



April 14, 2016

NG-16-0076  
10 CFR 50.90

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 Request for Additional Information, License Amendment Request (TSCR-143) to Extend Containment Leakage Test Frequency

- References: 1) License Amendment Request (TSCR-143) to Extend Containment Leakage Test Frequency, NG-15-0234, dated August 18, 2015 (ML15246A445)
- 2) Electronic Communication, Request for Additional Information – Extension of the 10 CFR 50 Appendix J Containment Type A & Type C Test Intervals, dated December 15, 2015
- 3) Letter, T. A. Vehec (NextEra) to U.S. NRC, “Response to Request for Additional Information, License Amendment Request (TSCR-143) to Extend Containment Leakage Test Frequency, NG-16-0029, dated January 29, 2016
- 4) Electronic Communication, Request to Additional Information – Extension of the 10 CFR 50 Appendix J Containment Type A & Type C Test Intervals, dated March 14, 2016

In the Reference 1 letter, NextEra Energy Duane Arnold, LLC (hereafter NextEra Energy Duane Arnold) submitted a License Amendment Request for the Duane Arnold Energy Center (DAEC) pursuant to 10 CFR 50.90. The NRC Staff requested, via Reference 2, additional information regarding that application. NextEra Energy Duane Arnold submitted that additional information via Reference 3. Subsequently, the NRC Staff requested, via Reference 4, additional information regarding that application.

The Enclosure to this letter contains the requested information.

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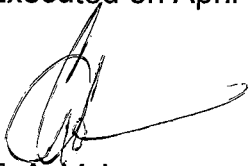
This additional information does not impact the 10 CFR 50.92 evaluation of "No Significant Hazards Consideration" previously provided in the referenced application.

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 April 14, 2016



T. A. Vehec

Vice President, Duane Arnold Energy Center

NextEra Energy Duane Arnold, LLC

Enclosure

cc: NRC Regional Administrator  
NRC Resident Inspector  
NRC Project Manager  
A. Leek (State of Iowa)

Enclosure to NG-16-0076

Response to Request for Additional Information, License Amendment Request  
(TSCR-143) to Extend Containment Leakage Test Frequency

12 pages follow

## **NRC RAI**

*In a letter dated August 18, 2015, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15246A445), as supplemented by letter dated January 29, 2016 (ADAMS Accession No. ML16034A031), NextEra Energy Duane Arnold, LLC requested an amendment to Duane Arnold Energy Center (DAEC) Technical Specifications (TS). The proposed amendment will revise DAEC TS Section 5.5.12, "Primary Containment Leakage Rate Testing Program," to allow extension of the Type A test interval up to one test in 15 years and extension of the Type C test interval up to 75 months.*

*The Probabilistic Risk Assessment Licensing Branch issued Request for Additional Information (RAI) by letter dated November 24, 2015 (ADAMS Accession No. ML15327A476) and the licensee provided responses to the RAI in letter dated January 29, 2016. The NRC staff has reviewed the responses and has determined that additional information is needed for the staff to complete its evaluation. The request for additional information is provided as below:*

### **Second Round of Request for Additional Information Regarding Duane Arnold Energy Center Request to Permanently Extend the Integrated Leak Rate Test Frequency to 15 Years**

*In an electronic communication dated December 15, 2015, the NRC staff requested a list of all findings from the past peer reviews and self-assessments relevant to the Integrated Leak Rate Test (ILRT) extension submittal, dated August 18, 2015, for which the internal events probabilistic risk assessment (PRA) did not meet the American Society of Mechanical Engineers (ASME) PRA Standard Capability Category (CC) I supporting requirements (SRs) and requested the licensee to summarize why not meeting each CC I requirement would have no impact on this application (PRA request for additional information (RAI)-1.b). In response to PRA RAI-1.b, the licensee identified five SRs, IE-B3, IE-C6, HR-A1, HR-A2 and HR-C1, which were assessed as not meeting CC I. The licensee further discussed the impact of findings associated with those SRs on the Duane Arnold Energy Center (DAEC) containment leakage test frequency extension request in Table 1 of the response.*

