



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

December 28, 2021

Ms. Kim Maza
Site Vice President
Duke Energy Progress, LLC
5413 Shearon Harris Road
New Hill, NC 27562-9300

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT – TRIENNIAL INSPECTION OF
EVALUATION OF CHANGES, TESTS AND EXPERIMENTS BASELINE
INSPECTION REPORT 05000400/2021010

Dear Ms. Maza:

On November 19, 2021, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Shearon Harris Nuclear Power Plant and discussed the results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

No findings or violations of more than minor significance were identified during this inspection.

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

Sincerely,

/RA/

James B. Baptist, Chief
Engineering Branch 1
Division of Reactor Safety

Docket No. 05000400
License No. NPF-63

Enclosure:
As stated

cc w/ encl: Distribution via LISTSERV

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT – TRIENNIAL INSPECTION OF EVALUATION OF CHANGES, TESTS AND EXPERIMENTS BASELINE INSPECTION REPORT 05000400/2021010 DATED December 28, 2021

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NAME	T. Su	P. Braxton	T. Fanelli	J. Baptist	
DATE	11/23/2021	11/23/2021	12/28/2021	12/28/2021	

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

Docket Number: 05000400

License Number: NPF-63

Report Number: 05000400/2021010

Enterprise Identifier: I-2021-010-0044

Licensee: Duke Energy Progress, LLC

Facility: SHEARON HARRIS NUCLEAR POWER PLANT

Location: New Hill, NC.

Inspection Dates: November 15, 2021 to November 19, 2021

Inspectors: P. Braxton, Reactor Inspector
T. Fanelli, Senior Reactor Inspector
T. Su, Reactor Inspector

Approved By: James B. Baptist, Chief
Engineering Branch 1
Division of Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a triennial inspection of evaluation of changes, tests and experiments baseline inspection at SHEARON HARRIS NUCLEAR POWER PLANT, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information.

List of Findings and Violations

No findings or violations of more than minor significance were identified.

Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
URI	05000400/2021010-01	Treatment of Class 1E interfaces and interlocks with the Turbine Trip System Design	71111.17T	Open

INSPECTION SCOPES

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

REACTOR SAFETY

71111.17T - Evaluations of Changes, Tests, and Experiments

Sample Selection (IP Section 02.01) (18 Samples)

The inspectors reviewed the following evaluations, screenings, and/or applicability determinations for 10 CFR 50.59 from [enter dates].

- (1) 50.59 Evaluation: EC 284334- HNP Turbine Control System Upgrade - Cable & Raceway, 5/11/2018
- (2) 50.59 Evaluation: EC 284333- HNP Turbine Control System Upgrade - Main Control Board Changes , 5/12/2018
- (3) 50.59 Evaluation: EC 414172- Turbine Valve FSAR Update , 1/20/2021
- (4) 50.59 Evaluation: EC 418016 Core/Reactor DESG Revise PLP-114 Subcritical Minimum Duration for Fuel Offload (EAR 2312872), 3/29/2021
- (5) 50.59 Evaluation: EC 403209 Non-Conservative T/S for EDG Voltage, 1/03/2019
- (6) 50.59 Evaluation: EC 284339 Turbine Control System Upgrade - Front Standard Modifications, 5/12/2018
- (7) 50.59 Evaluation: EC 296136 Incorporate NSAL 14-2 Into Plant Documents, 6/11/2020
- (8) 50.59 Screening: EC 284170- 480V Motor Control Center Bucket Replacement, 11/21/2019
- (9) 50.59 Screening: EC 413640- Safe Shutdown MCCB Testing Programmatic Change , 11/13/2018
- (10) 50.59 Screening: EC 417418- Evaluate Replacement of Cable 10943A-SA , 5/12/2020
- (11) 50.59 Screening: EC 419323- Permanent Change to TCS Time Constraints to Allow Testing Per OPT-1509, 6/10/2021
- (12) 50.59 Screening: EC 293260 RMS Migration to The Distributed I&C System Platform (DICSP) / Abandonment of Non-Critical Plant Radiation Monitors (Rm-80s), 7/10/2019
- (13) 50.59 Screening: EC 410354 HNP Cycle 23 Tech Spec Changes - Site Impacts, 1/13/2020
- (14) 50.59 Applicability Determination: EC 292421 6.9 KV Breaker Replacement RFO 19, 20 and 21, 11/14/2019
- (15) 50.59 Applicability Determination: EC 295762 EDG Full Load Rejection Voltage Low Margin, 10/15/2018
- (16) 50.59 Applicability Determination: EC 401808 MSSV Tolerance and Pressurizer Level

