



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

May 22, 2017

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

**SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT - NRC DESIGN BASES
INSPECTION ASSURANCE INSPECTION (TEAM) REPORT NUMBER
05000400/2017007**

Dear Ms. Hamilton:

On April 6, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Shearon Harris Nuclear Power Plant, Unit 1. On April 6, 2017, the NRC inspectors discussed the results of this inspection with you and members of your staff. On April 20 and on May 15, 2017, we discussed the change in characterization of the results of this inspection with you and members of your staff. The results of this inspection are documented in the enclosed report.

The NRC inspectors did not identify any finding or violation of more than minor significance.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <https://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/

Jonathan H. Bartley, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos. 50-400
License Nos. NPF-63

Enclosure:
Inspection Report 05000400/2017007,
w/Attachment: Supplemental Information

cc: Distribution via ListServ

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT - NRC DESIGN BASES
INSPECTION ASSURANCE INSPECTION (TEAM) REPORT NUMBER
05000400/2017007 DATED MAY 22, 2017

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ADAMS: Yes ACCESSION NUMBER: ML SUNSI REVIEW COMPLETE FORM 665 ATTACHED

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 50-400

License No.: NPF-63

Report Nos.: 05000400/2017007

Licensee: Duke Energy Progress, Inc.

Facility: Shearon Harris Nuclear Power Plant, Unit 1

Location: 5413 Shearon Harris Road
New Hill, NC 27562

Dates: March 20 – April 6, 2017

Inspectors: W. Deschaine, Resident Inspector (Lead)
C. Franklin, Reactor Inspector
M. Riley, Reactor Inspector
L. Jones, Senior Reactor Inspector
D. Strickland, Reactor Inspector
M. Yeminy, Contractor
J. Nicely, Contractor

Approved by: Jonathan H. Bartley, Chief
Engineering Branch 1
Division of Reactor Safety

Enclosure

SUMMARY

IR 05000400/2017-007; 03/20/2017–04/06/2017; Shearon Harris Nuclear Power Plant, Unit 1; Design Bases Assurance Inspection (Team).

A team of five Nuclear Regulatory Commission (NRC) inspectors from Region II, and two NRC contract personnel performed the inspection activities described in this report. The significance of inspection findings are indicated by their color (i.e., greater than Green, or Green, White, Yellow, or Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," (SDP) dated April 29, 2015. 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 operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Rev. 6.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R21 Design Bases Assurance Inspection (Team) (71111.21M)

.1 Inspection Sample Selection Process

The team selected risk-significant samples and related operator actions for review using information contained in the licensee's probabilistic risk assessment. In general, this included risk significant structures, systems, and components (SSCs) that had a risk achievement worth factor greater than 1.3 or Birnbaum value greater than 1E-6. The sample included six components selected based on risk significance, one component associated with containment large early release frequency (LERF), four modifications to mitigation SSCs, and three operating experience (OE) items.

The team performed a margin assessment and a detailed review of the selected risk-significant components and associated operator actions to verify that the design bases had been correctly implemented and maintained. Where possible, this margin was determined by the review of the design basis and Updated Final Safety Analysis Report (UFSAR). This margin assessment also considered original design issues, margin reductions due to modifications, or margin reductions identified as a result of material condition issues. Equipment reliability issues were also considered in the selection of components for a detailed review. These reliability issues included items related to failed performance test results, significant corrective action, repeated maintenance, maintenance rule status, Inspection Manual Chapter 0326 conditions, NRC Resident Inspector input regarding problem equipment, system health reports, industry OE, and licensee problem equipment lists. Consideration was also given to the uniqueness and complexity of the design, OE, and the available defense-in-depth margins. An overall summary of the reviews performed and the specific inspection findings identified is included in the following sections of the report.

.2 Component Reviews

a. Inspection Scope

Components Selected Based on Risk Significance

- TDAFW pump
- Motor Operator Valves (MOV) SI-300,301,310,311 - Containment sump suction MOVs
- Emergency Diesel Generator (EDG) Exhaust Fans E-86-1ASA and E-86-1BSB
- Component Cooling Water (CCW) Heat exchanger B
- Safety related Instrument Bus Inverters
- Safety Related Motor Control Centers (MCCs). MCC1A35-SA, MCC1B35-SB, MCC 1A31-SA
- Startup Transformer B

Components with LERF Implications

- Main Steam PORVs - EC Package: 0000295206 - Obsolete Main Steam PORV Electro-Hydraulic Operator (EHO) Replacement.