*In discussing the impact of not meeting SRs IE-B3 and IE-C6, the licensee stated, in part, that:*

*Substantial margin to the guidelines contained in Regulatory Guide 1.174 have been demonstrated for this ILRT test interval extension request with respect to acceptable changes in [large early release frequency] LERF. ... Change in the Type A ILRT test interval from the three in ten years to one in fifteen years is conservatively estimated to represent a 2.57E-08/yr increase in LERF. Postulated increase in baseline values of [core damage frequency] CDF and LERF result in approximately the same fractional increase in the calculated delta-LERF for this application. For example, a large increase in baseline CDF and LERF, such as 10 percent, would translate into an increase in delta-LERF of about 10 percent, resulting in a final delta-LERF that is still well below the 1E-07 criteria for which the impact of the requested ILRT testing extension is considered to be very small. As such, these criteria would also not be exceeded by inclusion of additional initiators in the PRA as required for closure of this Peer Review item.*

*In discussing the impact of not meeting SR HR-C1, the licensee stated that:*

*The impact of evaluating pre- initiators at the train level instead of the system level, or at the system level instead of the train level, is judged to have little or no impact on baseline values of CDF and LERF. Even if the actual impact of addressing this gap is more than minor, the*

*change translates into only a small reduction in margin to criteria established for the ILRT testing interval extension application as described earlier with respect to finding IE-B3-01A. As such, the conclusions of the risk evaluation performed for this application are not changed by this variance from the standard.*

*The estimated increase in LERF of  $2.57E-08$ /yr does not include the risk from external events. In the original submittal, the licensee estimated the total increase in LERF from both internal and external events as  $8.14E-08$ /yr. Furthermore, this impact estimate (from both external hazards and internal events) provided in the original submittal does not include the new seismic hazard CDF and LERF estimates, which were provided in response to PRA RAI-2. The new seismic CDF estimate in response to PRA RAI-2 is larger than the seismic CDF estimate in the original submittal by more than a factor of 8. Although the licensee provided an estimate change in LERF of  $6.80E-08$ /yr in response to PRA RAI-2 when providing the new seismic CDF estimate, this change in LERF estimate does not appear to include the risk from other external hazards or internal events.*

*The NRC staff believes that the change in LERF could increase to a value greater than  $1E-07$ /yr when the impact from external events is considered, the new seismic CDF and LERF estimates from response to PRA RAI-2 are used, and the findings related to IE-B3, IE-C6, and HR-C1 are resolved. For a change in LERF greater than  $1E-07$ /yr, the licensee should provide total LERF and demonstrate that the RG 1.174 guidelines are met. The licensee provided total LERF estimate of  $9.79E-06$ /yr in the original submittal. Again, this estimate could exceed the guideline value of  $1E-05$ /yr once the new seismic risk estimates are considered and the findings associated with the above SRs are resolved.*

*In summary, the NRC staff does not find the information provided by the licensee in the original submittal and in response to PRA RAIs to be sufficient for determining that the change in LERF is less than  $1E-07$ /yr (to meet the guidelines of RG 1.174 Region III) or the total LERF is less than  $1E-05$ /yr (to meet the guidelines of RG 1.174 Region II).*

*Show that the change in LERF does not exceed  $1E-07$ /yr by including the impact of external hazards, using updated seismic risk estimates and providing a sensitivity analysis that estimates the impact of not meeting SRs IE-B3, IE-C6 and HR-C1. Alternatively, show that the total LERF does not exceed  $1E-05$ /yr when external hazards are considered, updated seismic risk estimates are used, and a sensitivity analysis is performed to estimate the impact of not meeting SRs listed above.*

**NextEra Energy Response:**

This response is provided in three parts:

- Part 1 – Impact of All External Hazards to the Change in LERF – provides all of the information previously provided in RAI-2. It includes:
  - An estimate of DAEC Seismic CDF and Seismic LERF using the most up to date seismic hazard estimate
  - A discussion of the internal and external events total CDF, total LERF, and  $\Delta$ LERF for the ILRT application, updated for the new seismic hazard.
  - A sensitivity case examining a lower bound for seismic LERF value.
  
