UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, ILLINOIS 60532-4352

September 19, 2018

Mr. David B. Hamilton
Site Vice President
FirstEnergy Nuclear Operating Company
Perry Nuclear Power Plant
Reg Affairs–A210
10 Center Road, P.O. Box 97
Perry, OH 44081–0097

SUBJECT: PERRY NUCLEAR POWER PLANT—NRC DESIGN BASES ASSURANCE (PROGRAMS) INSPECTION; INSPECTION REPORT 05000440/2018010

Dear Mr. Hamilton:

On July 13, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed a Design Bases Assurance (Programs) Inspection at your Perry Nuclear Power Plant. On August 14, 2018, the NRC inspectors discussed the results of this inspection with yourself and other members of your staff. The results of this inspection are documented in the enclosed report.

Based on the results of this inspection, the NRC has identified one issue that was evaluated under the risk significance determination process as having very-low safety significance (Green). The NRC has also determined that one violation is associated with this issue. Because the licensee initiated a condition report to address this issue, this violation is being treated as Non-Cited Violation (NCV), consistent with Section 2.3.2 of the Enforcement Policy. The NCV is described in the subject inspection report.

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 III; the Director, Office of Enforcement; and the NRC Resident Inspector at the Perry Nuclear Power Plant.

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/

Nestor J. Feliz-Adorno, Acting Chief
Branch 2
Division of Reactor Safety

Docket No. 50–440
License No. NPF–58

Enclosure:
Inspection Report 05000440/2018010

cc: Distribution via LISTSERV®

Letter to David B. Hamilton from Nestor J. Feliz-Adorno dated September 19, 2018

SUBJECT: PERRY NUCLEAR POWER PLANT—NRC DESIGN BASES ASSURANCE (PROGRAMS) INSPECTION; INSPECTION REPORT 05000440/2018010

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50–440
License No:	NPF–58
Report No:	05000440/2018010
Enterprise Identifier:	I–2018–010–0007
Licensee:	FirstEnergy Nuclear Operating Company (FENOC)
Facility:	Perry Nuclear Power Plant
Location:	North Perry, Ohio
Dates:	June 25, 2018, through July 13, 2018
Inspectors:	A. Dunlop, Senior Reactor Engineer A. Dahbur, Senior Reactor Engineer J. Robbins, Reactor Engineer
Approved by:	N. Feliz-Adorno, Acting Chief Branch 2 Division of Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring licensee's performance by conducting a Design Bases Assurance (Programs) Inspection at the Perry 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. Findings and violations being considered in the NRC's assessment are summarized in the table below.

List of Findings and Violations

Failure to Correctly Establish Maintenance/Replacement Frequency for the Weed Temperature Transmitters In Zone FB-7			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000440/2018010–01 Opened and Closed	None	71111.21N
The inspectors identified a finding of very-low safety significance (Green), and associated Non-Cited Violation (NCV) of Title 10 of the *Code of Federal Regulations* (CFR), Part 50.49(e)(5), "Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants," for the licensee's failure to correctly establish maintenance/ replacement frequency for Weed temperature transmitters installed in harsh environment. Specifically, Calculation EQ-115, "Qualified Life Calculation for Weed RTD/RTDT and TC Assemblies," incorrectly established a qualified life for Weed temperature transmitters installed in Zone FB-7. The calculation determined that the qualified life for these transmitters in Zone FB-7 as 18.9 years plus accident. However, the calculation failed to account for the accident time and temperature.			

Additional Tracking Items

None

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

71111.21N—Design Bases Assurance Inspection (Programs)

The inspectors evaluated Environmental Qualification (EQ) Program implementation through the sampling of the following components:

Risk Significant/Low Design Margin Components (7 Samples)

