



January 26, 2018

NG-18-0013
10 CFR 50.55a

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Duane Arnold Energy Center
Docket No. 50-331
Renewed Op. License No. DPR-49

Response to Second Request for Additional Information, Fifth Inservice
Inspection Interval Program Plan, Relief Request RR-03

- References: 1) Letter, Curtland (NextEra) to U.S. NRC, "Fifth Inservice
Inspection Interval Program Plan, dated March 7, 2017
(ML17069A172)
- 2) Electronic Communication, Second Round of Request for
Additional Information for DAEC Fifth Inservice Inspection Interval
Program Plan, Relief Request No. RR-03, dated January 5, 2018.

In the Reference 1 letter, NextEra Energy Duane Arnold, LLC (hereafter NextEra Energy Duane Arnold) submitted our Fifth Inservice Inspection Interval Program Plan pursuant to 10 CFR 50.55a. The NRC Staff requested, via Reference 2, additional information regarding Relief Request RR-03 which is contained in Reference 1.

The Enclosure to this letter contains the requested information.

This letter does not contain any new or revised commitments.

If you have any questions or require additional information, please contact
J. Michael Davis at 319-851-7032.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on January 26, 2018

 Mike Strope for Dean Curtland

Dean Curtland
Site Director
NextEra Energy Duane Arnold, LLC

Enclosure

cc: NRC Regional Administrator
NRC Resident Inspector
NRC Project Manager

Enclosure to NG-18-0013

Response to Second Request for Additional Information, Fifth Inservice
Inspection Interval Program Plan, Relief Request RR-03

1.0 INTRODUCTION

In the Reference 1 letter, NextEra Energy Duane Arnold, LLC (hereafter NextEra Energy Duane Arnold) submitted our Fifth Inservice Inspection Interval Program Plan pursuant to 10 CFR 50.55a. The NRC Staff requested, via Reference 2, additional information regarding Relief Request RR-03 which is contained in Reference 1. The requested information is given below.

2.0 REQUEST FOR ADDITIONAL INFORMATION

By letter dated March 7, 2017 (Agency wide Documents Access and Management System Accession No. ML17069A172), NextEra Energy Duane Arnold, LLC (the licensee) submitted the fifth inservice inspection (ISI) interval program plan for Duane Arnold Energy Center (DAEC) for the U. S. Nuclear Regulatory Commission (NRC) review and approval. The program plan contains several relief requests from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, requirements. Among them, Relief Request RR-03 proposed to use an alternative based on ASME Code Case N-702, "Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds," for inspection of nozzle inner radius and nozzle-to-shell welds at Duane Arnold Energy Center (DAEC).

Background

On October 26, 2017 (ADAMS Accession No. ML17300A195), the licensee provided response to the NRC staff's request for additional information (RAI), sent via an email dated August 8, 2017 (ADAMS Accession No. ML17220A333). The NRC staff reviewed the RAI response and determined that additional information was required to complete the response. On November 7, 2017, a teleconference was held between the NRC staff and the NextEra representatives to discuss the needed information. As a result, on December 7, 2017 (ADAMS Accession No. ML17341A852), the licensee provided supplemental response to the original RAI. The NRC staff has reviewed this supplemental response and found four issues with the licensee's supplemental response:

- The response states that there are no acceptance criteria for probability of failure (PoF) due to normal operation. The NRC staff noted that the acceptance criteria for PoF due to normal operation was established in the safety evaluation (SE) for the Boiling Water Reactor Vessel Internals Project (BWRVIP) report, BWRVIP-108, "Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," (ADAMS Accession No. ML073600374).
- The response states that linear elastic fracture mechanics (LEFM) is overly conservative for vessel material behavior at normal operating temperatures, and the number reported in the BWRVIP-108 SE for normal

operation PoF was used for comparative purposes only. The NRC staff noted that normal operation includes heatup, cooldown, and hydro/pressure test, covering the entire temperature range. Therefore, using LEFM is appropriate. Further, the supplemental response by Boiling Water Reactor Vessel Internals Project (BWRVIP) in letter dated September 13, 2007 (ML072600167) to support BWRVIP-108 contains PoF values for both the normal operating condition and the low temperature overpressure (LTOP) condition for all simulation cases without emphasizing one condition. Therefore, during the BWRVIP-108 review, the BWRVIP and the NRC treated both normal operation condition and LTOP condition equally.

