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November 8, 2001

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

SUBJECT: Waterford Steam Electric Station, Unit 3
Docket No. 50-382
License No. NPF-38
Technical Specification Change Request NPF-38-236
Integrated Leakage Rate Testing Interval Extension

Gentlemen:

In a letter dated July 23, 2001, Entergy Operations, Inc. (Entergy) had requested approval of a change to the Waterford Steam Electric Station, Unit 3 (Waterford 3) Technical Specifications extending the interval for the performance of the Integrated Leak Rate Test. Entergy subsequently provided responses to several containment inspection questions and an assessment of the risk impact of the requested change using a previously accepted methodology by letter dated September 21, 2001. The risk methodology was similar to that approved for the Crystal River 3 (CR3) application. In the September 21, 2001 risk assessment, Entergy utilized the total CDF when determining the contribution of the EPRI Class 1 events; attached is a revised assessment that more appropriately uses the CDF for intact containment sequences. The information in Attachment 1 supersedes in its entirety the information in Attachment 2 of the September 21, 2001 correspondence. The changes made are highlighted.

Attachment 1 provides a plant-specific sensitivity analysis that considers the differences in analytical approach between the original Waterford 3 submittal and the previously approved CR3 methodology. The approach taken in that original submittal is still considered to be appropriate, reasonable, and accurate in assessing the impact of an increase in the ILRT surveillance interval. The attached sensitivity study is provided to aid the NRC staff in evaluating the Waterford 3 results on a basis consistent with that used on other docketed applications.

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The proposed change has been evaluated in accordance with 10CFR50.91(a)(1) using criteria in 10CFR50.92(c). As noted in the original submittal, this change involves no significant hazards considerations. This conclusion is not affected by the supplementary information provided here.

This submittal does not include any new commitments. Should you have any questions or comments concerning this request, please contact Jerry Burford at (601) 368-5755.

I declare under penalty of perjury that the foregoing is true and correct. Executed on November 8, 2001.

Very truly yours,

J. T. Herron
Vice President, Operations
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JTH/FGB/cbh

Attachment: Risk Evaluation of ILRT Interval Extension

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Attachment 1

to

W3F1-2001-0108

Risk Evaluation of ILRT Interval Extension

SENSITIVITY EVALUATION COMPARING the CEOG JAR METHODOLOGY with an ALTERNATE PREVIOUSLY APPROVED METHODOLOGY

In response to a phone call discussing the July 23, 2001 Waterford Steam Electric Station, Unit 3 (Waterford 3) ILRT submittal between the NRC staff and Entergy Operations, Inc. (Entergy), Entergy agreed to provide additional risk information. The original submittal had referenced the Combustion Engineering Owners Group (CEOG) Joint Applications Report (JAR) for the supporting technical justification for the request of a one-time extension of the ILRT interval to 15 years. Entergy agreed to provide an analysis of the risk impact and not rely on the approval of the CEOG report, which might not be approved in time to support the Waterford 3 schedule needs.

Also in that discussion, the NRC staff had indicated a preference for the risk analysis to utilize a methodology similar to that now approved for the Crystal River 3 application. Note that Entergy believes the methodology applied in the CEOG JAR to be reasonable and consistent with good practice in risk-informed evaluations. That evaluation uses a best-estimate approach to establish the probability of the containment failures of interest. As a result, the evaluation referenced in the original submittal represents a realistic and accurate determination of the risk due to the increase of the ILRT interval. The previously approved methodology utilizes a 95^{th} percentile estimate of the probability of the containment failures of interest and the results reflect a conservative and somewhat greater impact of the change on overall risk. Other differences between the methodologies will be described below. The change is demonstrated to be risk insignificant in both methodologies.

Both of the methodologies followed the same general approach to the evaluation of the risk of the interval extension. There were differences in the approaches in the assumptions and in the development of a probability estimate for the release class 3 events. The methodologies:

- both utilize the EPRI TR-104285 release classes to categorize the various containment failure scenarios.
- both establish the plant-specific frequencies for each EPRI release class.
- both define estimated leakage for each release class.
- both quantify the risk for each release class by multiplying the class frequency times the assumed leakage.
- both evaluated three ILRT intervals: a baseline case (3 tests in 10 years), a current case (1 test in 10 years), and the proposed case (1 test in 15 years).