(1) 1E12F0064A, Residual Heat Removal Pump "A" Minimum Flow Valve (Limitorque actuator including motor, terminal boards, limit and torque switches, and control wiring).
(2) 1E51N0091, Reactor Core Isolation Cooling (RCIC) Turbine Bearing Oil Pressure Switch (Square D)
(3) 1G43N0090A, Suppression Pool Water Level Transmitter (Rosemount)
(4) 1E51N0010, RCIC Steam Supply Line Drain Pot Level Switch (Magnetrol).
(5) 1E51K0704, RCIC Steam Turbine Electronic Control System Remote Servo (Woodward).
(6) 1E12C0002A; Residual Heat Removal Pump "A" Motor (General Electric)
(7) 1M15N0021A/B; Fast Response RTD RTDT and Thermocouple Assemblies (Weed transmitter)

Primary Containment Components (2 Samples)

(1) 1B21F0022B, Inboard Main Steam Isolation Valve, (NAMCO limit switches, receptacle, and connector; R.A. Hiller Company Solenoid Valve Cluster Assembly with Valcor solenoid valves).
(2) 1B21F0047H; Safety Relief Valve (Seitz solenoid valve with EDPM o-rings)

INSPECTION RESULTS

71111.21N—Design Bases Assurance Inspection (Programs)

<table>
<tr><td colspan="4">Failure to Correctly Establish Maintenance/Replacement Frequency for the Weed Temperature Transmitters In Zone FB-7</td></tr>
<tr><td>Cornerstone</td><td>Significance</td><td>Cross-cutting Aspect</td><td>Report Section</td></tr>
<tr><td>Mitigating Systems</td><td>Green
NCV 05000440/2018010–01
Opened and Closed</td><td>None</td><td>71111.21N</td></tr>
<tr><td colspan="4">The inspectors identified a finding of very-low safety significance (Green), and associated NCV of 10 CFR 50.49(e)(5), “Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants,” for the licensee’s failure to correctly establish maintenance/ replacement frequency for Weed temperature transmitters installed in harsh environment. Specifically, Calculation EQ-115, “Qualified Life Calculation for Weed RTD/RTDT and TC Assemblies,” incorrectly calculated the qualified life and the replacement frequency for Weed temperature transmitters installed in Zone FB-7. The calculation determined that the qualified life for these transmitters in Zone FB-7 as 18.9 years plus accident. However, the calculation failed to account for the component mission time and the maximum room temperature for post-accident.</td></tr>
<tr><td colspan="4">Description: Condition Report 2013-18761, issued on November 22, 2013, identified that Preventive Maintenance (PM) frequencies for Weed temperature transmitters were inappropriately changed from 9 years to 14 years based on the result of EQ-134, “Qualified Life of Weed RTDT (4000R) In FB-3.” The licensee identified that the start of the changes to the PM frequencies occurred during 1995 when PM Revision Special Maintenance and Replacement Requirements 95-0004 was processed. This Special Maintenance and Replacement Requirements changed the replacement interval for 1M15N0021A & B from 9 years to 14 years based on the results of Calculation EQ-134 using a normal average temperature of 93 degrees Fahrenheit. However, the licensee identified that EQ-134 was specifically for Zone FB-3 and these components (1M15N0021A/B) were in zone FB-7. At the time of discovery, the temperature in zone FB-3 did not bound the temperature in zone FB-7.

The licensee initial review of the temperature data from PTI-M99-P0001, “Ambient Temperature Monitoring”, indicated the average temperatures in zone FB-7 since the last replacement of each transmitter (i.e., since January of 2000) was 85.83 degrees Fahrenheit. This temperature was well under the 93 degrees Fahrenheit temperature used in Calculation EQ-134. Therefore, the licensee determined the results of Calculation EQ-134 enveloped the monitored conditions and there was no challenge to the qualification of any of these components and so operability of these components was not challenged.

As part of the corrective action for CR 2013-18761, the licensee revised EQ-115 and recalculated the qualified life for the Weed transmitters located in all zones including Zone FB-7 using the temperature data obtained from PTI-M99-P0001. Based on the average temperature results of 90 degrees Fahrenheit for Zone FB-7, the licensee determined the qualified life for these transmitters (1M15N0021A/B) could be extended to 18.9 years plus accident. Based on this result, an 18-year replacement frequency was incorporated into the maintenance requirement, Section 8 of EQ File E-596-000-01 “Fast Response RTD/RTDT and Thermocouple Assemblies.”</td></tr>
</table>

During the inspectors' review of EQ-116, "Qualified Life for Transistors in Weed Temperature Transmitters," the inspectors noticed the calculation stated because the plant accident temperature for Zone FB-7 of 144 degrees Fahrenheit was close to the post-accident testing temperature of 150 degrees Fahrenheit for out-of-containment, there was no appreciable gain to taking credit for the 20 hours of testing at this temperature. Therefore, the calculation used the thermal aging to demonstrate accident as well as normal plant conditions.

