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SOUTHERN COMPANY
Energy to Serve Your World℠

January 9, 2003

Docket Nos: 50-348
50-364

NL-03-0108

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

Joseph M. Farley Nuclear Plant
Response to Request for Additional Information
Technical Specification Revision Request
Integrated Leakage Rate Testing Interval Extension

Ladies and Gentlemen:

In a letter dated April 4, 2002, Southern Nuclear Operating Company (SNC) proposed a change to the Joseph M. Farley Nuclear Plant (FNP) Unit 1 and Unit 2 Technical Specifications (TS). The proposed change revised TS section 5.5.17, "Containment Leakage Rate Testing Program," to reflect a one-time deferral of the Type A Containment Integrated Leak Rate Test (ILRT). The Enclosure provides additional information as requested in a December 10, 2002 teleconference between SNC and the NRC staff.

Southern Nuclear Operating Company requests the proposed amendment be approved by February 14, 2003 to support the planning activities for the Unit 1 outage scheduled in March 2003.

This letter contains no new commitments. As noted in the original submittal, this change involves no significant hazards considerations. This conclusion is not affected by the additional information provided in this letter.

A copy of the proposed changes has been sent to Dr. D. E. Williamson, the Alabama State Designee, in accordance with 10 CFR 50.91(b)(1).

A017

Mr. J. B. Beasley, Jr. states he is a Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

J. B. Beasley, Jr.

Sworn to and subscribed before me this 9th *day of* January*, 2003*

Glenda C. Spirks
Notary Public

My commission expires: 11/10/06

JBB/CHM/sdl

Enclosure: SNC Response to Request for Additional Information

cc: Southern Nuclear Operating Company
Mr. D. E. Grissette, Nuclear Plant General Manager – Farley

U. S. Nuclear Regulatory Commission, Washington, D. C.
Mr. F. Rinaldi, NRR Project Manager – Farley

U. S. Nuclear Regulatory Commission, Region II
Mr. L. A. Reyes, Regional Administrator
Mr. T. P. Johnson, Senior Resident Inspector – Farley

Joseph M. Farley Nuclear Plant
Technical Specification Revision Request
Integrated Leakage Rate Testing Interval Extension

Enclosure

Response to Request for Additional Information

Joseph M. Farley Nuclear Plant
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Enclosure

Response to Request for Additional Information

Because the containment inservice inspection requirements mandated by 10CFR50.55a and leak rate testing requirements of Option B of 10CFR50, Appendix J complement each other to ensure the leak-tightness and structural integrity of the containment, the Staff needs the following information to complete its review of the license amendment request.

1. **NRC Question**

Since there is no description (or summarization) regarding the containment ISI program being implemented at FNP, please provide a description of the ISI methods that provide assurance that in the absence of an ILRT for 15 years, the containment structural and leak tight integrity will be maintained.

FNP Response:

As described in Enclosure 1, "Basis for Proposed Change," section c, of SNC letter dated April 4, 2002, containment leak tight integrity is also verified through periodic inservice inspections conducted in accordance with the requirements of the 1992 edition of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), section XI. More specifically, subsection IWE provides the rules and requirements for inservice inspection of Class MC pressure retaining components and their integral attachments, and of metallic shell and penetration liners of Class CC pressure retaining components and their integral attachments in light water cooled plants. Furthermore, NRC regulations, 10 CFR 50.55a(b)(2)(ix)(E), require licensees to conduct visual inspections of the accessible areas in the interior of the containment 3 times every 10 years. These requirements will not be changed as a result of the extended ILRT interval. In addition, Appendix J, Type B local leak tests performed to verify the leak tight integrity of containment penetration bellows, airlocks, seals and gaskets are not affected by the change to the Type A test frequency. Likewise the Appendix J, Type C local leak tests, which are performed to verify the leak tight integrity of containment isolation valves, are not affected by the change to the Type A test frequency.

The ASME Code Section XI IWE and IWL containment inspections provide a high degree of assurance that any degradation of the containment structure is identified and corrected before a containment leakage path is introduced.