Modifications to Mitigation SSCs

- EC Package: 0000294035 – Replacement of the 1A3-SA Station Service Transformer.
- EC Package: 0000298880 – Replace Air Actuators on Butterfly Valves 1SW-231, 240, and 242.
- EC Package: 0000260437 - ESW Pump Wear Ring and Packing Material Change.

For the six components listed above, the team reviewed the plant technical specifications (TS), UFSAR, design bases documents, and drawings to establish an overall understanding of the design bases of the components. Design calculations and procedures were reviewed to verify that the design and licensing bases had been appropriately translated into these documents and that the most limiting parameters and equipment line-ups were used. Logic and wiring diagrams were also reviewed to verify that operation of electrical components conformed to design requirements. Test procedures and recent test results were reviewed against design bases documents to verify the adequacy of test methods and that acceptance criteria for tested parameters were supported by calculations or other engineering documents, and that individual tests and analyses served to validate component operation under accident conditions. Maintenance procedures were reviewed to ensure components were appropriately included in the licensee's preventive maintenance program, that components or sub-components were being replaced before the end of their intended service life, and that the licensee has appropriate controls in place for components that are beyond vendor recommended life. Vendor documentation, system health reports, preventive and corrective maintenance history, and corrective action program documents were reviewed (as applicable) in order to verify that the performance capability of the component was not negatively impacted, and that potential degradation was monitored or prevented. Maintenance Rule information was reviewed to verify that the component was properly scoped, and that appropriate preventive maintenance was being performed to justify current Maintenance Rule status. Component walk downs and interviews were conducted to verify that the installed configurations would support their design and licensing bases functions under accident conditions, and had been maintained to be consistent with design assumptions.

For the four modifications listed above, the team reviewed design bases, licensing bases, and performance capability of components to ensure they have not been degraded through modifications. In addition, post-modification testing was reviewed to ensure operability was established by verifying unintended system interactions will not occur, SSC performance characteristic continue to meet the design bases, modification design assumptions are appropriate, and modification test acceptance criteria have been met. The team also verified design basis documentation was updated consistent with the design change, verified other design basis features were not adversely impacted, verified procedures and training plans affected by the modification were updated, and verified that affected test documentation was updated or initiated as required by applicable test programs. Walk downs and interviews were conducted as necessary to verify that the modifications were adequately implemented. Documents reviewed are listed in the Attachment.

Additionally, the team performed the following specific reviews:

- The team evaluated the station's interface and coordination with the transmission system operator for station voltages requiring plant notifications
- The team evaluated the long-term reliability issue with the NLI MCC starter coils.
- The team evaluated plant plans to address the issue of Transformer Open Phasing identified in IN 2012-003.
- The team evaluated the station's implementation of an internal valve preventive maintenance program as required in NRC SER ML15142A761 for MOVs using the EPRI MOV Performance Prediction Program (PPM) Model.
- The team evaluated the adequacy of the EDG 18-month LOOP/LOCA testing in regards to evaluation of voltage and frequency dips and recovery during load sequencing as required by RG 1.9.

b. Findings

No findings were identified.

.3 Operating Experience

a. Inspection Scope

The team reviewed three operating experience issues for applicability at the Shearon Harris Nuclear Power Plant. The team performed an independent review for these issues and, where applicable, assessed the licensee's evaluation and disposition of each item. The issues that received a detailed review by the team included:

- Modification package: 0000295853 (Effects of Harmonic Distortion on Safety Bus Relaying)
- NRC Information Notice 2010-27: Ventilation System Preventive Maintenance and Design Issues
- Generic Letter 91-15: Operating Experience problems with solenoid-operated valves

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA6 Meetings, Including Exit

On April 6, 2017, the team presented the inspection results to Ms. Hamilton and other members of the licensee's staff. On April 20 and on May 15, 2017, a re-exit meeting was conducted via teleconference to present the final inspection results to Ms. Hamilton and other members of the licensee's staff. Proprietary information that was reviewed during the inspection was returned to the licensee or destroyed in accordance with prescribed controls.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel:

P. Fisk, Plant Manager

M. Grantham, Manager, Design Engineering

T. Hamilton, Site Vice President

S. O'Connor, General Manager, Engineering

J. Robertson, Manager, Regulatory Affairs

T. Stephens, Senior Nuclear Engineering Technologist, Regulatory Affairs

NRC personnel:

