



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, ILLINOIS 60532-4352

July 10, 2018

Mr. Dean Curtland
Director of Site Operations
NextEra Energy Duane Arnold, LLC
3277 DAEC Road
Palo, IA 52324-9785

**SUBJECT: DUANE ARNOLD ENERGY CENTER—NRC DESIGN BASES ASSURANCE
INSPECTION (PROGRAMS); INSPECTION REPORT 05000331/2018011**

Dear Mr. Curtland:

On May 10, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed a Triennial Baseline Design Bases Assurance Inspection (Programs) at your Duane Arnold Energy Center. On June 5, 2018, the NRC inspectors 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.

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 was associated with this issue. Because the licensee initiated condition reports to address this issue, the 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 Duane Arnold Energy Center.

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*, Part 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Mark T. Jeffers, Chief
Engineering Branch 2
Division of Reactor Safety

Docket Nos. 50-331; 72-032
License No. DPR-49

Enclosure:
Inspection Report 05000331/2018011

cc: Distribution via LISTSERV®

Letter to Dean Curtland from Mark T. Jeffer dated July 10, 2018

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Numbers: 50-331; 72-32

License Numbers: DPR-49

Report Numbers: 05000331/2018011

Enterprise Identifier: I-2018-011-0004

Licensee: NextEra Energy Duane Arnold, LLC

Facility: Duane Arnold Energy Center

Location: Palo, IA

Dates: April 23, 2018, through May 10, 2018

Inspectors: A. Dahbur, Senior Reactor Inspector (Lead)
I. Hafeez, Reactor Inspector
M.I Greenleaf, Reactor Inspector (Region II)

Approved by: Mark T. Jeffers, Chief
Engineering Branch 2
Division of Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring licensee’s performance by conducting a Triennial Fire Protection at Duane Arnold Energy Center 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. There were no Licensee-identified violations.

List of Findings and Violations

Failure to Translate Environmental Qualification Requirements into Maintenance Procedures/Instructions			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000331/2018011–01 Opened and Closed	None	71111.21N
<p>The inspectors identified a finding of very-low safety significance (Green), and associated Non-Cited Violation (NCV) of Title 10 of the <i>Code of Federal Regulations</i> (CFR), Part 50, Appendix B, Criterion III, “Design Control,” for the licensee’s failure to establish measures to assure that Environmental Qualification (EQ) requirements for qualified components correctly translated into procedures and instructions. Specifically, the inspectors identified two examples of the licensee’s failure to ensure that the EQ requirements for O-ring installed in EC290 connector/plug-in cable assemblies were translated into the associated maintenance procedures and instructions (i.e., EQ Files, warehouses storage requirements). The licensee failed to correctly establish an end-of-life replacement schedule for the O-ring used in the cable assemblies installed in the drywell and failed to establish a 2-year shelf-life for the O-ring stored in the warehouse.</p>			

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 EQ Program implementation through the sampling of the following components:

Risk Significant/Low Design Margin Components (5 Samples)

- FIS2111; ITT Barton Differential and Flow Switch QUAL-I204-04; Reactor Building 720' Southeast Corner
- FT1971B; Gulton-Statham Pressure Transmitter QUAL-G182-00; Reactor Building 720' Northwest Corner
- NAM-CON-2C874; NAMCO EC210/EC290 Connector/Plug-in Cable Assembly QUAL-N007-01A; Reactor Building 770' Steam Tunnel
- MO-2512; Limitorque MOV QUAL-L200-01A and -03A; Reactor Building Steam Tunnel
- SV7605A; ASCO Solenoid Valve NP8316 and NP8321 QUAL-A610-00A; HPCI Room

Primary Containment Components (3 Samples)

- TE4386H; CONAX Corporation Temperature Switch/Thermocouple QUAL-C515-00A; Drywell Northwest Quad
- SV4412A; AVCO Automatic Valve for MSIV QUAL-A613-02A; Drywell Southeast Quad
- PS4406C; Pressure Controls A17-1N Pressure Switch QUAL-P381-01B; Drywell Northeast Quad

INSPECTION RESULTS

71111.21N—Design Bases Assurance Inspection (Programs)

