



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

March 22, 2017

Mr. Steven D. Capps
Site Vice President
Duke Energy Carolinas, LLC
McGuire Nuclear Station
12700 Hagers Ferry Road
Huntersville, NC 28078

**SUBJECT: MCGUIRE NUCLEAR STATION – NRC DESIGN BASES ASSURANCE
INSPECTION (PROGRAMS) REPORT 05000369/2017007 AND
05000370/2017007**

Dear Mr. Capps:

On, February 10, 2017, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your McGuire Nuclear Station, Units 1 and 2, and discussed the results of this inspection with you, and other members of your staff. Additional inspection results were discussed with Mr. Jeff Thomas of your staff on March 8, 2017. Inspectors documented the results of this inspection in the enclosed inspection report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. The finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the NRC Enforcement Policy.

If you contest the violation or the significance of the NCV, you should provide a response within 30 days of the date of this inspection report with the basis of your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the McGuire Nuclear 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/

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

Docket Nos.: 05000369, 05000370

License Nos.: NPF-9, NPF-17

Enclosure:

Inspection Report 05000369/2017007
and 05000370/2017007 w/Attachment:
Supplemental Information

cc: Distribution via Listserv

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INSPECTION (PROGRAMS) REPORT 05000369/2017007 AND
05000370/2017007

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DATE	3/15/2017	3/16/2017	3/14/2017	3/15/2017	3/22/2017	
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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-369, 50-370

License Nos.: NPF-9, NPF-17

Report Nos.: 05000369/2017007, 05000370/2017007

Licensee: Duke Energy Carolinas, LLC

Facility: McGuire Nuclear Station

Location: Huntersville, NC 28078

Dates: January 23, 2017, through February 10, 2017

Inspectors: T. Su, Reactor Inspector (Team Lead)
M. Greenleaf, Reactor Inspector
C. Franklin, Reactor Inspector

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

Enclosure

SUMMARY

Inspection Report (IR) 05000369/2017007 and 05000370/2017007; January 23 – February 10, 2017; McGuire Nuclear Station, Units 1 & 2; NRC Evaluations of Environmental Qualification 10CFR 50.49 Programs, Process and Procedures

Three Nuclear Regulatory Commission (NRC) inspectors from Region II conducted this inspection. 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 were 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," Revision 5.

NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The team identified a green non-cited violation (NCV) of Title 10 Code of Federal Regulations (CFR) Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to translate requirements necessary for maintaining the environmental qualification of the pressurizer power-operated relief valve (PORV) NAMCO EA-180 limit switches into maintenance procedures. The licensee evaluated the impact of the incorrect guidance and determined that the PORV limit switches remained operable. The licensee plans to correct the affected procedures. The licensee entered this issue into the corrective action program as NCR 02095333.

This performance deficiency was more than minor because it was associated with the mitigating systems cornerstone attribute of equipment performance and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, not maintaining the PORV limit switches in their qualified condition impacted their reliability. The team used IMC 0609, Att. 4, "Initial Characterization of Findings," issued October 7, 2016, for Mitigating Systems, and IMC 0609, App. A, "The Significance Determination Process (SDP) for Findings At-Power," issued June 19, 2012, and determined the finding to be of very low safety significance (Green) because the finding was a deficiency affecting the design of a mitigating structure, system, or component (SSC), and the SSC maintained its operability or functionality. The team determined that no cross-cutting aspect was applicable because the finding was not indicative of current licensee performance. (Section 1R21.b1)

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21N)

a. Inspection Scope

The inspection team performed an inspection conducted as outlined in NRC Inspection Procedure (IP) 71111.21N, Attachment 1, "Environmental Qualification under 10 CFR 50.49 Programs, Processes, and Procedures." The team assessed McGuire Nuclear Plant's implementation of the environmental qualification program as required by 10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants." The team evaluated whether the McGuire Plant staff properly maintained the environmental qualification of electrical equipment important to safety throughout plant life, established and maintained required environmental qualification documentation records, and implemented an effective corrective action program to identify and correct environmental qualification related deficiencies.