Drawing 022-0042-00000, "Environmental Conditions for Intermediate Building," showed that the maximum and average temperature for Zone FB-7 "Harsh—Annulus Exhaust Gas Treatment Area," as 144 and 135 degrees Fahrenheit respectively for 180 days. The inspectors noted the qualified life of 18.9 years for these transmitters located in Zone FB-7 as calculated per EQ-115 did not account for accident conditions. The qualified life was only based on average temperature of 90 degrees Fahrenheit and 142 degrees Fahrenheit for 100 hours for abnormal condition as a result of loss of the ventilation.

Corrective Action: The licensee performed an evaluation and concluded the qualified life for the temperature transmitters located in Zone FB-7 (1M15N0021A/B) should be 14.7 years instead of 18.9 years. Since both of these transmitters were last replaced in 2008, the transmitters remained qualified until 2022. The licensee planned to revise Calculation EQ-115 and the PM task accordingly.

Corrective Action References: CR 2018-06287

Performance Assessment:

Performance Deficiency: The inspectors determined the licensee's failure to correctly establish maintenance/replacement frequency for the Weed transmitters installed in harsh environment was contrary to the requirements of 10 CFR 50.49 (e)(5) and a Performance Deficiency. Specifically, the licensee failed to correctly account for the post-accident mission time and zone temperature when calculating the qualified life for the Weed transmitters.

Screening: The performance deficiency was determined to be more-than-minor because it was associated with the Mitigating Systems cornerstone attribute of design control and affected the cornerstone objective of ensuring the availability, reliability, and capability of mitigating systems to respond to initiating events to prevent undesirable consequences. Specifically, the failure to establish the appropriate maintenance/replacement frequency for the Weed transmitters installed in Zone FB-7 did not ensure the reliability of the EQ transmitters to fulfill their post-accident mission time in a harsh environment.

Significance: The inspectors evaluated the finding in accordance with NRC IMC 0609, "Significant Determination Process," Attachment 4, "Initial Characterization of Findings," dated October 7, 2016, for Mitigating Systems, and IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, and determined the finding was of very-low safety significance (Green) because the finding did not represent a deficiency affecting the qualification of a mitigating structure, system, or component, such that the structure, system, or component maintained its operability/functionality. Specifically, the licensee performed a preliminary evaluation and determined that the installed transmitters did not exceed the re-calculated qualified life plus the accident.

Cross-Cutting Aspect: The finding did not have a cross-cutting aspect because it was considered not to be indicative of current licensee performance (i.e., deficiency existed for more than 3 years). Specifically, in May 2014 when the licensee revised EQ-115 and changed the replacement frequency for these transmitters from 9 years to 18 years.
Enforcement: Violation: Title 10 CFR 50.49(e)(5), requires, in part, that equipment qualified by test must be preconditioned by natural or artificial (accelerated) aging to its end-of-installed life condition. If preconditioning to an end-of-installed life condition is not practicable, the equipment may be preconditioned to a shorter designated life. The equipment must be replaced or refurbished at the end of this designated life unless ongoing qualification demonstrates that the item has additional life. Contrary to the above, prior to July 12, 2017, the licensee failed to age EQ components to their end-of-installed life condition nor establish the correct replacement designated life. Specifically, the licensee incorrectly calculated the qualified life for the Weed transmitters installed in harsh environment. Calculation EQ-115 failed to account for the accident temperature and time when calculating the qualified life for these transmitters which resulted in overstated replacement frequency for these transmitters. Disposition: This violation is being treated as a NCV, consistent with Section 2.3.2 of the Enforcement Policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors confirmed that proprietary information was controlled to protect from public disclosure. No proprietary information was documented in this report.

