effectiveness
- compliance with site procedures

The inspectors also assessed the ability of control room operators to combat potential fires, including identifying the location of the fire, dispatching the fire brigade, and sounding alarms. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 – 1 sample)a. Inspection ScopeUnderground Cables

The inspectors reviewed related flood analysis documents and inspected the areas listed below containing cables whose failure could disable risk-significant equipment. The inspectors directly observed the condition of cables and cable support structures and, as applicable, verified that dewatering devices and drainage systems were functioning properly. In addition, the inspectors verified the licensee was identifying and properly addressing issues using the CAP. Documents reviewed are listed in the Attachment.

- Manhole M-70
- Manhole M-72
- Manhole M-73
- Manhole M-84

b. Findings

Introduction: A self-revealing Green NCV of Criterion III, Design Control, Appendix B of 10 CFR Part 50, occurred due to the licensee's failure to maintain Class 1E (safety-related) electrical cables in an environment for which they were designed. Specifically, the low-voltage safety-related cables associated with the 'B' ESW system were submerged in water, a condition for which they are not qualified.

Description: On October 7 and 8, 2015, the inspectors, accompanied individuals from the licensee's engineering staff to inspect the condition of the electrical cables in the licensee's manholes which house the underground cable vaults. As part of the sample, the inspectors observed the conditions of manholes M-72, M-73, and M-84 and observed that water levels in underground vaults M-73C and M-84B were such that the low-voltage safety-related cables associated with the 'B' ESW system were submerged.

The licensee also conducted an evaluation of the entire underground safety-related vault system and the associated pump-down system. Each safety-related underground vault is equipped with a pumping system that is designed to monitor water level in each compartment in the vault and initiate a pump-down of the vault before cable submergence occurs. Submergence in water is a known degradation phenomenon that can impact the 40-year service life of the cables. The evaluation identified several instances where the level instrumentation was providing unreliable indication (e.g., M-84B level indicated 60 inches; actual level was 25 inches) as well as issues with the pumping system failing to automatically initiate a pump-down. The pump-down system, which was installed in January 2013, in response to a previous cable submergence issue, was never incorporated into the preventive maintenance program and as such, the level instrumentation and initiation functions have never been calibrated or tested since the system was originally installed. A manual pump-down of the safety-related vaults was implemented on a monthly schedule. However, on November 11, 2015, a high level condition (25 inches) was discovered on the M-70D vault with the low-voltage safety-related cables submerged. The licensee has since increased the frequency of the manual pump-downs to weekly and implemented the logging of the level in the M-70D vault on a daily basis. As part of the review of the licensee's operability determination, the inspectors determined that while the cables are qualified for a dry or wet (moisture resistant) environment, they are not qualified for continuous submergence.

Analysis: The licensee's failure to maintain the low-voltage safety-related cables associated with the 'B' ESW system in an environment for which they are designed was a performance deficiency. The performance deficiency was more than minor because the cables known to be submerged are part of the 'B' ESW system, which is a mitigating system and is associated with the Mitigating Systems Cornerstone. The performance deficiency was related to the equipment reliability attribute and failure to maintain the cables in the environment for which they were designed adversely impacted the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the submergence of the safety-related cables adversely impacted the service life of the cables and could cause the 'B' ESW system to be inoperable in the event a cable failed as a result of continuous submergence. The inspectors used Table 2 of Attachment 4, Initial Characterization of Findings, of IMC 0609, Significance Determination Process (SDP), to determine that the finding was associated with the Mitigating Systems Cornerstone. Using the guidance provided in Table 3 of Attachment 4, the inspectors transitioned to Appendix A, SDP for Findings At-Power, of IMC 0609. The inspectors used Exhibit 2, Mitigating Systems Screening Questions, of the appendix, to determine that the finding was of very low safety significance (Green) because the finding did not represent an actual loss of function on the ESW system. The finding was assigned the cross-cutting aspect of work management, as described in the area of human performance, because the licensee failed to implement an adequate preventive maintenance program to monitor and maintain the sump pumping system associated with the safety-related cable vaults (H.5).

Enforcement: Criterion III, Design Control, Appendix B of 10 CFR Part 50 requires, in part, that measures shall be established to assure applicable regulatory requirements and the design basis, as defined in section 50.2 and as specified in the license applications, for those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions.