The inspection included review of environmental qualification program procedures, component environmental qualification files, environmental qualification test records, equipment maintenance and operating history, maintenance and operating procedures, vendor documents, design documents, and calculations. The team interviewed program owners, engineers, maintenance staff, and warehouse staff. The team performed in-plant walk-downs (where accessible) to verify equipment was installed as described in McGuire Plant's environmental qualification component documentation files; and that the components were installed in their tested configuration. Additionally, the team performed in-plant walk-downs to determine whether equipment surrounding the environmental qualification component could fail in a manner that could prevent the safety function of the components, and to verify that components located in areas susceptible to a high-energy line break were properly evaluated for operation in a harsh environment. The team reviewed and inspected the storage of replacement parts and associated procurement records to verify environmental qualification parts approved for installation in the plant were properly identified and controlled and that storage and environmental conditions did not adversely affect the components' qualified lives. Documents reviewed for this inspection are listed in the Attachment to this document.

The inspection procedure requires the team to select six to ten components to assess the adequacy of the environmental qualification program. The team selected eight components for this inspection. Component samples selected for this inspection are listed below:

- 2NIEV0333B, Unit 2 NI Pump Suction Flow from ND Iso. Motor
- 2NCLT5170, Unit 2 PZR Level, (U2 Containment)
- 1NCLL0340, Unit 1 PZR PORV Solenoid Limit Sw.
- 2NDPS5040, 2A ND Pump Mini Flow
- Raychem tubing qualification files for the latest qualified model at McGuire
- 2EPCGMP2B RE004, Relay GMP2BRE

- 2ETP TB1182, Terminal Box, NI System
- Okonite Cable qualification files for the latest qualified model at McGuire

b. Findings

1 Failure to Translate Required Gasket Replacement Requirements into Limit Switch Maintenance Manual

Introduction: The NRC identified a Green non-cited violation (NCV) of Title 10 Code of Federal Regulations (CFR) Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to translate requirements necessary for maintaining the environmental qualification of the pressurizer power-operated relief valve (PORV) NAMCO EA-180 limit switches into maintenance procedures.

Description: The licensee uses NAMCO EA-180 limit switches for the pressurizer PORVs. They provide an open or closed signal to indication in the main control room, so that operators are aware of the PORV position, and can make appropriate assessment of plant conditions during and following design basis accidents. The PORV limit switch resides in the top of the pressurizer cubicle, inside containment, and as such, the limit switch is located in a harsh environment when expected to perform its post-accident function. The limit switch was therefore included in the scope of McGuire Nuclear Station's environmental qualification (EQ) program and was subject to its requirements in accordance with 10 CFR 50.49.

In order to qualify the equipment to the requirements of 10 CFR 50.49, NAMCO tested EA-180 limit switches to provide assurance that they will perform their post-accident function when subjected to their most limiting harsh environment. Proof of this qualification was provided in qualification test report 155 (QTR 155), "Generic Qualification of EA 180 Series Limit Switches for Use in Nuclear Power Plant Class 1E Applications in Compliance with IEEE Standards 323-1974, 382-1972, and 344-1975" (Duke document DPM-1393.01-00-0021). Section 11.12 "EA189-90060 Maintenance and Surveillance Instructions," Subsection 2.4, "Gasket and Screw Assembly Replacement," required that:

"In order to maintain the qualification and integrity of the limit switch seals, replace the top cover gasket and screw assemblies each time the top cover is removed for any reason."

Equipment Qualification Maintenance Manual EQMM-1393.01-N03-01 provided the required maintenance activities that must be performed to maintain the PORV limit switch qualified. Section 1.1.1 of EQMM-1393.01-N03-01 stated that "if the switch is opened for any reason...inspect cover gaskets and screw O-rings, replace if damaged."

The EQMM, as written was less restrictive than the requirements contained in QTR 155, and therefore created the potential for the gaskets and screw O-rings to not be replaced each time the top cover was removed, thereby leaving the PORV in an unqualified state after maintenance had been performed. Following the team's identification of the issue, the licensee determined that there were several instances in which the gaskets may not have been replaced on some of the PORV limit switches. The licensee entered this issue into their corrective action program as NCR 02095333 and evaluated the impact of

the incorrect information provided in the EQMM. The licensee determined that the affected NAMCO limit switches remained operable, although they were in an unqualified condition.