R. Patterson, Acting Senior Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened & Closed

None

LIST OF DOCUMENTS REVIEWED

Corrective Action Documents Written as a Result of the Inspection

CR 2110073, DEH Table and Computer Configuration
CR 2110103, LFDPCP-3 panel door found open
CR 2110165, Error in Logic Drawing 6-B-430 31.181
CR 2110173, Regulator Guide 1.108 EDG Test Requirements (ref. PRRs 2114634 [OST-1823] and 2114638 [OST-1824])
CR 2110515, Safety Related 125V Batteries End Rail Gap
CR 2111137, E-6000 Case Clarification
CR 2110318, Calculation AF-0013 Clarification Needed
CR 2114240, E-6000 Bases Clarification
CR 2114435, Critical PM's Rescheduled w/o Formal Risk Assess
CR 2114605, Calculation E-6000 MOV Starting In-Rush Current
CR 2114954, AFW Pump Suction Swap-over (Certrec WK2-05)
CR 2114967, Use of EPRI MOV Performance Prediction Method

Procedures

OST-1824, 1B-SB EDG Operability Test 18 Month Interval, Rev. 60
AOP-024, Loss of Uninterruptible Power Supply, Rev. 57
CM-E0030, Safety Inverter 10 Year Parts Replacement, Rev. 2
MST-E0045, 6.9 KV Emergency Bus 1A-SA and 1B-SB Under voltage Relay Channel Calibration, Rev. 26
MST-E0075, 6.9 KV Emergency Bus, 1A-SA and 1B-SB Under voltage (Loss of Voltage) Channel Calibration, Rev. 9
PM-E0069, 6.9kV Safety Bus Harmonic Distortion Testing, Rev. 0
OST-1024, On-Site Power Distribution Verification Weekly Interval Modes 1-6, dated 3/26/17
OST-1023, Site Power Availability Verification Weekly Interval Modes 1,2,3,4,5,6; 11/17/2016
OST-1023, Site Power Availability Verification Weekly Interval Modes 1,2,3,4,5,6; 2/22/2017
OST-1191, Steam Generator PORV and Block Valve Operability Test Quarterly Interval Modes: 1-4; 12/14/2016
PD-EG-ALL-1612, Environmental Qualification Program Description; Rev. 1
EGR-NCCC-0150, Evaluation of Solenoid Valve Applications, Rev. 9
AD-EG-ALL-1612, Environmental Qualification Program; Rev. 0
OP-137, Auxiliary Feedwater System, Rev. 45
OST-1077, Auxiliary Feedwater Valves Operability Test Quarterly Interval Mode 4-5-6, Rev. 23
OST-1311, Auxiliary Feedwater Valves Remote Position Test 2 Year Interval Modes 4-6, Rev. 12
OST-1080, Auxiliary Feedwater Pump 1X-SAB Full Flow Test Quarterly Interval Mode 1, 3, Rev. 32
OST-1087, Motor driven Auxiliary Feedwater Pumps Full Flow Test Quarterly Interval Mode 1, Rev. 26
OST-1411, Auxiliary Feedwater Pump 1X-SAB Operability Test Quarterly Interval Mode 1,2,3, Rev. 48
APP-ALB-017, Main Control Board, Rev. 15
OWP-HVAC, Emergency Ventilation, Rev. 27
EOP-E-1, Loss of Reactor or Secondary Coolant, Rev. 4
EOP-E-2, Faulted Steam Generator Isolation, Rev. 2
AD-EG-ALL-1202, Preventive Maintenance and Surveillance Testing Administration, Rev. 4
PM-M0085, Gravity dampers, Rev. 11

Drawings

6-B-041-0127, Power Distribution and Motor Data 480V Emergency Bus 1A3-SA, Rev. 11
 CAR 2166-G-0030, 480V Auxiliary One Line Wiring Diagram, Rev. 32
 CAR 2166-G-0025, 230KV Switchyard Auxiliary One Line Diagram, Rev. 7
 CAR 2166-G-029, Main & 6900V Auxiliary One Line Wiring Diagram, Rev. 24
 CAR 2166-B-041-0045, Power Distribution and Motor Data 6900V Emergency Bus 1A-SA, Rev 14
 13923NP1, Nameplate Drawing SST 1A3-SA, Rev. 1
 CAR-2166-B-041-0664, U1 Power Distribution & Motor Data 118V Power Panel IDP-1B-SIV, 14
 CAR-2166-B-041, U1 Power Distribution & Motor Data 208/120V Power Panel PP-1B211-SB, Rev. 19
 CPL-2165 S-0544, Simplified Flow Diagram, Feedwater System, Unit 1, Rev. 40
 8560, CBS-7 Backdraft Damper 2X1 Section, Rev. C
 1364-94302, Damper Schedule, Rev. B
 CAR-2168-G-517S03, HVAC-Air Flow Diagrams Reactor and Auxiliary Building, Rev. 31
 8-G-0548 S03, HVAC Diesel Generator Building Air Flow Diagram Bays 2A and 2B, Rev. 0
 5-G-036 S01, General Arrangement Diesel Generator Building Plans, Rev. 10
 PD-8542, Index Cover Sheet Diesel Generator Building, Rev. 1
 CAR-2168-G-548, HVAC – Air Flow Diagrams Miscellaneous Buildings, Rev. 10