- Part 2 – Sensitivity Analysis for the impact of SRs IE-B3, IE-C6 and HR C1 –It includes:
  - The impact of SRs IE-B3, IE-C6 and HR C1 on internal events and fire CDF and LERF
  - The delta LERF determination for internal events
  - The delta LERF determination for external events
  - The assessment of the combined results against the RG 1.174  $\Delta$ LERF Acceptance Guideline
  
- Part 3: RAI Response Summary – provides a summary table of all analysis results.

**Part 1: Impact of All External Hazards to the Change in LERF**

*External Events Total CDF, Total LERF, and  $\Delta$ LERF for ILRT Application*

Table 1 summarizes the conservative Duane Arnold external hazard CDF estimates used for the ILRT application.

<b>Table 1: Conservative External Hazard CDF and LERF Estimates used for ILRT Application</b>		
<b>Hazard</b>	<b>CDF (/yr)</b>	<b>LERF (/yr)</b>
Seismic	5.71E-06	5.71E-06
Internal Fire	1.20E-05	7.49E-06
External Flood	< 1E-06	Not calculated
High Winds	1.41E-07	< 1.41E-07

Table 1: Conservative External Hazard CDF and LERF Estimates used for ILRT Application		
Hazard	CDF (/yr)	LERF (/yr)
Transportation and Nearby Facilities	not significant	not significant
Other Plant-Unique	Judged included in IPE for External Events	Judged included in IPE for External Events
Total	< 1.89E-05	< 1.33E-05

The value of Seismic CDF and LERF, External Flood, Transportation and Nearby Facilities, and Other Plant-Unique hazards have been updated from the values presented in Table 7-2 of Reference 4. The information in Table 1 differs somewhat from what was provided in the response contained in Reference 10, however it more accurately characterizes the external events risk for DAEC and its use does not change any ILRT conclusions for DAEC.

The value of seismic LERF is assumed to be equal to seismic CDF. The values presented above are taken from Reference 5.

The External Flooding CDF and LERF were not calculated. In section 5.2.5 of the DAEC IPEEE (Reference 6) it was concluded that the DAEC design basis has been determined to meet the 1975 SRP criteria related to external floods. Based on the conformance to the 1975 SRP, the contribution to core damage frequency from external flood initiated accident sequences is judged to be less than 1E-6/yr. Furthermore, Reference 7, in the reevaluation of the flooding hazard for the Duane Arnold Energy Center site, concluded that the Current Licensing and Design Basis (CLB) bounds the updated results.

For the CDF and LERF due to Transportation and Nearby Facilities Hazards, section 5.3.5 of Reference 6 concluded that the "design of the DAEC plant is appropriate for its siting such that the contribution to overall plant risk from transportation and nearby facility hazards is not significant." For the Other Plant-Unique Hazards, Reference 6, section 5.4.6 stated "No quantitative evaluation was judged necessary for external events not already included in the internal IPE or the NRC-specified external events of the IPEEE."