Failure to Translate Environmental Qualification Requirements into Maintenance Procedures/Instructions			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Initiating Events	Green NCV 05000331/2018011-01 Opened and Closed	None	71111.21N
<p>The inspectors identified a finding of very-low safety significance (Green), and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to establish measures to assure that EQ requirements for qualified components correctly translated into procedures and instructions. Specifically, the inspectors identified two examples of the licensee's failure to ensure that the EQ requirements for O-ring installed in EC290 connector/plug-in cable assemblies were translated into the associated maintenance procedures and instructions (i.e., EQ Files, warehouses storage requirements). The licensee failed to correctly establish an end-of-life replacement schedule for the O-ring used in the cable assemblies which were installed in the drywell and failed to establish a 2-year shelf-life for the O-ring stored in the warehouse.</p>			
<p>Description: NAMCO Controls Corporation EC210/EC290 Receptacle/Plug-in Cable assembly consisted of the receptacle attached to a device, such as a limit switch or enclosure, and the plug-in cable assembly connected to the field cable. These devices provided an environmental seal as well as electrical connection for limit switches and other equipment enclosures. NAMCO supplied the connector seal assembly either as a separate unit or as an integral unit consisting of a limit switch and the EC210/EC290 assembly. Electrical Environmental Qualification Report (EQR) QUAL-N007-01 File addressed the qualification of the connector assemblies as stand-alone units located in the Drywell and in the steam tunnel where they were installed as electrical connectors for junction boxes serving main steam isolation valves solenoid valves cluster assembly.</p>			
<p>NAMCO EC210 receptacle/plug-in cable assembly was obsolete and no longer available. Patel EGS quick disconnect connector was type tested. NAMCO has named this EGS quick disconnect connector as EC290 receptacle/plug-in assembly for direct replacement to EC210 assembly. NAMCO Report QTR-500 documented and summarized the EQ of EC290 assemblies and concluded that the EC290 assembly was equal to or better than EC210 assembly. Between 2005 and 2010, all EC210 assemblies used for the main stem isolation valves solenoid valves cluster located in the drywell and steam tunnel were replaced by EC290.</p>			
<p>The EQR QUAL-N007-01 concluded that EC290 Receptacle/Plug-in Cable assembly was qualified for the accident conditions postulated for the drywell and steam tunnel. This assembly was qualified for 40 years at temperature of 154 degrees Fahrenheit in the drywell and 71.8 years at a temperature of 145 degrees Fahrenheit in the steam tunnel.</p>			
<p>In addition, each EC210/EC290 assembly included a Parker E-740 DuPont EPMD O-ring. Tab E of this EQR, Revision 6, determined that the O-ring installed in the NAMCO EC290 assemblies located in the steam tunnel, need to be replaced every 14.3 years. At the time of the revision, the analysis didn't establish a periodic O-ring replacement schedule for the EC290</p>			

assemblies located in the drywell. Similarly, Tab C of the QUAL-N007-01, the EQ system component evaluation worksheet, showed a requirement for the 14.3 years O-ring replacement for the assemblies located in the steam tunnel but did not show a replacement frequency for the O-rings used in the assemblies located in the drywell.

A review of QTR 500, NAMCO Controls Qualification Report, showed that the O-ring was thermally aged for 100 hours at 126 degrees Celsius for qualified life of 10 years at 150 degrees Fahrenheit. The inspectors were concerned that the EQ File didn't ensure that maintenance activities for periodic replacement of the O-ring for the connector assemblies installed in the drywell would be established/completed prior to their end of qualified life.

In addition, during the inspectors' walkdown for the spare EC290 receptacle/plug-in cable assemblies in the warehouse, the inspectors noticed that the assemblies included the O-rings and had a shelf-life of 480 months. A review of the EQ NAMCO Control Report QTR 500 showed that the qualification report listed a shelf-life of 2 years from shipment for the O-rings. The inspectors were concerned that warehouse storage requirements did not meet the shelf-life specified in the qualification report for the O-rings. Based on the inspectors' concern, the licensee reviewed the procurement records for these assemblies stored in the warehouse and concluded that several O-rings installed in these assemblies had exceeded the 2 year shelf-life.