- Setpoint Tech Spec Changes, 3/20/2018
- (17) 50.59 Applicability Determination: EC 414770 Migration to The Distributed I&C System Platform (DICSP) / Abandonment of Non-Critical Plant Radiation Monitors (Rm-80s), 12/19/2019
 - (18) 50.59 Applicability Determination: EC 417073 Power Supply To Remote Monitoring Equipment IMAC (Intelligent Monitoring & Analytics Center), 07/14/2021

INSPECTION RESULTS

Unresolved Item (Open)	Treatment of Class 1E interfaces and interlocks with the Turbine Trip System Design URI 05000400/2021010-01	71111.17T
<p><u>Description:</u> The NRC identified an Unresolved Item (URI) while examining modifications to the main turbine trip system. The Harris Turbine Trip System (TTS) was updated and modified to digital controls using non-Class 1E Engineering Change (EC) packages. The inspectors noted that the turbine trips were generated from the Reactor Protection System (RPS) apparently to prevent and mitigate accidents, and thus appear to be safety related functions (Class-1E).</p> <p>The inspectors noted the following design requirements and specifications. The Updated Final Safety Analysis Report (UFSAR) in Section 7.1, "Introduction," specified that the Reactor Protection System (RPS) circuits identified in Sections 7.2, "Reactor Trip System," and 7.3, "Engineered Safety Features System," met the requirements in IEEE Std. 279-1971 and IEEE Standard 384-1974 and conform to Regulatory Guide 1.75, "Physical Independence of Electrical Systems." Additionally, UFSAR Sections 7.2.1.1.1 "Functional Performance Requirements," 7.2.1.1.2, "Reactor Trips," and 7.3.1.1.3 "Digital Circuitry," discusses the TTS to mitigate plant events when initiated by the RPS.</p> <p>The Class 1E power system design requirements and specifications discussed in the UFSAR subsection 8.3.1.2.30, "IEEE Standard 384-1974," specifies, in part, 8) Cables and conduits routed in non-Category 1 structures associated with safety related functions or anticipatory trips (i.e., turbine trip on reactor trip, reactor trip on turbine trip, loss of feedwater) are designed to meet IEEE-Standard 279-1971 including redundancy, separation, and single failure criteria (see detailed description in Section 7.2.1.1.2). These circuits are designated as safety related and identified similar to the reactor protection system channels as described in Section 8.3.1.3. Separation of these circuits is maintained from other reactor trip circuits by routing each of these circuits independently in a separate conduit from the actuating device to the Reactor Protection System cabinet."</p> <p>In addition, Westinghouse Electric Company (WEC) letter CQL-8627, Subject: "Carolina Power & Light Company Shearon Harris Nuclear Power Plant Turbine Trip on Reactor Trip Criteria," dated 2/21/1985, prior to licensing, specified that WEC "consistently maintained that these circuits are part of the Reactor Protection System and are thus Class 1E even though they terminate at unqualified equipment." The inspectors noted that the discussions in the UFSAR Sections 7 and 8 appear to agree with this WEC letter in that the turbine trip when initiated from the RPS appear to describe Class 1E functions that use Class 1E power criteria.</p> <p>URI Item 1. The inspectors reviewed Engineering Change (EC) packages to determine the quality of interfaces between the TTS and the RPS and where this interface occurs. EC-284243, "[Turbine Control System] TCS Base/System Integration" tested and qualified the</p>		

TTS functions and actuation devices (hydraulic trip solenoid valves) as non-Class 1E. The inspectors noted that this could have adverse implications on the qualification, functional performance, and installation of the turbine trips as described in the UFSAR Section 7 and 8. The TTS functions generated by the RPS now resides in non-Class 1E programmable logic controllers (PLCs). The functional performance of these components did not appear to be verified in accordance with Appendix B, Criterion 7. As an example, the inspectors identified that the licensee performance specifications indicated a required a normally energized solenoid valve in an ambient environment of 149 °F. The energized state would increase the solenoid valve temperature significantly; however, the test documents provided back to the licensee specified that the testing was at 75 °F not 149 °F. As a result, heat induced breakdown of the hydraulic fluid in the valve capillaries was not identified as a potential risk. After installation, failures to trip the turbine occurred when at operational temperatures above 75 °F.

URI Item 2. The inspectors noted that the ECs identified the RPS turbine trip wiring as Class 1E to a terminal box "B" but then identified the wiring in terminal box "B" as non-Class 1E inside the terminal box and beyond to the hydraulic trip valves." The inspectors need to understand how the required independence requirements are meet from the RPS cabinets to the hydraulic trip valves in this design. The inspectors contend that the licensee needed to maintain independence requirements from the RPS to the input terminals of the trip actuation device. This includes independence between trains as well as between Class 1E and non-Class 1E circuits. Not maintaining independence could affect the single failure analysis (IEEE 279-1971/379-1972) for the RPS circuits.

