



December 7, 2017

NG-17-0241
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

Supplemental Response to 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, Request for Additional Information –
Duane Arnold Energy Center – Relief Request No. RR-03 –
Alternative Requirements for Nozzle Inner Radius and Nozzle-To-
Shell Welds, dated August 8, 2017 (ML17220A333)
- 3) Letter, Curtland (NextEra) to U.S. NRC, "Response to Request for
Additional Information, Fifth Inservice Inspection Interval Program
Plan, Relief Request RR-03," dated October 26, 2017
(ML17300A195)

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. NextEra Energy Duane Arnold provided the additional information in Reference 3. Subsequent discussion with the NRC Staff has identified the need for a supplemental response regarding Relief Request RR-03.

The Enclosure to this letter contains Structural Integrity Associates, Inc. Report No. 1701150.401.R0 which includes the requested supplemental information. This report provides context for the Probable Fracture Mechanic results for the

low temperature over pressure condition and the normal operation condition; specifically, the differences in the methods used to determine these results and the context in which each value can be illustrative.

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 December 7, 2017



Dean Curtland
Site Director
NextEra Energy Duane Arnold, LLC

Enclosure

cc: NRC Regional Administrator
NRC Resident Inspector
NRC Project Manager

Enclosure to NG-17-0241

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

Structural Integrity Associates, Inc. Report No. 1701150.401.R0

2 pages follow



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November 29, 2017
Report No. 1701150.401.R0
Quality Program: Nuclear Commercial

Subject: Normal Operating Probability of Failure for Code Case N-702 Using VIPERNOZ

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 and computer program used in BWRVIP-108, which is the technical basis for ASME Code Case N-702 and similar to the work in BWRVIP-05. However, during sensitivity studies performed for the Safety Evaluation Report (SER) of BWRVIP-108, the results for normal operating conditions were requested for sensitivity comparison, even though it was not the focus of BWRVIP-108. The reported PoF due to normal operation was higher than the PoF due to an LTOP event for one of the sensitivity study cases.

The purpose of this report is to explain why reporting the PoF due to normal operation in the application of Code Case N-702 using the VIPERNOZ program is not required.

There are no acceptance criteria for PoF due to normal operation. The 5×10^{-6} PoF limit for the LTOP event is obtained from NUREG-1806 for pressurized thermal shock screening.

In addition, since the VIPERNOZ program was designed to give a proper LTOP PoF number, the program only considers linear elastic fracture mechanics (LEFM). This is appropriate for analyzing the conditions during an LTOP event, but overly conservative for vessel material behavior at normal operating temperatures where materials have significantly higher ductility. The number reported in the BWRVIP-108 SER for normal operation PoF was used for comparative information purposes only.

Other than for comparative information purposes, the PoF due to normal operation is irrelevant because when the plant stays within the required pressure-temperature (PT) curve limits the regulatory required margin to failure is met. The intent of the BWRVIP-05 and BWRVIP-108 work was to evaluate the PoF due to a postulated LTOP event, where the low temperature and high pressure can result in failure due to brittle fracture. The PT curves assure that plant startup, shutdown, and other normal operating conditions are within the bounds for prevention of brittle failure. Accordingly, a PoF value for normal operating conditions calculated using the LEFM method in VIPERNOZ is not appropriate for comparison to the PoF acceptance criterion.

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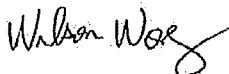
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In addition, the PoF for the LTOP event in the sensitivity study reported in the SER of BWRVIP-108 is actually two orders of magnitude higher (1.19×10^{-4}) than the normal operation condition (1.98×10^{-6}). It's only when the conditional probability of the LTOP event is accounted for that the comparison showed a closer relationship. This confirms the original assessment in BWRVIP-05 and concurred in the SER of BWRVIP-108, that the LTOP event is the governing event that should be evaluated for PoF.

Therefore, the PoF due to normal operation in the application of Code Case N-702 is not required because it's calculated using overly conservative methods, is already addressed in PT curve limits, and is governed by the LTOP event.

Prepared by:

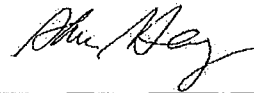


Wilson Wong
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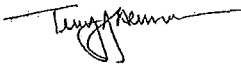


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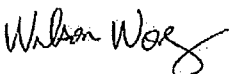


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