- On August 14, 2018, the inspector presented the Design Bases Assurance Program Inspection results to Mr. D. Hamilton, and other members of the licensee staff.

DOCUMENTS REVIEWED

71111.21N—Design Bases Assurance Inspection (Programs)

Condition Reports—Issued During Inspection

- CR 2018-05846; NRC EQ DBAI: Correct Qualified Life of Remote Servo in AFP E301-S08-00; 06/26/2018
- CR 2018-05872; NRC EQ DBAI: Revise Accident Peak Temperature Qualification in Calculation EQ-188 Rev 0; 06/27/2018
- CR 2018-05895; NRC EQ DBAI: Calc EQ-188 Continuation of Shutdown Cooling; 06/27/2018
- CR 2018-05939; NRC EQ DBAI: Accounting for Heat Rise in EQ Component Evaluations; 06/28/2018
- CR 2018-06029; NRC EQ DBAI: Rosemount Transmitter ICI and IMI's have Discrepancies with the Related Vendor Manual; 07/02/2018
- CR 2018-06168; NRC EQ DBAI: Effects of Hot Spots on EQ Component Qualified Life; 07/09/2018
- CR 2018-06242; NRC EQ DBAI: Transcription Error in RCIC Steam Turbine Assembly AFP (E301-S08-00); 07/12/2018

- CR 2018-06287; NRC EQ DBAI: Revise Qualified Life Calculation for the Weed Temperature Transmitters in AFP E596-000-01; 07/12/2018

Condition Reports Reviewed During Inspection

- CR 2013-06350; Conditional Release of SRV Air Block and Solenoids; 04/22/2013
- CR 2013-18761; Weed Temperature Transmitter PM Frequencies Inappropriately Changed; 12/22/2013
- CR 2014-11874; MS-C-14-07-16: Procurement Package 100085712, Air Block Assembly with Solenoid, is Deficient; 07/17, 2014
- CR 2015-15163; AREVA 10CFR21.21(b) Notice of Deviation Determination to Perry; 12/04/2015
- CR 2016-06835; Degraded Wires Inside Level Switch E51N0010 on RX Core Isolation Cooling; 05/17/2016
- OE-2015-0663-3; IN 15-12, Unaccounted for Error Terms Associated with the Irradiation Testing and Environmental Qualification of Important-to-Safety Components; 11/24/2015

Drawings

- 022-0032-0000; Environmental Conditions for Drywell Area; Revision M
- 022-0031-0000; Environmental Conditions for Drywell Area; Revision K
- 022-0030-0000; Environmental Conditions for Drywell Area; Revision K
- 025-0028-0000; Mechanical Longitudinal Section RCIC Turbine; Revision A
- 022-0004-0000; Environmental Condition for Auxiliary Building, Revision L
- 208-0075-00006; RCIC Process Instrumentation Equipment; Revision BB

Calculations/Environmental Qualification Binder

- AFP 301-S05-02; Environmental Qualification of NAMCO EA-740 Limit Switch on MSIV; Revision 10
- AFP 301-S05-03; Environmental Qualification of MSIV Solenoid Valve Cluster Assembly; Revision 07
- AFP 301-S05-04; Environmental Qualification of NAMCO EC-210 Series Receptacle and Connector with Cable; Revision 01
- AFP E301-C11-01; Environmental Qualification of Magnetrol Level Switch; Revision 14
- AFP E301-S01-00; Emergency Core Cooling Pump Motor; Revision 17
- AFP E301-S02-01; Main Steam Safety Relief Valve Solenoid Coil; Revision 18
- AFP E301-S08-00; Environmental Qualification of RCIC Steam Turbine Assembly; Revision 20
- AFP E301-S08-00; RCIC Steam Turbine Assembly; Revision 20
- AFP E568-000-02; Limitorque Motor Operators (AC) Outside Containment; Revision 27
- AFP E568-000-04; Multi-point Terminal Strips; Revision 7
- AFP E596-000-01; Fast Response RTD/RTDT and Thermocouple Assemblies; Revision 24
- AFP E604-000-03; Pressure Transmitter—Rosemount 1153 Series B; Revision 29
- B0003; Qualification Type Test Report Limitorque Valve Actuators for Class 1E Service Outside Containment; 05/28/1976
- B0027; Limitorque Valve Actuator Temperature Related to High Superheat Ambient Temperatures; 08/31/1978
- B0058; Limitorque Valve Actuator Qualification for Nuclear Service Report; 01/11/1980
- DCP 860646; RCIC Turbine Trip and Throttling Valve E51A-F510; Revision 0
- DCP 87-00066A; E51—RCIC DC MOV's Shunt Field Energization; Revision 0