Contrary to the above, from January 2013 to October 2015, the licensee failed to establish adequate maintenance and monitoring program procedures and instructions, for the pump-down system, to ensure the low-voltage safety-related cables were maintained within the environmental conditions for which they were designed. The licensee took immediate actions to lower the water levels in underground cable vaults where submerged cables were discovered, and conduct pump-downs of the safety-related underground cable vaults on an increased scheduled frequency. Because the licensee entered the issues with the submerged cables into the CAP as NCRs 1961933 and 1962664, and the finding was of very low safety significance (Green), this violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy: NCV 05000400/2015004-01, 'B' ESW System Safety-Related Cables Submerged in Water.

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

a. Inspection Scope

.1 Resident Inspector Quarterly Review of Licensed Operator Requalification

On November 3, 2015, the inspectors observed an evaluated simulator scenario administered to an operating crew conducted in accordance with the licensee's

accredited requalification training program. The scenario involved a reactor trip, followed by a loss of offsite power and a station blackout.

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 Actual Plant/Main Control Room

The inspectors observed licensed operator performance in the main control room during a downpower to 75 percent to conduct turbine control valve testing and to repair the GV-1 governor valve on October 31, 2015.

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 August, 28, 2015, the licensee completed the annual requalification operating examinations 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 Inspection Procedure (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.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 5 samples)

a. Inspection Scope

The inspectors reviewed the maintenance activities listed below to verify that the licensee assessed and managed plant risk as required by 10 CFR 50.65(a)(4) and licensee procedures. The inspectors assessed the adequacy of the licensee's risk

assessments and implementation of risk management actions. The inspectors also verified that the licensee was identifying and resolving problems with assessing and managing maintenance-related risk using the CAP. Additionally, for maintenance resulting from unforeseen situations, the inspectors assessed the effectiveness of the licensee's planning and control of emergent work activities. Documents reviewed are listed in the Attachment.

- October 3, 2015, Emergent Risk Assessment following Trip of Cooling Tower Makeup (CTMU) 1X; Risk Remained Green
- October 21, 2015, Emergent Risk Assessment following 'A' EDG; Risk Remained Green
- October 26, 2015, Yellow Qualitative Risk while 'B' Feedwater Regulating Valve is in Manual for Scheduled Surveillance Testing
- October 31, 2015, Yellow Risk during Power Reduction to 75 percent for Main Turbine Oil valve testing
- November 21, 2015, Emergent Risk Assessment following the Loss of Temporary Air Compressor #2; Risk Remained Green

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 4 samples)

a. Inspection Scope

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 technical specification (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. Documents reviewed are listed in the Attachment.

- Sump Pump Reliability and Submerged SR Cables, NCR 1964721
- ESCW Chiller, WC-2A SA, Tripped on Overcurrent, NCR 1950574
- ESCW Chiller, WC-1B-SB, Current Limiter Calibration, NCR 1944657
- WC-2A SA Operability Determination, NCR 1983806

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 11 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# 20028390, 'A' EDG Overspeed Trip Will Not Reset, October 22, 2015
- WO# 20028662, 'A' EDG Turbo Engine Air Flex Joint Failed, October 22, 2015
- WO# 13391087, Perform PIC-I825: Perform Terry Turbine Governor Control System, Calibration, December 17, 2015
- WO# 20026453, Perform OP-120.07 to Check for Leakage on the Waste Gas System, October 16, 2015
- WO# 12225610, Perform OST-1030 – Operability Testing of Breaker for R-2A-SA, November 30, 2015
- WO# 13447975, "A" Steam Generator PORV – Install Voltage Vision Disconnect, November 23, 2015
- WO# 12227163, MCC 1 &4A33-SA-4C Bucket Replacement, October 21, 2015
- WO# 13513620, Perform OST-1085 for Fast-start on 1A-SA EDG
- WO# 20041055, Perform PM-I0076, Functional Check of LC-01HD-1551A, 1A Feedwater Heater Level control valve, December 17, 2015
- WO# 01967301, Calibrate 'B' Chiller Current Limiter, August 19, 2015
- WO# 02293632, Optimize ('A' chiller) Temperature Control Module Tuning, October 22, 2013

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

Introduction: A self-revealing Green NCV of Criterion XI, Test Control, Appendix B of 10 CFR Part 50, occurred due to the licensee's failure to perform adequate post-maintenance testing on the ESCW chillers. Specifically, on multiple occasions the licensee failed to perform section 7.8, Current Signal Input Resistor Adjustment, of procedure CM-I0014, York Essential Services Chilled Water Chiller Temperature Control Maintenance, following maintenance on the temperature controller associated with the ESCW chillers.