Calculations

E-6000, AC Distribution System Voltage/Load Flow/Fault Current Study, Rev. 13
 E-6001, Electrical Distribution System Load Factor Study, Rev. 12
 E-6003, Emergency Power System Voltage Criteria, Rev. 11
 E2-0005.09, Degraded Grid Voltage Protection for 6.9KV Busses 1A-SA and 1B-SB, Rev. 5
 E5-0001, Analysis of Motor Output Torque for AC MOV's, Rev. 16
 E-5518.000, Class 1E MCC Control Loop Analysis Methodology/Data, Rev. 10
 1270-0021-01, Evaluation of MOV 1CC-252 using EPRI PPM Software, Rev. 0
 E1-0005.02, 480V Overcurrent Protection of Transformer 1A3-SA and 1B3-SB, Rev. 2
 E2-0002.02, 6.9KV Overcurrent Protection of Transformer 1A3-SA and 1B3-SB, Rev. 2
 0054-JRG, PSB-1 Loss of Offsite Power Relay Settings, Rev. 5
 E-5505, Worst Case 120VAC/125VDC Panel Appendix R/ Non-Appendix R, Rev 6
 E-6007, Safety Related Instrument Distribution Panel Voltage Drop Analysis, Rev. 1
 E-5506, Safe Shutdown Common Power Supply Coordination and MHIF Study, Rev. 15
 0024-JRG, 120Vac Class 1E inverter Load Tabulation, Rev. 10
 0054-JRG, PSB-1 Loss of Offsite Power Relay Settings, Rev. 5
 AF-0013, Auxiliary Feedwater Verification and Setpoints, Rev. 4
 9-RAB-7CC, Component Cooling Pumps, Heat Exchangers, and Auxiliary Feed Water Pump Area, in the RAB EL. 236.0' Served By Air Handling Units AH-6 and AH-7, Rev. 1
 EQS-003, Condensate Storage Tank Level Setpoints, Rev. 6
 Tank-0014, Condensate Storage Tank Minimum Water Level, Rev. 4
 AF-0045, Evaluation of TDAFW Pump Runout, Rev. 5
 SC-B-085, Instrumentation Control Scaling Calculations, Rev. 2
 AF-0047, Determination of AFW Pumps 1A-SA, 1B-SB and 1X-SAB Minimum Allowable IST Testing Limits, Rev. 4
 CAR-2165-G-033, General Arrangement Tank Area, Rev. 16
 CAR-2165-G-044, Flow Diagram Feedwater and Auxiliary Feedwater Systems, Rev. 54

Corrective Action Documents

NCR458376	0485795	0648704
NCR460601	2019763	0648703
NCR460895	0537972	0635131
NCR460900	0552849	0541121
NCR460953	0444015	0745898
NCR 20921122	1941822	0745742
0458640	0747459	0745741
0458648	0732259	0625060
0460930	0652226	0685390
0545290	0648942	6484122
0502376	0648943	
0498425	0648903	

Work Orders

00757304-01	13314135-01	0226880701
13386751-01	20103815-01	0222740410
01574595-01	13352574-01	00665329
13498717-01	20105299-01	00425450
01825929-01	13352575-01	13445604
13520535-01	02276746	02185019