2. NRC Question

IWE-1240 requires licensees to identify the containment surface areas requiring augmented examinations. Please provide the locations of the containment liner surfaces that have been identified as requiring augmented examination and a summary of the findings of the examinations performed.

FNP Response:

There are no areas of the Farley Unit 1 or Unit 2 containment liners that require augmented examinations per IWE-1240.

3. NRC Question

For the examination of seals and gaskets, and examination and testing of bolted connections associated with the primary containment pressure boundary (Examination Categories E-D and E-G), relief from the requirements of the Code had been requested. As an alternative, it was proposed to examine them during the leak rate testing of the primary containment. However, Option B of Appendix J for Type B and Type C testing (as per Nuclear Energy Institute 94-01 and Regulatory Guide 1.163), and the ILRT extension requested in this amendment for Type A testing provide flexibility in the scheduling of these inspections. Please provide your schedule for examination and testing of seals, gaskets, and bolts that provide assurance regarding the integrity of the containment pressure boundary.

FNP Response:

The one time extension requested by the SNC letter dated April 4, 2002, applies only to the 10 CFR 50, Appendix J, Type A integrated leak rate test that is currently on a 10 year interval pursuant to Appendix J, Option B, Performance Based Requirements. Appendix J, Type B and Type C tests are performed at the intervals required by Appendix J, Option B and will be tested at least once in the 10 year interval. This frequency of testing of seals, gaskets and containment pressure retaining bolting provides reasonable assurance that the integrity of the containment pressure boundary is maintained during the period of the extension.

4. NRC Question

The stainless steel bellows have been found to be susceptible to trans-granular stress corrosion cracking and the leakage through them is not readily detectable by Type B testing (see Information Notice 92-20). If applicable, please provide information regarding inspection and testing of the bellows, and how such behavior has been factored into the risk assessment.

FNP Response:

NRC Information Notice 92-20, Inadequate Local Leak Rate Testing, discussed the inadequate local leak rate testing of two-ply stainless steel bellows. FNP does not have such bellows as a part of the containment pressure boundary.

5. NRC Question

Inspections of some reinforced concrete and steel containment structures have found degradation on the uninspectable (embedded) side of the drywell steel shell and steel liner of the primary containment. These degradations cannot be found by visual (i.e., VT-1 or VT-3) examinations unless they are through the thickness of the shell or liner, or, 100% of the uninspectable surfaces are periodically examined by ultrasonic testing. Please provide information (additional analyses) addressing how potential leakage under high pressure during core damage accidents is factored into the nsk assessment related to the extension of the ILRT.

FNP Response:

The attached "Joseph M. Farley Nuclear Plant Sensitivity Calculation for the ILRT Extension Risk Assessment" analysis provides a sensitivity evaluation considering potential corrosion impacts within the framework of the ILRT interval extension risk assessment. The analysis confirms that the ILRT interval extension has a minimal impact on plant risk. Additionally, a series of parametric sensitivity studies regarding the potential age related corrosion effects on the steel liner also indicate that even with very conservative assumptions, the conclusions from the original analysis would not change. That is, the ILRT interval extension is judged to have a minimal impact on plant risk and is therefore acceptable.

The attached analysis also clarifies the results to present the delta LERF for the original License Bases "3 tests in 10 years" and the proposed "1 test in 15 years." The analysis also provides a discussion on the effects ILRT interval extension would have on the total LERF (internal and external events) for FNP. The conclusion show that the total LERF for both FNP Units is well below the RG 1.174 acceptance criteria for total LERF of 1.0E-05.