An alternate estimate of the wind hazard LERF can be made assuming the ratio CDF to LERF for these hazards is similar to the ratio for internal events. The internal events CDF is 4.24E-06/yr (per Section 5.2.1 of Reference 4, and the internal events LERF is 1.46E-06/yr (per high early release frequency specified in Table 5-1 of Reference 1). The internal event ratio of LERF to CDF is:

$$\text{LERF}_{\text{IE}} / \text{CDF}_{\text{IE}} = 1.46\text{E-}06/\text{yr} / 4.24\text{E-}06/\text{yr} = 0.34$$

The total external events LERF contribution for DAEC is therefore approximated as:

$$\begin{aligned} \text{LERF}_{\text{EE}} &= (\text{LERF}_{\text{seismic}}) + (\text{CDF}_{\text{wind}} * 0.34) + (\text{LERF}_{\text{fire}}) \\ &= (5.71\text{E-}06) + (1.41\text{E-}07 * 0.34) + (7.49\text{E-}06) \\ &= 1.32\text{E-}05/\text{yr} \end{aligned}$$

Note that the above LERF estimate does not consider internal events and any LERF contribution due to non-detected containment flaws as assessed in the ILRT methodology.

External events LERF attributed specifically to non-detected containment failures is conservatively estimated as follows, using the probabilities of a non-detected containment failure ( $p_{\text{NDCF}}$ ) described in Section 5.3 of Reference 4:

$$\text{LERF}_{\text{NDCF}} = p_{\text{NDCF}, \Delta} * (\text{CDF}_{\text{EE}} - \text{LERF}_{\text{EE}})$$

- Where,  $p_{\text{NDCF}, 3/10} = 0.0023$
- $p_{\text{NDCF}, 1/10} = 0.0023 * 3.33$
- $p_{\text{NDCF}, 1/15} = 0.0023 * 5.00$
- $\text{CDF}_{\text{EE}} = 1.89\text{E-}05/\text{yr}$  (from Table 1)
- $\text{LERF}_{\text{EE}} = 1.32\text{E-}05/\text{yr}$

[ $\text{CDF}_{\text{EE}}$  and  $\text{LERF}_{\text{EE}}$  are the core damage and large early release frequencies, respectively, associated with external hazard sequences only]

Note in the above equation, LERF is subtracted from CDF because only the non-LERF portion of CDF is applicable to the ILRT Class 3b evaluation. This properly excludes sequences that are already LERF and independent of Class 3b such as containment isolation failure. The results of the ILRT Class 3b calculation of  $\Delta\text{LERF}$  are presented in Table 2.

Table 2 summarizes the External Events LERF and  $\Delta\text{LERF}$  values attributed specifically to non-detected containment failures. Reported  $\Delta\text{LERF}$  values are relative to the 3 per 10 year surveillance interval.

Table 2: External Events LERF and $\Delta\text{LERF}$ specific to each ILRT Test Interval		
ILRT Interval	LERF (/yr)	$\Delta\text{LERF}$ (/yr)
3 per 10 years	1.29E-08	-
1 per 10 years	4.29E-08	3.00E-08
1 per 15 years	6.44E-08	5.15E-08



*Assessment of internal and external events against the RG 1.174 ΔLERF Acceptance Guideline*

The ΔLERF for the 1/10 and 1/15 ILRT intervals (combining the contributions from internal and external events), relative to the base 3/10 interval, are as follows:

$$\begin{aligned}\Delta\text{LERF}_{1/10} &= \Delta\text{LERF}_{\text{IE},1/10} \text{ (Table 6-8 of Reference 4)} + \Delta\text{LERF}_{\text{EE},1/10} \\ &= 1.50\text{E-}08/\text{yr} + 3.00\text{E-}08/\text{yr} \\ &= 4.50\text{E-}08/\text{yr}\end{aligned}$$

$$\begin{aligned}\Delta\text{LERF}_{1/15} &= \Delta\text{LERF}_{\text{IE},1/15} \text{ (Table 6-8 of Reference 4)} + \Delta\text{LERF}_{\text{EE},1/15} \\ &= 2.57\text{E-}08/\text{yr} + 5.15\text{E-}08/\text{yr} \\ &= 7.72\text{E-}08/\text{yr}\end{aligned}$$

*Sensitivity Analysis*

An additional sensitivity analysis was performed on the fraction of seismic core damage frequency expected to lead to LERF. The results of this sensitivity analysis demonstrate that the ΔLERF value remains below 1E-07/year for all seismic LERF contributions when the fraction of seismic core damage frequency expected to lead to LERF exceeds 60%. This 60% value is considered reasonable, given that industry experience indicates that plants with full scope seismic PRAs notice a LERF/CDF in general higher than the ratio noticed in internal events.