Analysis: The team determined that the failure to translate gasket replacement requirements into maintenance manual EQMM-1393.01-N03-01 was a performance deficiency. This performance deficiency was more than minor because it was associated with the mitigating systems cornerstone attribute of equipment performance and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Failing to maintain EA-180 limit switches in their qualified condition impacted their reliability. The team used IMC 0609, Att. 4, "Initial Characterization of Findings," issued October 7, 2016, for Mitigating Systems, and IMC 0609, App. A, "The Significance Determination Process (SDP) for Findings At-Power," issued June 19, 2012, and determined the finding to be of very low safety significance (Green) because the finding was a deficiency affecting the design of a mitigating structure, system, or component (SSC), and the SSC maintained its operability or functionality. The team determined that no cross-cutting aspect was applicable because the finding was not indicative of current licensee performance.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," required, in part, that "measures shall be established to assure that applicable regulatory requirements for those structures, systems, and components to which this appendix applies are correctly translated into procedures and instructions." Contrary to the above, since the issuance of revision 8 of EQMM-1393.01-N03-01 on February 29, 2012, McGuire Nuclear Station failed to assure that the gasket replacement requirements necessary for maintaining 10 CFR 50.49 qualification of NAMCO EA-180 PORV limit switches were correctly translated into EQMM-1393.01-N03-01. Specifically, the EQMM did not require that the top gasket and screw O-rings be replaced each time the top cover was opened. In response to this issue, the licensee evaluated the potential condition of the PORV limit switch and other limit switches qualified in the same manner and determined they remained operable based on other testing by NAMCO on a similar limit switch that had no gasket. The licensee plans to correct the affected procedures. This violation is being treated as an NCV consistent with section 2.3.2.a of the Enforcement Policy. The violation was entered into the licensee's corrective action program as NCR 02095333. (NCV 05000369/2017007-01 and 05000370/2017007-01 "Failure to Translate Required Gasket Replacement into Limit Switch Maintenance Manual")

40A6 Meetings, Including Exit

On February 10, 2017, the inspectors presented inspection results to Mr. Steven Capps and other members of the licensee's staff. The inspectors verified that no proprietary information was retained or documented in this report. Additional inspection results were discussed with Mr. Jeff Thomas of your staff on March 8, 2017.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee personnel

Adam Goodman, Fleet Reg. Affairs
Brian Richards, McGuire Reg. Affairs
Brian Kandell, MNS-Program Eng. MGR
Chris Abernathy, Fleet EQ Program Lead
Grant Cutri, Primary System Engineer
Jeremy Bell, Programs Engineer
Robin Turpin, DES-Elec.

NRC personnel

F. Ehrhardt, Chief, Reactor Projects Branch 1, Division of Reactor Projects
A. Hutto, Senior Resident Inspector, McGuire Nuclear Station
R. Cureton, Resident Inspector, McGuire Nuclear Station

LIST OF REPORT ITEMS

Opened, Closed, and Discussed

05000369, 370/2017007-01	NCV	Failure to Translate Required Gasket Replacement Requirements into Limit Switch Maintenance Manual (Section 1R21.b.1)
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LIST OF DOCUMENTS REVIEWED

Documents Reviewed

Permanent Plant Modifications

EC 105712, Replace Level Transmitter 2NCLT5170, Rev. 1
EC 33005, MGMM-8895 – Remove NC0195 and NC0196 from EQ List, Rev. 0
EC 39306, MGMM12819 – Revise EDB Use Codes for LLS & SVS on System NV, Rev. 0
EC 400046, C, CGI, Q2, Various, Enclosures, Hoffman, LFC/KCM, Rev. 0
EC 400061, C, CGI, Q2, Various, Parker Hannifin, JAS/KM, Rev. 0
MGMM-8895, NC0195 and NC096, Dated 6/11/97
MGMM-12819, Removal NV SOVs and Limit Switches, Dated 10/31/01

Design Specifications

DPS-1205.19-0004, Safety Related Rotork Motor Operators and Spare Parts, Rev. 4
MCS-1390.01-00-0050, McGuire Nuclear Station Electrical Installation Specifications Manual, Rev. 7