- The response states that the PoF due to normal operation is irrelevant because when the plant stays within the required pressure-temperature (P-T) curve limits the regulatory required margin to failure is met. The NRC staff noted that the P-T limit or pressurized thermal shock (PTS) requirements are completely separated from the ASME inspection requirements. A plant meeting the P-T limit (BWRs and PWRs) or PTS (PWRs) requirements still needs to perform ASME Code required inspections. The inspection alternative proposed in BWRVIP-108 was based on the probabilistic fracture mechanics (PFM) results for the normal and LTOP conditions. Therefore, the PoF due to normal operation is essential information for the NRC staff's evaluation.
- The response implied that conditional PoF is more relevant in this evaluation. In the risk evaluation, the NRC staff always considers the event frequency and the conditional PoF. If the event frequency is zero, then the value of conditional PoF is meaningless. Both were considered by the BWRVIP and the NRC staff during the BWRVIP-108 review.

Hence, the NRC staff determined that the following follow-up RAI is needed to complete the review of RR-03.

Follow-up RAI

The licensee's October 26, 2017, response to the RAI contains a plant-specific PFM for the LTOP condition to support Relief Request RR-03. However, the PFM results in the supplemental response by Boiling Water Reactor Vessel Internals Project (BWRVIP) in letter dated September 13, 2007 (ML072600167) to support BWRVIP-108, indicated that the PFM results for normal operation are more limiting than the LTOP condition. Since the approval of BWRVIP-108 was based on the BWRVIP's PFM results, which indicated that both the normal condition and the LTOP condition satisfy the NRC's safety goal of 5×10^{-6} , performing PFM results for the normal condition is essential. Please provide the PFM results for the normal condition, or quantitative information to demonstrate that the normal condition is not limiting for DAEC.

RESPONSE:

SI Calculation No. 1701150.301 Revision 1 determined that probability of failure (PoF) per reactor year due to a Low Temperature Over Pressure (LTOP) event for the nozzle-to-shell-weld and nozzle blend radii in the Duane Arnold N1 nozzles are below the acceptance criterion of 5×10^{-6} per year. The work was performed using the same methodology used in BWRVIP-108, which is the technical basis for ASME Code Case N-702 and similar to the work in BWRVIP-05.

In the NRC Staff's request for additional information, sent via email dated January 5, 2018 the PoF due to normal operation was requested to complete their response for NextEra's Relief Request RR-03.

In response to the RAI, the PoF due to normal operation was calculated for both the nozzle-to-shell-weld and nozzle blend radii in the Duane Arnold N1 nozzles. For both components, there were no failures in two million simulations, which means the PoF is less than 8×10^{-9} . This is significantly below the PoF due to an LTOP event and the acceptance criterion of 5×10^{-6} per year. The normal operation PoF was calculated using the same methodology as the normal operation PoF number reported in the Safety Evaluation of BWRVIP-108.

3.0 REFERENCES

- 1) Letter, Curtland (NextEra) to U.S. NRC, "Fifth Inservice Inspection Interval Program Plan, dated March 7, 2017 (ML17069A172).
- 2) Electronic Communication, Request for Additional Information – Duane Arnold Energy Center – Relief Request RR-03 – Alternative Requirements for Nozzle Inner Radius and Nozzle-To-Shell Welds, dated August 08, 2017.
- 3) Letter, Curtland (NextEra) to U.S. NRC, "Supplemental Response to Request for Additional Information, Fifth Inservice Inspection Interval Program Plan, Relief Request RR-03," dated December 7, 2017 (ML17341A852).
- 4) Electronic Communication, Second Round of Request for Additional Information for DAEC Fifth Inservice Inspection Interval Program Plan, Relief Request No. RR-03, dated January 5, 2018.