Planned Closure Actions: To close this URI the NRC needs to receive and review information to answer URI Items 1 and 2 above.

Licensee Actions: The licensee entered this issue into the corrective action program.

Corrective Action References: CR02406337, CR02406338

EXIT MEETINGS AND DEBRIEFS

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

- On November 19, 2021, the inspectors presented the triennial inspection of evaluation of changes, tests and experiments baseline inspection results to Kim Maza and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71111.17T	Corrective Action Documents	NCR 600326, NCR 651057, NCR 2131373, NCR 2142338, NCR 2143543, NCR 2170819, NCR 2198430, NCR 2198718, NCR 2199907, NCR 2201225, NCR 2201225, NCR 2203928, NCR 2204275		
	Engineering Changes	EC 414172	Turbine Valve FSAR Update	Rev. 0
		EC 284102	NON-CONSERVATIVE T/S FOR EDG VOLTAGE AND FREQUENCY	Rev. 3
		EC 284170	480V Motor Control Center Bucket Replacement	Rev 39
		EC 284333	HNP Turbine Control System Upgrade – Main Control Board Changes	Rev 54
		EC 284339	Front Standard Modification	Rev 19
		EC 290655	Permanent Closure of 1SW-179, 1SW-180, 1SW-204, AND 1SW-206 (Isolate ESW to/from BTRS Chillers)	Rev 5
		EC 293260	Radiation Monitoring System (RMS) Migration to the Distributed I&C System Platform (DICSP) / Abandonment of Non-Critical Plant Radiation Monitors (RM-80s)	Rev 17
		EC 294324	Replace 45 KVA ERFIS Inverter	Rev 11
		EC 401808	MSSV Tolerance and Pressurizer Level Setpoint Tech Spec Changes	Rev 2
	EC 410354	HNP Cycle 23 Tech Spec Changes - Site Impacts	Rev 5	
	Engineering Evaluations	AR 1962459	EC 284102 REV 000 NON-CONSERVATIVE T/S FOR EDG VOLTAGE AND	Dated 10/08/2015
		AR 2063041	EC 292421 50.59 AD	Dated

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
				9/20/2016
		AR 2089653	EC 284102 Revision 003 MASTER - NON-CONSERVATIVE T/S FOR	Dated 01/05/2017
		AR 2223487	002 EDG FULL LOAD REJECTION VOLTAGE LOW MARGIN	Dated 08/08/2018
		AR 2267378	I&C SYSTEM PLATFORM (DICSP) / ABANDONMENT OF NON-CRITICAL PLANT RADIATION MONITORS	Dated 04/08/2019
		AR 2320351	AD for Modification Providing Power to Remote Monitoring	Dated 03/11/2020
		AR 266216	Radiation Monitoring System (RMS) Migration to the Distributed I&C System Platform	Rev. 17
		NCR 460601	SAFETY BUS UV AND DGV RELAY COORDINATION - CDBI #115 & 121	Dated 04/19/2011
	Miscellaneous	Application Bulletin	Operating Fluid Maintenance Guidelines Fyrquel® EH Product Series	
		Attachment Z24	Vendor Quality Management Plan	
		IEEE 279	Criteria for Protection Systems for Nuclear Power Generating Stations	1971
		IEEE 379	IEEE Trial Use Guide for the Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems	1972
		IEEE 384	IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits	1974
	Procedures	AD-EG-ALL-1132	Preparation and Control of Design Change Engineering Changes	Rev. 18
		AD-EG-ALL-1133	Preparation and Control of Design Equivalent Change Engineering Changes	Rev. 14
		AD-LS-ALL-0008	10 CFR 50.59 Review Process	Rev. 3
		AD-LS-ALL-005	UFSAR Updates	Rev. 9
		CM-I0123	Emergency Diesel Generator 1A-SA Automatic Voltage Regulator Replacement and Adjustment	Rev. 11
		CM-I0124	Emergency Diesel Generator 1B-SB Automatic Voltage Regulator Replacement and Adjustment	Rev. 11
		HNP-D-0044	System Requirements Specification – Main Turbine Control	Rev 5

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
			System	
		PLP-114	Relocated Technical Specifications and Design Basis Requirements	Rev. 30
	Self-Assessments	AR 02305786-05	Applicability Determination Process and 50.59 / 72.48	Rev 5
		AR 02354187-05	10 CFR 50.59 Program Inspection Readiness Assessment	Rev 5
		AR 2354132	EC 418016 R0, 50.59 Screening	Dated 10/20/2020
	Work Orders	20153387-15, 20153387-05, 20153387-23, 20153387-46, 20153387-24, 20153387-35, 20153387-38		