Calculations

DPC-1381.05-00-0006, Duke Power Company Shelf Life and Storage, Rev.2
DPC-1381.05-00-0008, NAMCO Limit Switches – Qualified Life – All Models, Rev. 1
DPC-1381.05-00-0048, Environmental Qualification (EQ) Evaluation of Cameron EQ Documents, Rev. 0
DPC-1381.05-0018, Cutler-Hammer Relay Qualified Life Analysis, Rev. 0
MCC-1229.00-00-0019, Post Accident Shielding, Rev.19

Procedures

AD-OP-ALL-0105, Operability Determinations and Functionality Assessments, Rev. 3
AD-EG-ALL-1103, Procurement Engineering Products, Rev. 2
AD-EG-ALL-1612, Environmental Qualification (EQ) Program Description, Rev. 1
EQMM-1393.01-N03-01, Environmental Qualification Manual, Limit Switch NAMCO EA-180, Revision H or Later, Rev. 8
IP/0/A/3190/012, NAMCO Limit Switch Preventative and Corrective Maintenance, Rev. 41

Completed Procedures

EQMM-1393.01-A01-02, Environmental Qualification Maintenance Manual for Rotork NA1E Electric Motor Actuators, Rev. 0
EQMM-1393.01-N01-02, Environmental Qualification Maintenance Manual for ITT-Barton 289-A Differential Pressure Switch, Rev. 4
EQMM-1393.01-N04-01, Environmental Qualification Maintenance Manual for Solon Differential Pressure Switch Outside Containment, Rev. 8
IP/2/A/3004/009 A, RHR Pump A Flow Loop 2NDPS5040 and 2NDPG5041 Calibration, Rev 6
IP/0/A/3066/002 N, Rotork Actuator Lubrication and Inspection, Rev. 15
IP/0/A/3066/022 D, Rotork Actuator Preventive Maintenance, Rev. 43
IP/0/A/3090/010, Sealing Safety-Related Equipment Out-side Containment and Doghouses, Rev. 32
IP/0/A/3090/022, Wire Splice Insulating and Wire Insulation Repair (600 Volts or Less), Rev. 20
MP/0/A/7650/001, Pipe Flange Joint Disassembly, Inspection, and Assembly, Rev. 71

Drawings

MCFD-1553-01.00, Flow Diagram of Reactor Coolant System, Rev. 12
 MC-1240-04.01-02, Pipe Rupture Zone Map, Reactor Building, 696' + 11", Figure 4.1-2, Rev. 0
 MC-1240-04.02-02, Pipe Rupture Zone Map, Reactor Building, 725' + 10", Figure 4.2-2, Rev. 0
 MC-1240-04.03-01, Radiation Zone Map Reactor Building Elevation 738'+3" Figure 4.3-1, Rev. 0
 MC-1240-04.03-02, Pipe Rupture Zone Map Reactor Building Elevation 738'+3" Figure 4.3-2, Rev. 0
 MC-1240-04.03-03, HVAC Zone Map Reactor Building Elevation 738'+3" Figure 4.3-3, Rev. 0
 MC-1240-04.04-02, Pipe Rupture Zone Map, Reactor Building, 767' + 10 3/4", Figure 4.4-2, Rev. 0
 MC-1240-04.05-02, Pipe Rupture Zone Map, Reactor Building, 778' + 10", Figure 4.5-2, Rev. 0
 MC-1240-04.06-02, Pipe Rupture Zone Map, Reactor Building, 841' + 10", Figure 4.6-2, Rev. 0
 MC-1240-04.07-02, Pipe Rupture Zone Map, Reactor Building, 842' + 5", Figure 4.7-2, Rev. 0
 MC-1240-04.08-02, Pipe Rupture Zone Map, Auxiliary Building, 695' + 0", Figure 4.8-2, Rev. 0
 MC-1240-04.09-02, Pipe Rupture Zone Map, Auxiliary Building, 716' + 0", Figure 4.9-2, Rev. 0
 MC-1240-04.10-02, Pipe Rupture Zone Map, Auxiliary Building, 733' + 0", Figure 4.10-2, Rev. 0
 MC-1240-04.11-02, Pipe Rupture Zone Map, Auxiliary Building, 750' + 0", Figure 4.11-2, Rev. 0
 MC-1240-04.12-02, Pipe Rupture Zone Map, Auxiliary Building, 767' + 0", Figure 4.12-2, Rev. 0
 MC-1240-04.13-02, Pipe Rupture Zone Map, Diesel Generator Building, 736' + 6", Figure 4.13-2, Rev. 0
 MC-1240-04.14-02, Pipe Rupture Zone Map, Fuel Building, 778' + 10", Figure 4.14-2, Rev. 0