Description: On September 4, 2015, following repairs to the 'A' train load sequencer, the 'A' train ESCW chiller was started. Approximately four minutes later, the 'A' train ESCW chiller tripped. An inspection of the temperature controller revealed that solder joints

associated with the current limiter inputs to the temperature controller were broken, which led the 'A' train ESCW chiller to trip on overcurrent. The licensee also determined that the current limiter for the temperature controller had been improperly set, which limits the travel of the pre-rotation vanes on the compressor start. The pre-rotation vanes extend in response to a load demand on the compressor. The current limiter is designed to prevent the pre-rotation vanes from fully extending during the initial loading of the ESCW chiller which can lead to a trip on overcurrent. The overcurrent trip setting is 80 amps on a two-minute time delay. The delay period decreases proportionally as amperage increases above 80 amps. The licensee's investigation determined that the correct setting for the current limiter is at approximately 65 amps which corresponds to 104 percent of full load amperage. The current limiter for the 'A' ESCW chiller was set at 76 amps, which resulted in an increase in the initial loading of the compressor.

An extent of condition review revealed that the current limiter on the 'B' ESCW chiller was set at only 41 amps; well below the design setting of 65 amps. At the lower setting of 41 amps, the response of the pre-rotation vanes to a load demand would be limited to less than the design setting, which in turn would limit the unit's ability to meet the load demand on the system. Using the licensee's estimation, a minimum current loading of approximately 39 amps is required to ensure the chiller can provide adequate cooling of safety-related components during accident conditions. Subsequent investigation revealed that for the 'A' train ESCW chiller, the current limiter had been out-of-calibration high since October 2012, and the 'B' train ESCW chiller had been out-of-calibration low since August 2013. During the above-mentioned timeframes, several instances were documented of maintenance being performed on the temperature controllers for each of these units; following the direction of procedure CM-I0014. However, section 7.8, which sets the current limiter for the temperature controller, was not performed.

Analysis: The licensee's failure to perform adequate post-maintenance testing on the ESCW chiller was a performance deficiency. Specifically, the failure to perform section 7.8 of procedure CM-I0014 to ensure the configuration of the temperature controllers were per design specifications resulted in the current limiters on each unit being out of calibration for extended periods of time. The performance deficiency was more than minor because if left uncorrected, it would have the potential to lead to a more significant safety concern. In the case of the 'A' train, continued omission of section 7.8 following maintenance on its temperature controller had the potential of the pre-rotation vanes pulling excessive load resulting in a trip of the 'A' train chiller. In the case of 'B' train, continued omission of section 7.8 following maintenance on its temperature controller had the potential of the pre-rotation vanes not picking up adequate load to meet the cooling demands during accident conditions. The inspectors used Table 2 of Attachment 4, Initial Characterization of Findings, of IMC 0609, Significance Determination Process, to determine that the finding was associated with the Mitigating Systems Cornerstone. Using the guidance provided in Table 3 of Attachment 4, the inspectors transitioned to Appendix A, Significance Determination Process (SDP) for Findings At-Power, of IMC 0609. Using Exhibit 2, Mitigating Systems Screening Questions, of the appendix, the inspectors determined that the finding was of very low safety significance (Green) because while the chillers were in a nonconforming condition, operability of the chillers was maintained. The finding was assigned the cross-cutting aspect of bases for decisions, as described in the area of human performance, because the licensee made the decision not to perform section 7.8 of maintenance procedure CM-I0014 without documenting a reason for omitting the section following maintenance on the ESCW temperature controllers (H.10).

Enforcement: Criterion XI, Test Control, Appendix B of 10 CFR Part 50 requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. Procedure, PLP-0400, Post-Maintenance Testing, Section 2.0, step 1, states, "The scope of post-maintenance testing should be based on the extent of preventive or corrective maintenance performed. A satisfactory test verifies a component or system is able to perform its intended function, the original deficiency has been corrected, and no new or related problems were created by the maintenance activity." Section 7.8 of procedure CM-I0014 was used to ensure the configuration of the temperature controllers were per design specifications.

Contrary to this requirement, from October 2012 to September 2015, the licensee failed to perform section 7.8 of procedure CM-I0014 and the settings on the current limiters for one and/or both trains of ESCW chillers were never verified to ensure the pre-rotation vanes would function as designed. The licensee took corrective actions to adjust the current limiters on the ESCW chillers to be at the correct setting of 65 amps. Because the licensee entered the issues with the current limiter into the CAP and the finding was of very low safety significance (Green), this violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. This violation was entered into the licensee's CAP as NCRs 1944657 and 1950574 and is designated as NCV 05000400/2015004-02, Failure to Adequately Implement Post-Maintenance Testing.