Corrective Action(s): As immediate corrective actions, the licensee changed the shelf-life for the O-rings to 2 years and tagged and segregated the expired O-rings stored in the warehouse. In addition, the licensee were planning to replace all O-rings for all installed NAMCO connectors located in the steam tunnel and drywell this year coming plant maintenance outage.

Corrective Action References: AR 02261718 and AR 02261255

Performance Assessment:

Performance Deficiency: The inspectors determined that the failure to translate the EQ requirements for the O-rings installed in EC290 connector/plug-in assemblies into maintenance procedures and instructions was contrary to the requirements of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," and a Performance Deficiency.

Screening: The performance deficiency was determined to be more-than-minor because it was associated with the Mitigating Systems cornerstone attribute of design and procedure 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 ensure that the O-ring installed in the EC290 assemblies met the EQ requirement for qualified-life and shelf-life did not ensure the reliability of the EQ connector/plug-in assemblies 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 represent a deficiency affecting the qualification of a mitigating structure, system, or component, however the structure, system, or component maintained its operability/functionality. The licensee

verified that all O-rings in the installed EC290 assemblies did not exceed their shelf-life prior to their installation and the licensee were planning to replace the assemblies located in the drywell this coming plant maintenance outage before their end of qualified life.

Cross-Cutting Aspect: The finding did not have a cross-cutting aspects because it was considered not to be indicative of current licensee performance (i.e., deficiency existed for more than 3 years).

Enforcement:

Violation: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions.

Contrary to the above, prior to May 12, 2017, the licensee failed to assure that the design basis (i.e., EQ Requirements) was translated into maintenance procedures and instructions. Specifically, the licensee did not incorporate the EQ Requirement associated with periodic replacement and shelf-life for the O-ring used in NAMCO EC290 Receptacle/Plug-in Cable assembly. The licensee failed to establish/incorporate the requirement for end-of-life periodic replacement for the O-ring used in the assemblies installed in the drywell. The licensee also failed to establish/incorporate the 2-year shelf-life warehouse storage requirement for the O-ring supplied with the EC290 assemblies.

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 June 5, 2018, the inspector presented the Design Bases Assurance (EQ Program) inspection results to Mr. D. Curtland, and other members of the licensee staff.

DOCUMENTS REVIEWED

Condition Reports—Issued During Inspection

- AR 02261231; Degraded Coating on EQ motors Stored in Warehouse; 04/24/2018
- AR 02261233; Safety-Related Cable Stored Improperly; 04/24/2018
- AR 02261250; SCEW Sheets not Updated for SV4412A/B; 04/24/2018
- AR 02261255; Documentation Update to QUAL-N007-01; 04/24/2018
- AR 02261342; Clarification Needed for QUAL-L200-03E; 04/25/2018
- AR 02261367; Update QUAL-C515-00D with Basis for Activation Energy Value; 04/25/2018
- AR 02261718; Shelf-Life Discrepancy on NAMCO EC290-29020; 04/26/2018
- AR 0262164; MO2512-M/O SCEW Sheet Incorrect; 05/01/2018
- AR 02262184; Limitorque DC Class RH Motors; 05/01/2018
- AR 02262214; Correction Needed for QUAL-A610-00E; 05/01/2018
- AR 02262421; MSIV Limit Switch O-Ring Replacement; 05/02/2018
- AR 02262557; Qual-C515-00E Qualified Life Activation Energy; 05/03/2018

- AR 02262559; EQ Drywell Spray PH Issue; 05/03/2018
- AR 02263489; File QUAL-P381-01E Activation Energy Enhancement; 05/09/2018
- AR 02263548; Terminal Block Qualified Life Documentation Issue; 05/10/2018

Condition Reports Reviewed During Inspection

- AR 02257694; Minor Hazing Found Inside FIS2111; 04/03/2018
- AR 02226131; NAMCO Connector O-ring Replacement Discrepancy