*Conclusion*

For the updated estimate of seismic CDF of 5.71E-06/yr, the ΔLERF for the 1/15 interval falls within RG 1.174 Region III (Reference 8), where ΔLERF is less than 1.0E-07/yr. In this region, the ΔLERF contribution due to the ILRT interval extension is considered very small.

**Part 2: Sensitivity Analysis for the impact of SRs IE-B3, IE-C6 and HR C1.**

The RAI requests that the licensee provide a sensitivity analysis that estimates the impact of SRs IE-B3, IE-C6 and HR C1.

Reference 9 contains the results of the evaluation of the impact of the unresolved peer review findings. The evaluation concludes that the fire PRA is impacted only by peer review finding HR-C1-01A, causing both the value of Fire PRA CDF and LERF to increase by approximately 3%. The internal events PRA is impacted by peer review findings IE-B3-01A and finding HR-C1-01A. The estimated combined impact from these findings causes internal events CDF to increase by approximately 16.9% and internal events LERF to increase by approximately 18.6%.

Incorporating results of the previously unresolved peer review comments results in the following updated values of CDF and LERF for the internal and external events PRAs (including the seismic PRA contribution determined by Part 1 above):

Internal Events PRA CDF	= 4.96E-06/yr (from Reference 9, Table 6)
Internal Events PRA LERF	= 1.73E-06/yr (from Reference 9, Table 6)
Seismic Hazard CDF	= 5.71E-06/yr (unchanged from above)
Seismic Hazard LERF	= 5.71E-06/yr (unchanged from above)
Fire PRA CDF	= 1.24E-05/yr (from Reference 9, Table 5)
Fire PRA LERF	= 7.72E-06/yr (from Reference 9, Table 5)
High Winds CDF	= 1.41E-07/yr (unchanged from above)
High Winds LERF	= 4.86E-08/yr (unchanged from above)
External Flood CDF	= 1.00E-6/yr (unchanged from above)

Integrating these changes into the plant CDF/LERF contribution table (see Table 3) results in the following:

<b>Table 3: Summary Table of CDF and LERF Estimates used for ILRT Sensitivity Analysis</b>		
<b>Hazard</b>	<b>CDF (/yr)</b>	<b>LERF (/yr)</b>
Internal Events	4.96E-06	1.73E-06
Seismicity	5.71E-06	5.71E-06
Internal Fire	1.24E-05	7.72E-06
External Flood	< 1E-06	not calculated
High Winds	1.41E-07	4.86E-08
Transportation and Nearby Facilities	not significant	not significant
Other Plant-Unique	Judged included in IPE for External Events	Judged included in IPE for External Events
<b>Total for External Events</b>	<b>1.93E-05</b>	<b>1.35E-05</b>

**Delta LERF Determination for Internal Events (impact of SRs)**

In order to determine the impact of the sensitivity values of Internal Events CDF and LERF, these values are used as input to a sensitivity calculation of the impact of the ILRT extension risk assessment. Changes to the values of internal events CDF and LERF also result in modifications to the class frequency distributions used for the ILRT analysis. The results of this calculation are contained in Table 4.