1R22 Surveillance Testing (71111.22 – 2 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

- OST-1013, 1A-SA EDG Operability Test Monthly Interval Modes 1-2-3-4-5-6

In-Service Tests (IST)

- OST 1193, Spent Fuel Pool Cooling System Train B, Unit 2 ISI Testing Quarterly Interval Spent Fuel in the Fuel Pool(s) All Modes

b. Findings

No findings were identified.

#### 4. OTHER ACTIVITIES

##### 4OA1 Performance Indicator Verification (71151 – 2 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 2014 and September 2015 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 Nuclear Energy Institute 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 systems
- cooling water systems

###### 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 functional assessments / operability determinations, 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 2015 through December 2015, 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 identified that an adverse trend still existed associated with the licensee's ability to perform timely and adequate functionality assessments/operability determinations. The following are examples of this trend.

- NCR 1985189, 1L-140 Lube Oil Relief Valve on the TDAFW Pump
- NCR 1964721, Sump Pump Reliability and Submerged Safety-Related Cables

.3 Annual Follow-up of Selected Issues

a. Inspection Scope

The inspectors conducted a detailed review of the following NCRs:

- NCR 1964721, Sump Pump Reliability and Submerged Safety-Related Cables
- NCR 1957563, AH-12 1B-SA Tripped when Starting

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

A self-revealing Green NCV associated with NCR 1964721 is documented in Section 1R06 of this report.

4OA6 Meetings, Including Exit

On January 21, 2016, the resident inspectors presented the inspection results to Mr. Benjamin Waldrep 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.

ATTACHMENT: SUPPLEMENTARY INFORMATION

## **SUPPLEMENTARY INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee personnel

J. Caves, (Acting) Manager, Nuclear Regulatory Affairs  
L. Faulk, Director, Nuclear Plant Security  
D. Griffith, Manager, Nuclear Training  
T. Hamilton, Plant Manager  
F. Womack, Manager, Nuclear Work Management  
J. Keltner, Manager, Nuclear Chemistry  
S. O'Connor, General Manager, Nuclear Engineering  
M. Parker, Manager, Nuclear Radiation Protection  
B. McCabe, Manager, Nuclear Oversight  
S. Scott, (Acting) Manager, Nuclear Operations  
B. Waldrep, Site Vice President

#### NRC personnel

G. Hopper, Chief, Reactor Projects Branch 4, Division of Reactor Projects, Region II

### **LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

#### Opened and Closed

05000400/2015004-01	NCV	'B' ESW System Safety-Related Cables Submerged in Water (Section 1R06)
05000400/2015004-02	NCV	Failure to Adequately Implement Post-Maintenance Testing (Section 1R19)

## LIST OF DOCUMENTS REVIEWED

### **Section 1R01: Adverse Weather Protection**

#### Procedures

ORT-1415, Electric Unit Heater Check Monthly Interval  
OP-161.01, Operations Freeze Protection and Temperature Maintenance Systems  
AP-300, Severe Weather Response  
AP-301, Seasonal Weather Preparations and Monitoring

#### Other Documents

NCR 1959727  
UFSAR Sections 2.4.2, 2.4.10  
PMS-0001, Probable Maximum Storm Ponding on All Buildings, October 9, 2014

### **Section 1R04: Equipment Alignment**

#### Partial System Walkdown

Emergency Diesel Generator system:  
Procedure OP-155, Diesel Generator Emergency Power System,

Procedure OP-148, Essential Services Chilled Water System  
Drawing 2165-S-0998-S02, Simplified Flow Diagram Essential Services Chilled Water System

Auxiliary Feedwater system:

Procedure OP-137, Auxiliary FeedwaterSystem,  
Drawing 2165-S-0544, Simplified Flow Diagram Feedwater Systems

#### Complete System Walkdown

Procedure OP-148, Essential Services Chilled Water System  
Design Basis Document 132, Essential Services Chilled Water System  
Drawing 2165-S-0998-S01 and –S02, Simplified Flow Diagram Essential Services Chilled Water System,  
FSAR section 9.2.8

### **Section 1R05: Fire Protection**

#### Procedures

AD-EG-ALL-1530, Fire Brigade Requirements  
FPP-001 Fire Protection Program Manual  
FPP-013, Fire Protection – Minimum Requirements, Mitigating Actions and Surveillance Requirements  
FPP-012-02-RAB286, Fire Pre-Plan: A33-6-286-0637 Switchgear Ventilation Room B  
FPP-012-02-RAB286, Fire Pre-Plan: A33-6-286-0635 Switchgear Ventilation Room A  
FPP-012-02-RAB286, Fire Pre-Plan: A33-6-286-0639 Switchgear Room A  
FPP-012-02-RAB286, Fire Pre-Plan: A33-6-286-0641 Switchgear Room B  
FPP-012-08-SEC, Fire Pre-Plan: S01-0-262-0999 ESW Intake Screening Structure and Yard