Table 1 summarizes the treatment of each of the EPRI Release Classes and provides a summary of some of the differences between the CEOG JAR and the CR3 methodologies.

Table 1
EPRI Release Class Summary

Release Class	Description	CR3 Submittal	CEOG JAR
1	No containment failure	Frequency reduced as CI 3 increases; considered leakage of L_a	Frequency reduced with CI 3 increase; considered leakage of L_a
2	Large isolation failures	No change from baseline consequence measures; considered leakage of 35 L_a	No change from baseline consequence measures; considered leakage of 200 L_a
3	Isolation failures (sequences detected by ILRT and not LLRT)	3a: small leaks, 10 L_a, non-LERF (Large Early Release Frequency) 3b: large leaks, 35 L_a, LERF probability derived using 95^{th} %-ile χ^2 distribution of NUREG-1493	3a: small leaks, 25 L_a, non-LERF 3b: large leaks, 200 L_a, LERF probability derived using log-normal distribution of NUREG-1493 data
4,5	Other small isolation failures (LLRT)	No change from baseline consequence measures; not analyzed	No change from baseline consequence measures; not analyzed
6	Other isolation failures	No change from baseline consequence measures; considered leakage of 35 L_a	No change from baseline consequence measures; considered leakage of 70 L_a
7	Induced failures	No change from baseline consequence measures; considered leakage of 100 L_a	No change from baseline consequence measures; considered leakage of 560 L_a
8	Bypass	characterized by SGTR scenario – not impacted by ILRT extension	characterized by SGTR and ISLOCA – not impacted by ILRT extension

Note – The description of the release classes above are based on the definitions provided in EPRI TR-104285.

Evaluation of Baseline ILRT Interval

A sensitivity analysis is performed below by deriving the plant-specific risk impact for each ILRT interval using the previously approved methodology. The risk results of this evaluation for the baseline case are presented in Table 2. The release frequencies for the Class 2, 6, 7, and 8 bins are taken from the Waterford 3 IPE and are the same values that were used in the CEOG JAR. As noted in Table 1, the risk associated with the Class 4 and 5 bins is not impacted by the ILRT interval and is not analyzed here. The release frequencies for the Class 3a and 3b bins are determined based on the previously approved methodology (see next paragraph). The release frequency for Class 1 is the value of core damage frequency (CDF) reduced by the frequencies of the Class 3a and 3b scenarios. (Note – the analysis referenced in the original Waterford 3 submittal had utilized a value of CDF representative of sequences in which the containment remains intact. This value was approximately 52% of total CDF. The previously approved methodology used total CDF. The intact containment CDF is used in this sensitivity analysis.)

The Class 3a and 3b frequencies in the previously approved methodology were determined based on a 95th percentile χ^2 distribution of the NUREG-1493 data. For the baseline ILRT interval (3 tests in 10 years), this resulted in a frequency for Class 3a of 0.064 times CDF and a frequency for Class 3b of 0.021 times CDF. These frequencies are used in the Waterford 3 sensitivity analysis presented in Table 2. Note the total CDF for Waterford 3 is 2.54E-05 and the intact containment CDF is 1.31E-05 per the current plant risk model.

Table 2
Waterford 3 Risk Evaluation
of Baseline ILRT Interval

Class	Frequency (per reactor-year)	Release (person-rem)	Risk (person-rem/year)
1	CDF_{intact} - freq(3a)-freq(3b) = 1.09E-05	L_a = 6.73E+04	0.74
2	2.54E-08	35 L_a = 2.356E+06	0.06
3a	0.064 x CDF = 1.63E-06	10 L_a = 6.73E+05	1.10
3b	0.021 x CDF = 5.33E-07	35 L_a = 2.356E+06	1.26
6	4.78E-10	35 L_a = 2.356E+06	0.0011
7	1.08E-05	100 L_a = 6.73E+06	72.68
8	1.47E-06	1.08E+08	158.76
		Total Risk	234.60