**Table 4: Internal Events Sensitivity Case – Duane Arnold ILRT Cases: Base, 3 to 10, and 3 to 15 Yr Extensions (Including Age Adjusted Steel Liner Corrosion Likelihood)**

EPRI Class	DOSE (Per-Rem)	Base Case 3 in 10 Years		Extend to 1 in 10 Years		Extend to 1 in 15 Years	
		CDF/Yr	Per-Rem/Yr	CDF/Yr	Per-Rem/Yr	CDF/Yr	Per-Rem/Yr
1	3.45E+03	1.79E-07	6.17E-04	9.23E-08	3.18E-04	3.02E-08	1.04E-04
2	5.19E+05	1.26E-08	6.54E-03	1.26E-08	6.54E-03	1.26E-08	6.54E-03
3a	3.45E+04	2.97E-08	1.03E-03	9.89E-08	3.41E-03	1.49E-07	5.13E-03
3b	3.45E+05	7.45E-09	2.57E-03	2.48E-08	8.57E-03	3.73E-08	1.29E-02
7	3.67E+05	4.72E-06	1.73E+00	4.72E-06	1.73E+00	4.72E-06	1.73E+00
8	5.19E+05	1.89E-08	9.80E-03	1.89E-08	9.80E-03	1.89E-08	9.80E-03
Total	N/A	4.96E-06	1.75E+00	4.96E-06	1.76E+00	4.96E-06	1.77E+00
ILRT Dose Rate from 3a and 3b		3.60E-03		1.20E-02		1.80E-02	
Delta Total Dose Rate	From 3 in 10 yr	N/A		8.08E-03		1.39E-02	
	From 1 in 10 yr	N/A		N/A		5.79E-03	
% change in dose rate from base	From 3 in 10 yr	N/A		0.46%		0.79%	
	From 1 in 10 yr	N/A		N/A		0.33%	
3b Frequency (LERF)		7.45E-09		2.48E-08		3.73E-08	
Delta LERF	From 3 in 10 yr	N/A		1.74E-08		2.98E-08	
	From 1 in 10 yr	N/A		N/A		1.24E-08	
CCFP %		95.80%		96.15%		96.40%	
Delta CCFP%	From 3 in 10 yr	N/A		0.35%		0.60%	
	From 1 in 10 yr	N/A		N/A		0.25%	

The results of this sensitivity analysis are summarized in Table 5.

Table 5: Summary of Results from the Internal Events Analysis Documented in Table 4		
ILRT Interval	LERF (/yr)	$\Delta$ LERF (/yr)
3 per 10 years	7.45E-09	-
1 per 10 years	2.48E-08	1.74E-08
1 per 15 years	3.73E-08	2.98E-08

**Delta LERF Determination for External Events (impact from SRs)**

External events LERF attributed specifically to non-detected containment failures is conservatively estimated as follows, using the probabilities of a non-detected containment failure ( $p_{NDCF}$ ) described in Section 5.3 of Reference 4:

$$LERF_{NDCF} = p_{NDCF, \Delta} * (CDF_{EE} - LERF_{EE})$$

Where,  $p_{NDCF,3/10} = 0.0023$

$p_{NDCF,1/10} = 0.0023 * 3.33$

$p_{NDCF,1/15} = 0.0023 * 5.00$

$CDF_{EE} = 1.94E-05/yr$  (from Table 3 above)

$LERF_{EE} = 1.36E-05/yr$  (from Table 3 above)

$CDF_{EE} - LERF_{EE} = 5.77E-06$

Table 6 summarizes the External Events LERF and  $\Delta$ LERF values attributed specifically to non-detected containment failures. Reported  $\Delta$ LERF values are relative to the 3 per 10 year surveillance interval.