#### Other Documents

FPQ0001H, Fire Drill Scenario, Turbine 314 Storage Area, Rev. 1  
Pre-Drill Brief for Fire Drill: Turbine 314 Storage Area

## **Section 1R06: Flood Protection Measures**

### UFSAR Sections

3.4.1, Flood Protection

### Procedures

AD-EG-ALL-1615, Cable Aging Management Program

### Other Documents

NCR 1961933

NCR 1962664

NCR 1964721

NCR 1974430

Specification CAR-SH-E-14B, Electric Cables

Specification NCP-E-0002, Control Cable and Low Voltage Power Cable

Specification NCP-E-0007, Medium Voltage Cable

Carolina Power & Light Company Quality Release No. 5984, Power and Coaxial Cable

SK-79281-M-2035, Manhole M73 Sump Skid Plan, Rev. D

The Vendor Quality Assurance Report Release for Shipment for Purchase Order N4435045,  
Release 12

Cable-qualification test reports obtained from the Kerite Company under Kerite Factory Order  
D-857

Kerite Engineering Memorandum No. 223, Determining Temperature 'Rating' of High  
Temperature Kerite Insulated Cables for Operation in Wet and Alternate Wet/Dry Locations,  
5/4/77

## **Section 1R11: Licensed Operator Requalification Program**

### Training Material

Simulator Evaluation Guide, DSS-036, Rev. 1

### Procedures

AD-OP-ALL-1000, Fleet Conduct of Operations, Revision 5

Operations Management Manual, OMM-001, Operations Administrative Requirements, Rev 109

Training Administrative Procedure (TAP) -403, Examination and Testing, Rev 19

TAP 410, NRC License Examination Security Program, Rev 15

TAP-412, Simulator Operations, Maintenance and Testing, Rev 8

Training Program Procedure (TPP)-206 Training Program Procedure-Simulator Rev 10

TPP- 306, Licensed Operator Continuing Training Program, Revision 20

HNP-E/ELEC-0001 Appendix 1 Compliance Assessment by Scenario

## **Section 1R13: Maintenance Risk Assessments and Emergent Work Evaluation**

OMM-001, Operations Administrative Requirements, Rev. 109

AD-WC-ALL-0200, Conduct of On-Line Work Management

WCM-001, On-line Maintenance

AD-NF-ALL-0501, Online EOOS Models for Risk Assessment

## **Section 1R15: Operability Evaluations**

OPS-OP-ALL- 0105, Operability Determinations and Functionality Assessments, Rev. 2

Prompt Determination of Operability (PDO) for NCR 1983806

### **Section 1R19: Post Maintenance Testing**

#### Procedures

OPT-1512, Essential Chilled Water Turbopak Units Quarterly Inspection/Checks Modes 1-6  
 OST-1080, Auxiliary Feedwater Pump 1X-SAB Full Flow Test Quarterly Interval Mode 1, 3  
 OST-1124, Train B 6.9 Kv Emergency Bus Undervoltage Trip Actuating Device Operational Test and Contact Check Modes 1-6  
 OST-1411, Auxiliary Feedwater Pump 1X-SAB Operability Test Quarterly Interval Mode 1, 2, 3  
 MPT-M0035, EG Overspeed Trip Pneumatic Response Time  
 MST-I0192, Auxiliary Feedwater Pump 1X Speed Instrumentation (SP-2180)

#### Other Documents

NCR 1967130  
 NCR 1967444  
 Open EMS Gas Permit Post-Release Data, Permit # G-2015-0204

### **Section 1R22: Surveillance Testing**

OST-1193, Spent Fuel Pool Cooling System Train B, Unit 2 ISI Testing Quarterly Interval Spent Fuel in the Fuel Pool(s) All Modes, Rev. 19  
 OST-1013, 1A-SA EDG Operability Test Monthly Interval Modes 1-2-3-4-5-6

### **Section 4OA1: 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

### **Section 4OA2: Identification and Resolution of Problems**

#### Procedures

AD-PI-ALL-0100, Corrective Action Program  
 AD-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

#### Other Documents

NCR 741705  
 Immediate Determination of Operability (IDO) for NCR 1985189  
 IDO for NCR 1961933  
 IDO for NCR 1962664  
 IDO for NCR 1964721