Procedures

- I.PDIS-1204-01; Barton Models 278,288A,288C, and 289A D/P Switches Dry Linear Calibration; Revision 26
- I.PDT-G182-01; Gould PD/PDH 3200 D/P Transmitters Wet Calibration; Revision 6
- Valve-A610-01; General Inspection of ASCO Solenoid Valves; Revision 9
- GMP-ELEC-04; Cable Installation; Revision 13
- GMP-ELEC-09; Electrical Insulation Resistance Testing (MEGGER); Revision 26
- QI-7-NSC-1; Warehouse Receipt, Storage, Issuance and Maintenance; Revision 18
- SD-683; Main Steam & MSIV LTS; Revision 10
- VALVE-A613-01; AVCO Model C-5450-5-110 Solenoid Valves Repair (EQ); Revision 12
- I.ZS-N007-01; Equipment Maintenance Procedure, NAMCO Controls Position and Limit Switches; Revision 17

Drawings

- BECH-M121; P.& I.D. Core Spray System; Revision 41
- BECH-M119; P.& I.D. Residual Heat Removal System; Revision 85
- BECH-EE515<215>; EQ. Equip. Configuration Detail SV7605A; Revision 1
- APED-A71-003; Sht. 11, Nuclear Steam Supply Shutoff System; Revision 22
- BECH-E122; Sht. 020A, Nuclear Steam Supply Shutoff System; Revision 11
- APED-A71-003; Sht. 10, Nuclear Steam Supply Shutoff System; Revision 22
- BECH-M114; P.& I.D. Nuclear Boiler System; Revision 84
- BECH-M338; Drywell Piping Drawing Section A-A; Revision 21
- BECH-M339; Drywell Piping Drawing Section B-B; Revision 16
- BECH-M341; Drywell Piping Drawing Section D-D; Revision 14
- BECH-M340; Drywell Piping Drawing Section C-C; Revision 19
- BECH-E329; Reactor Bldg. – Drywell Conduit & Trays Above EL.757'-4 ½"; Revision 26
- BECH-E328; Reactor Building Conduit & Trays above Elev. 757'-6" Main Steam. Tunnel & CRD Modules; Revision 32
- BECH-M257; Area – 4 Piping Elevation Section E-E Below El. 812'-0"; Revision 31
- BECH-E515; EQ Equipment Configuration Detail MO2512-O; Revision 3

Calculations/Environmental Qualification Binder

- QUAL-A610-00; ASCO Solenoid Valve Model Number NP8316 And NP8321
- QUAL-G182-00; Gulton-Statham (Formerly Gould Inc.) Transmitter Model PDH3200
- QUAL-1204-04; ITT Barton Differential Pressure and Flow Indicating Switch
- CAL-E92-025; Engineering Study for EQ Harsh Environment Definition
- CAL-R00-PP-003; Suppression Pool Post LOCA pH Calculation with Alternate Source Term
- QUAL-SC100; Environmental Service Conditions Analysis
- QUAL-SC101; Environmental and Seismic Service Conditions

- QUAL-L200-03; Limitorque Actuators with Class RH, DC Motors
- QUAL-A348-02; Amerace/Buchanan Terminal Blocks, DC Motors
- QUAL-A613-02; Automatic Valve (AV) Solenoid Valve Cluster Assembly (SCVA) for MISV and Solenoid Valve Assembly for MSR/V
- QUAL-C515-00; Conax ECSAs, RTDs, & Thermocouples
- QUAL-N007-01; NAMCO EC210/EC290 Connector/Plug-in Cable Assemblies
- QUAL-P381-01; PCI Pressure Switch Model A17-1N Installed with Conax Electrical Conductor Seal Assembly

Vendor Manual

- L4-290A/291A-2; Models 290A & 291A Indicating Switch; 5/10/1972
- Bulletin 201; Differential Pressure Transmitters Nuclear Qualified Model PD/PDH 3200 Series; 9/00/1984
- NP8316; Installation & Maintenance Instructions 3-Way Nuclear Solenoid-Operated Pilot Valves; 00/00/1986
- HV-208121; ASCO Valves; Installation & Maintenance Instructions Watertight Splice Box Solenoids For Nuclear Power Plant Pilot Valves; 00/00/1989

Work Orders

- 4051441401; STP 3.3.5.1-35-A Core Spray Pump Discharge Flow-Low; 04/11/2018
- 4051988601; STP 3.3.3.2-01A Remote Shutdown System Instrument Calibration; 02/23/2018