Table 6: Sensitivity Analysis: External Events LERF and $\Delta$ LERF specific to each ILRT Test Interval		
ILRT Interval	LERF (/yr)	$\Delta$ LERF (/yr)
3 per 10 years	1.33E-08	-
1 per 10 years	4.42E-08	3.09E-08
1 per 15 years	6.64E-08	5.31E-08

**Assessment against the RG 1.174  $\Delta$ LERF Acceptance Guideline**

The  $\Delta$ LERF for the 1/10 and 1/15 ILRT intervals, relative to the base 3/10 interval, are as follows:

$$\begin{aligned} \Delta\text{LERF}_{1/10} &= \Delta\text{LERF}_{\text{IE},1/10} \text{ (from Table 5)} + \Delta\text{LERF}_{\text{EE},1/10} \text{ (from Table 6)} \\ &= 1.74\text{E-}08/\text{yr} + 3.09\text{E-}08/\text{yr} \\ &= 4.83\text{E-}08/\text{yr} \end{aligned}$$

$$\begin{aligned} \Delta\text{LERF}_{1/15} &= \Delta\text{LERF}_{\text{IE},1/15} \text{ (from Table 5)} + \Delta\text{LERF}_{\text{EE},1/15} \text{ (from Table 6)} \\ &= 2.98\text{E-}08/\text{yr} + 5.31\text{E-}08/\text{yr} \\ &= 8.29\text{E-}08/\text{yr} \end{aligned}$$

### Conclusion

In this sensitivity case, the values of internal events CDF, internal events LERF, fire events CDF and fire events LERF have been raised to reflect the impact of the unresolved peer review comments. When these impacts are included, the  $\Delta\text{LERF}$  for the 1/15 interval rises from 7.72E-08/yr to 8.29E-08/yr. This higher value falls within RG 1.174 Region III (Reference 8) for very small increases, where  $\Delta\text{LERF}$  is less than 1.0E-07/yr.

### **Part 3: RAI Response Summary**

Table 7 provides a summary of the results of the analyses performed for this RAI response.

<b>Table 7: Summary Table of RAI Response Values</b>		
<b>Analysis Case</b>	<b>Delta LERF Value 1/10 (/yr)</b>	<b>Delta LERF Value 1/15 (/yr)</b>
Updated Seismic Hazard (CDF <sub>seismic</sub> equals LERF <sub>seismic</sub> )	4.50E-08	7.72E-08
Updated Seismic Hazard plus impact of SRs (CDF <sub>seismic</sub> equals LERF <sub>seismic</sub> )	4.83E-08	8.29E-08

The results of these analysis cases demonstrate that the  $\Delta\text{LERF}$  value remains below 1E-07/year when the impact of the updated seismic hazard and unmet supporting requirements are included.

## RAI Response References

1. NRC Document, "Results of Safety/Risk Assessment of Generic Issue (GI) 199, 'Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants,'" (ADAMS Accession No. ML100270582).
2. EPRI Document, "Seismic Probabilistic Risk Assessment Implementation Guide," EPRI, Palo Alto, CA: 2013. 3002000709.
3. NextEra Energy document, NG-14-0092, "NextEra Energy Duane Arnold, LLC Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," March 2014 (ADAMS Accession No. ML14092A331).
4. NextEra Energy Document, NG-15-0234 "License Amendment Request (TSCR-143) to Extend Containment Leakage Test Frequency," dated 18 August 2015, (ADAMS Accession No. ML15246A445), Attachment 4.
5. NextEra Energy Document, DAEC-BFJR-14-015, Revision 0, "Duane Arnold Seismic CDF Estimate."
6. NextEra Energy Document, "Duane Arnold Energy Center Individual Plant Examinations of External Events (IPEEE)," November 1995.
7. NextEra Energy Document, FPL070-PR-002, Rev. 0, "NTTF Recommendation 2.1 (Hazard Reevaluations): Flooding."
8. Regulatory Guide 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant Specific Changes to the Licensing Basis," May 2011.
9. NextEra Energy document, *Assessment of PRA Peer Review Findings with Respect to ILRT Testing Interval Extension*, as transmitted by EC 284252 DIT-08, *PDA Transition to NEI 94-01 R-3A*, dated 30 March 2016.
10. NextEra Energy Document, NG-16-0029 "Response to Request for Additional Information; License Amendment Request (TSCR-143) to Extend Containment Leakage Test Frequency, dated 29 January 2016."