In the CEOG JAR, a risk contribution of the intact containment sequences (i.e., Classes 1, 3a, and 3b) was determined. Using the previously approved methodology, the risk contribution due to the ILRT Type A testing was considered to be due to the Class 3a and 3b scenarios. From Table 2, it can be seen that the risk contribution associated with the ILRT testing interval considering Classes 3a and 3b is:

$$\% \text{ Risk} = [(\text{Risk}_{\text{Class 3a}} + \text{Risk}_{\text{Class 3b}}) / \text{Total Risk}] \times 100$$

$$= [(1.10 + 1.26) / 234.60] \times 100$$

$$= 1.01\%$$

In the CEOG JAR, it was also assumed that the Class 2, 3b, 6, 8, and half the Class 7 (half the class 7 release was considered to be 'early') scenarios could lead to large early releases and thus, contribute to LERF. The previously approved methodology focused only on the Class 3b scenario, which is the only LERF contributor affected by the consideration of the ILRT interval. As the parameter of concern in the evaluation is ΔLERF, it is compared on a consistent basis in both methodologies. Thus, for this sensitivity analysis, the baseline LERF is the Class 3b frequency, or 5.33E-07.

Risk Evaluation of the Current ILRT Interval (1 in 10 years)

This sensitivity analysis of the current 'once in 10 years' interval will be performed using the same approach as taken above for the baseline case. The frequencies for all release classes, except Class 1, 3a, and 3b, are unaffected by the change in the interval and remain as in Table 2. And the releases for all of the classes are the same as those shown in Table 2 for the baseline case.

The increased probability of not detecting excessive leakage in a Type A test directly impacts the frequencies of the Class 3 events. In the previously approved methodology, the Class 3a and 3b frequencies are determined by multiplying the baseline frequency by a factor of 1.1. This same factor is used in this sensitivity analysis to be consistent with the previously approved methodology. With this change in the Class 3 frequencies, the Class 1 frequency is also adjusted to preserve the total CDF. The evaluation of the current interval is presented in Table 3.

Table 3
Waterford 3 Risk Evaluation
of Current ILRT Interval

Class	Frequency (per reactor-year)	Release (person-rem)	Risk (person-rem/year)
1	CDF_{intact} - freq(3a)-freq(3b) = 1.07E-05	L_a = 6.73E+04	0.72
2	2.54E-08	35 L_a = 2.356E+06	0.06
3a	1.1 x 0.064 x CDF = 1.79E-06	10 L_a = 6.73E+05	1.20
3b	1.1 x 0.021 x CDF = 5.87E-07	35 L_a = 2.356E+06	1.38
6	4.78E-10	35 L_a = 2.356E+06	0.0011
7	1.08E-05	100 L_a = 6.73E+06	72.68
8	1.47E-06	1.08E+08	158.76
		Total Risk	234.80

As was noted above for the baseline evaluation:

- the risk contribution due to the Type A test interval is [(1.20 + 1.38) / 234.80] x 100, or 1.10%.
- the LERF for the current interval evaluation is the Class 3b frequency, or 5.87E-07.

Risk Evaluation of the Proposed ILRT Interval (1 in 15 years, one-time)

This sensitivity analysis of the proposed 'once in 15 years' interval will be performed using the same approach as taken above for the baseline case. The frequencies for all release classes, except Class 1, 3a, and 3b, are unaffected by the change in the interval and remain as in Table 2. The releases for all of the classes are the same as those shown in Table 2 for the baseline case.

The increased probability of not detecting excessive leakage in a Type A test directly impacts the frequencies of the Class 3 events. Based on the previously approved methodology, the Class 3a and 3b frequencies are determined by simply multiplying the baseline frequency by a factor of 1.15. With this change in the Class 3 frequencies, the Class 1 frequency is also adjusted to preserve the total CDF. The evaluation of the current interval is presented in Table 4.

Table 4
Waterford 3 Risk Evaluation
of Proposed ILRT Interval

Class	Frequency (per reactor-year)	Release (person-rem)	Risk (person-rem/year)
1	CDF_{intact} - freq(3a)-freq(3b) = 1.06E-05	L_a = 6.73E+04	0.71
2	2.54E-08	35 L_a = 2.356E+06	0.06
3a	1.15 x 0.064 x CDF = 1.87E-06	10 L_a = 6.73E+05	1.26
3b	1.15 x 0.021 x CDF = 6.13E-07	35 L_a = 2.356E+06	1.44
6	4.78E-10	35 L_a = 2.356E+06	0.0011
7	1.08E-05	100 L_a = 6.73E+06	72.68
8	1.47E-06	1.08E+08	158.76
		Total Risk	234.91

As was noted above for the baseline evaluation:

- the risk contribution due to the Type A test interval is [(1.26 + 1.44) / 234.91] x 100, or 1.15%.
- the LERF for the current interval evaluation is the Class 3b frequency, or 6.13E-07.