Miscellaneous Documents

CGD-3007.02-04-0001, State Terminal Block, Test Switch, and Accessories, Rev. 15
 CGD-3007.02-04-0002, State Type ZWM Terminal Blocks, Rev. 3
 DPM-1393.01-0001, Environmental Qualification Package for Raychem Corporation WCSF-U Shrink Tubing, Rev. D04
 DPM-1393.01-0002, Volume I, Environmental Qualification Package for Eaton Corporation (Cutler-Hammer) D26 Series Type M Relays and Accessories, Rev. 2
 DPM-1393.01-0002, Volume II, Environmental Qualification Package for Eaton Corporation (Cutler-Hammer) D26 Series Type M Relays and Accessories, Rev. 2
 DPM-1393.01-00-0021, Environmental Qualification Test Summaries Manual Test Summary for Limit Switch Namco EA-180 Series, Rev. 1
 DPM-1393.01-0029, Environmental Qualification Test Report Summary for Rotork Controls Electric Motor Actuators (Model NA1E), Rev. 0
 MC 1 NC VA 0195B EV, U1 NC Pump Motor Oil Fill Cont. Iso. ST1804 EDB, Dated 2/8/2017
 MC 1 NC VA 0195B MV, U1 NC Pump Motor Oil Fill Cont. Iso. ST1804 EDB, Dated 2/8/2017
 MC 1 NC VA 0196A EV, U1 NC Pump Motor Oil Fill Cont. Iso. ST1804 EDB, Dated 2/8/2017
 MC 1 NC VA 0196A MV, U1 NC Pump Motor Oil Fill Cont. Iso. ST1804 EDB, Dated 2/8/2017
 MC 2 ETP TB 1182, Terminal Box, NI System EDB Data Sheet, Dated 1/4/2017
 MCM 1205.19-0064.001, Maintenance Manual for Rotork NA Actuators, Based on the NA1E and NA5E Specifications, Rev. D04
 MCM 1210.04-0270-001, Models 288A & 289A Differential Pressure Indicating Switches Qualification Test Report, Rev. 4
 MCM 1210.04-0271.001, Differential Pressure Indicating Switches-Installation and Operation Manual, Barton Model 289A, D05
 MCM 1354.00-0053.001, Okonite TEFEL Cable Environmental Qualification, Rev. 2
 MCS-1240.03-00-0001, Specification for Plant Environmental Parameters (PEP), Rev. 9
 NP-6408, Guidelines for Establishing, Maintaining, and Extending the Shelf Life Capability of Limited Life Items (NCIG-13)

Nuclear System Directive: 303, Environmental Qualification Program. Rev. SUP
PO 03007405, Raychem Purchase Order, 10/09/2015
REDI-3000.00-00-0003, Replacement Parts for ITT Barton Transmitters, Rev. 1
SCD450, Putaway, Storage, and Inspection, Rev. 16
TR-100516, Equipment Qualification Reference Manual

Corrective Action Documents

01668936
01675527
01684955
01901558
01901589
01902797
01903845
01906862
01938312
01939267
02063615

Work Orders

02003668-02
00338045-06
00338467-04
02033624-02

Condition Reports generated Due to this inspection

02094351, 2017 EQ inspection of QA warehouse
02095333, 2017 NRC EQ Program Inspection Item on EQ NAMCO Limit Switch
02095936, 2017 MNS EQ Program Inspection – CH Relays
02096170, 2017 EQ Inspection: PEP Manual Enhancements
02096602, 2017 EQ Inspection – Cable/Splice EQML Question
02097097, 2017 EQ Inspection: EDB Information Missing / Incorrect
02098626, 2017 EQ Inspection – Barton Pressure Switch
02098645, 2017 EQ inspection – Minimum Thres Engagement KF Pipe Flange
02099109, 2017 MNS NRC EQ Program Inspection-NAMCO LS Violation