Miscellaneous Documents

HNP-611234-30-EVAL01, Assessment of 6.9KV and 480V Safety-Related Motor Voltage during Degraded Voltage Conditions, Rev. 0
 DBD-202, Plant Electrical Distribution System, REV. 35
 Electrical Criteria 20, Adequacy of Safety-Related Bus Voltage, Rev. 4
 EC 94035, Replacement of SR Transformer 1A3-SA, N/A
 HNP-06-032, 60 Day Response to NRC GL 2006-02, 04/03/2006
 HNP-07-016, Response to RAI Request for NRC GL 2006-02, 01/26/2007
 ML15142A761, SER for EPRI Topical Report TR-103237, 03/15/1996
 5175-ST3250, System Health Report – Low Voltage AC Distribution, Q4-2016
 AR 508592, Input for Fleet Evaluation of NRC RIS 2011-12 Rev. 1, 05/31/2012
 SORMC-NUC-040, System Operations Reference Manual Carolinas, Rev.17
 VM-EAT, Eaton Cutler Hammer MCC Vendor Manual, Rev. 2
 CAR-SH-E-18B, 125VDC Storage Batteries Class 1E, Rev. 9
 EC 402748, Increase RAB Battery Room temperature, dated 3/9/16
 EC 69610, Replace Safety Related Inverters SI, SII, SIII, and SIV, Rev. 17
 EC 95853, Evaluation of harmonics on degraded voltage and loss of voltage relays, Rev. 0
 Action Item 95H0129, Evaluation of IN 95-05, dated 4/11/95
 Specifications No. B-3252; Trace Inhibited Type II Transformer oil for power transformers for Progress Energy Carolinas and Progress Energy Florida
 NGGM-1A-0003, NGG Interface Agreement, Rev. 11
 Switchyard and Transformer Station Health Report; 3/6/2017
 DBD-202, Plant Electric Distribution System; Rev. 035
 VM-QLE-V02, Transformer Startup; Rev. 4
 CAR-SH-E-3, Non-Nuclear Safety Related Equipment, EBASCO Services Incorporated, Specification EBASCO 230-71, Startup Power Transformer, Part I, Specific Requirements; Rev. 8

PCHG-DESG Engineering Change 0000095206R12; Obsolete Main Steam PORV EHO Replacement; 11/25/2014
DBD-125, Steam Generator, Main Steam, Extraction Steam, Steam Dump and auxiliary Steam Systems; Rev. 12
VM-OSO, Operators, Rev. 021
MD 26420, Detailed Complete Functional Acceptance Test Procedure PORV Modulating Actuator; 7/25/2016
DWG No. 5S-0542, Simplified Flow Diagram Main Steam System Unit 1, Rev. 27
Assignment # 01464114-02, QCE – SG PORV Hydraulic Oil Samples, Fails Particle Test; 11/12/2015
EC 95206, Environmental Qualification for Linear Modulating Actuator for Power Operated Relief Valve (PORV); Rev. C
Project ID: 96-03512, Action Item Assignment, Evaluate OEF 96-510, Generic Letter 91-15, SOV Problems; 11/8/1996
AD-EG-ALL-1434, Air Operated Valve Tracking and Trending Requirements, Rev. 0
EQDP -0301, Equipment Qualification Documentation Package for Target Rock Solenoid Valves; Rev. 25
EQDP -0315, Qualification of Automatic Switch Company (ASCO) NP Series Solenoid Valves; Rev.11
DBD-140, Diesel Generator Building, Diesel Fuel Oil Pump Room, Emergency Service Water Intake Structure and Security Building HVAC Systems, Rev. 7
VM-MXM, Fans, Axial Flow, 12/5/2006
CAR-SH-BE-17A, In-Line Fans Outside of Containment Building Nuclear Safety Equipment (ANS Safety Class 3, Seismic Category I); Rev. 6
CC-130-17484-28, Certificate of Conformance; Rev. 0
FPP-012-04-DGB, Diesel Generator Building Fire Pre-Plan; Rev. 10
ESR 9600359, Operability Determination for E-86 Fan Motors; 6/21/1996
Specification CAR-SH-BE-08, Air Handling Units, Rev. 10
DBD-114, Auxiliary Feedwater, Rev. 15
DBD-140, Diesel Generator Building, Diesel Fuel oil Pump Room, ESWIS and Security Building HVAC Systems, Rev. 7
EOP-20, Condensate Storage Tank Level, Rev. 2
537972, Apparent Cause Evaluation, dated 05/21/2012
0000067999, HNP NFPA 805 Transition, dated 12/20/2010
Letter NRC to Addressees, Ventilation System Preventive Maintenance and Design Issues, dated 12/16/2010
PCR 6901, CST Dissolved Oxygen Control, Rev. A
VM-BJH-V02, Pumps Turbine Driven Auxiliary Feedwater, Rev. 25