Conditional Containment Failure Probability

Another parameter of interest in evaluating the risk impact of a change to the ILRT interval is the conditional containment failure probability (CCFP). In the CEOG JAR methodology, ΔLERF was considered to be directly related to ΔCCFP. The results using that approach were a ΔCCFP of 0.06% due to the proposed interval compared to the current interval, and 0.11% due to the change to the proposed interval compared to the baseline case. Based on the previously approved methodology used in this sensitivity risk analysis, CCFP is defined as:

$$CCFP = 1 - (\text{frequency of no containment failure sequences} / CDF)$$

Further, the sequences representing no containment failure were considered to be the Class 1 and 3a events. Thus, using this approach and the information from Tables 2, 3, and 4, the ΔCCFP for Waterford 3 may be derived as shown below. (note – the subscripts used represent the interval: b-baseline, c-current, p-proposed)

$$\Delta CCFP_{c\ to\ p} = \{[freq\ (Cl1) + freq\ (Cl3a)]_c - [freq\ (Cl1) + freq\ (Cl3a)]_p\} / CDF$$

$$= \{[1.07E\text{-}05 + 1.79E\text{-}06] - [1.06E\text{-}05 + 1.87E\text{-}06]\} / 2.54E\text{-}05$$

$$= 0.0008, \text{ or } 0.08\%$$

Similarly, the impact of the proposed interval compared to the baseline case is given by:

$$\Delta CCFP_{b\ to\ p} = \{[freq\ (Cl1) + freq\ (Cl3a)]_b - [freq\ (Cl1) + freq\ (Cl3a)]_p\} / CDF$$

$$= \{[1.09E\text{-}05 + 1.63E\text{-}06] - [1.06E\text{-}05 + 1.87E\text{-}06]\} / 2.54E\text{-}05$$

$$= 0.0024, \text{ or } 0.24\%$$

Summary

A summary of the sensitivity risk analysis of the ILRT interval changes using the previously approved methodology is presented in Table 5.

Regulatory Guide 1.174 provides guidance for determining the risk impact of plant-specific changes to the licensing basis. RG 1.174 defines very small changes in risk as resulting in increases of core damage frequency (CDF) below 1E-06/year and increases in LERF below 1E-07/year. Since the ILRT does not impact CDF, the relevant metric is LERF. Calculating the increase in LERF involves determining the impact of the ILRT interval on the leakage probability.

Table 5
Summary of Results of ILRT Interval
Risk Evaluation

ILRT Interval	ILRT Risk Contribution	LERF	ΔLERF from baseline	ΔLERF from current
baseline (3 in 10 years)	1.01%	5.33E-07	—	—
current (1 in 10 years)	1.10%	5.87E-07	5.4E-08	—
proposed (1 in 15 years)	1.15%	6.13E-07	8.0E-08	2.6E-08

Based on the Reg Guide 1.174 guidance, the extension of the ILRT interval from 10 years to 15 years is not risk-significant. It can also be noted that even the increase in the interval from the baseline case to 15 years is also below the risk-significance guideline of Reg Guide 1.174.

For comparison purposes, the evaluation results from the analysis referenced in the original Waterford 3 submittal, derived using different assumptions and methodology, are presented in Table 6.

Table 6
Summary of Results of ILRT Interval
Risk Evaluation (using CEOG JAR approach)

ILRT Interval	ILRT Risk Contribution	LERF	ΔLERF from baseline	ΔLERF from current
baseline (3 in 10 years)	0.26%	6.898E-06	—	—
current (1 in 10 years)	0.48%	6.903E-06	5.0E-09	—
proposed (1 in 15 years)	0.65%	6.906E-06	8.0E-09	3.0E-09

Conclusion

The risk associated with extending the ILRT interval is quantifiable. Entergy has utilized two alternate methodologies to quantify the risk and evaluate the proposed change in the ILRT interval to 15 years. The sensitivity analysis developed above demonstrates that both methodologies demonstrate the risk associated with the extension of the interval is small and acceptable. On this basis, Entergy requests approval of a one-time extension of the Waterford 3 ILRT interval to 15 years as requested in the July 23, 2001 submittal.