- ECR 03-0092; Acceptance of GE Evaluation of New EPDM O-Rings made of Material from a New Vendor; Revision 0
- EQ-012; Qualified Life Of Limitorque Valve Operators; Revision 5
- EQ-096; Rosemount 1153 Post LOCA Qualification; Revision 1
- EQ-142; Qualified Life of Rosemount 1153 Series B Transmitters; Revision 4, Addendum 1
- EQ-167; Qualified Life of RCIC Equipment in Zone AB-3; Revision 2
- EQ-178; Qualified Life of NAMCO EC210 Series Connectors with Cable: Revision 0, Addendum 1
- NEDC-32472P; Product Analysis Report Main Steam Isolation Valve Control Cluster (Valcor); Revision 01
- QR-5805; Qualification Tests for Firewall III Irradiation Cross-Linked Polyethylene Constructions for Class 1E Service; 05/22/1986
- Rosemount Report 108025; Qualification Report for Pressure Transmitters Rosemount Model 1153 Series B; Revision J
- Rosemount Report D8300040; Qualification Report for Pressure Transmitters Rosemount Model 1153 Series D; Revision D
- Rosemount Report D8800053; Qualification Report Model 1153/1154 Damping Option; Revision E

Miscellaneous

- General Electric Services Information Letter (SIL) No. 531; HPCI and RCIC Magnetrol Level Switches; 02/07/1991
- Letter from CEI and Bechtel Power Corp. to Ralph A. Hiller Company, Subject: Equipment Qualification Report Comments; 08/28/1995
- Letter from Ralph A. Hiller Company to Cleveland Electric Company, Subject: Solenoid Operated Cluster Assembly; 03/14/1995
- Limitorque Technical Update 14-01; SMB-000 ”C Style” Torque Switch Product Release; 08/25/2014
- PERP 000436; Equivalent Replacement for the RCIC Turbine Bearing Oil Pressure Switch; Revision 0

Procedures

- GMI-0096; MSIV Disassembly, Repair, and Reassembly Instructions; Revision 15
- IMI-E03-0001; Rosemount Transmitter Replacement; Revision 5
- ISS 2700; Installation Standard Specification; Revision 9
- NOBP-CC-7004; Shelf Life Evaluation; Revision 1
- NOBP-CC-7006; Storage Maintenance Requirements; Revision 7
- NOBP-MS-2005; Nuclear Warehousing; Revision 9
- NOP-CC-5301; Environmental Qualification Program; Revision 3
- NOP-CC-7002; Shelf Life Evaluation; Revision 1

Work Orders

- WO 200541046; PY-1B21 Nuclear Boiler Process Instrumentation; 02/26/2013
- WO 200364113; Replace RCIC Turbine Oil Pressure Switch; 02/06/2012
- WO 200267337; PY-1M15 Annulus Exhaust Gas Treatment; 05/27/2008
- WO 200241551; Replace Remote Servo and EG-R; 02/12/2008
- WO 200174699; Replace Limit Switches for Inboard MSIV 1B21F0022B; 05/10/2007
- WO 200510234; Replace Non-Metal Parts in Main Steam Line B AOV; 04/05/2017

- WO 200644276; Calibration Check Level Switch and Replace Gasket; 05/19/2016
- WO 200682877; Replace Power Lead Gland (Conax) Assembly and Switch Mechanism, and Perform Calibration Check & Replace New Housing Cover O-Ring; 01/25/2017
- WO 200710913; Calibration Check Level Switch and Replace Gasket; 01/25/2018