Attachment to Enclosure

Joseph M. Farley Nuclear Plant Sensitivity Calculation for the ILRT Extension Risk Assessment

Joseph M. Farley Nuclear Plant

SENSITIVITY CALCULATION FOR THE ILRT EXTENSION RISK ASSESSMENT

P0293010002-2130

Prepared by: Barbara J. Schlenger-Faber Date: 12/19/02

Reviewed by: Donald E. Vanover Date: 12/20/02

Approved by: [illegible] Date: 12/20/02

Accepted by: William E. B[illegible] Date: 01/09/03

Revisions:

Rev.	Description	Preparer/Date	Reviewer/Date	Approver/Date
1	Modify presentation and include external events impact.	DE Vanover 1/7/03	Barbara J. Schlenger-Faber 1/7/03	[illegible] 1/7/03

Background

A previous analysis [1] was performed to evaluate the risk impact of extending the Integrated Leak Rate Test (ILRT) interval for the Joseph M. Farley Nuclear Plant. That analysis was performed using the recommended approach developed by NEI [2] for performing assessments of one-time extensions for containment ILRT surveillance intervals. The results of that analysis are summarized in Tables 1A and 1B.

Table 1A
FNP Unit 1 ILRT Cases: Base, 3 to 10, and 3 to 15 Yr Extensions

	Base Case 3 Years			**Extend to 10 Years**			**Extend to 15 Years**		
EPRI Class	**CDF/Yr**	**Per-Rem**	**Per-Rem/Yr**	**CDF/Yr**	**Per-Rem**	**Per-Rem/Yr**	**CDF/Yr**	**Per-Rem**	**Per-Rem/Yr**
1	2.96E-05	1.48E+02	4 37E-03	2 83E-05	1.48E+02	4 18E-03	2 73E-5	1.48E+02	4.05E-03
2	2 39E-08	2 26E+05	5.40E-03	2.39E-08	2.26E+05	5.40E-03	2.39E-8	2.26E+05	5 40E-03
3a	4 99E-07	1 48E+03	7.39E-04	1.67E-06	1.48E+03	2 47E-03	2 50E-6	1 48E+03	3 70E-03
3b	4 99E-08	5 18E+03	2 59E-04	1.67E-07	5 18E+03	8 63E-04	2 50E-7	5.18E+03	1.30E-03
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	8.00E-06	1.73E+05	1.38E+00	8 00E-06	1 73E+05	1.38E+00	8 00E-06	1 73E+05	1.38E+00
8	4.18E-07	2.84E+05	1.19E-01	4 18E-07	2.84E+05	1 19E-01	4.18E-07	2 84E+05	1.19E-01
Total	3 85E-5		1.513	3 85E-5		1 516	3 85E-5		1 517
ILRT Dose Rate from 3a and 3b			9 98E-04			3 33E-03			5 00E-03
% of Total			0 07%			0 22%			0.33%
Delta Total Dose Rate (3 to 15 yr)									**3.68E-03**
3b Total			4.99E-08			1 67E-07			2.50E-07
Estimated LERF from 3b (Note 1)			4.99E-09			1 67E-08			**2.50E-08**
Delta LERF (3 to 15 yr)									**2.00E-08**
CCFP %			22.03%			22 34%			22 55%
Delta CCFP % (3 to 15 yr)									**0.52%**

(1) Based on the analysis presented in Section 5 4 of Reference 1, it can be assumed that 10% of the frequency of Class 3B sequences represents a less conservative first-order estimate to approximate the potential increase in LERF from the ILRT interval extension for Farley Consequently, the risk increase from extending the interval from the original 3-year requirement to 15 years correlates to 2.00E-8/yr for Unit 1, which is below the Regulatory Guide 1.174 [3] acceptance criteria threshold of 1.0E-7

Table 1B
FNP Unit 2 ILRT Cases: Base, 3 to 10, and 3 to 15 Yr Extensions

	Base Case 3 Years			Extend to 10 Years			Extend to 15 Years		
EPRI Class	CDF/Yr	Per-Rem	Per-Rem/Yr	CDF/Yr	Per-Rem	Per-Rem/Yr	CDF/Yr	Per-Rem	Per-Rem/Yr
1	4 35E-05	1 48E+02	6 43E-03	4.08E-05	1.48E+02	6.04E-03	3 89E-05	1.48E+02	5 76E-03
2	5 03E-08	2 26E+05	1.14E-02	5 03E-08	2.26E+05	1.14E-02	5 03E-08	2.26E+05	1 14E-02
3a	1 04E-06	1 48E+03	1.54E-03	3 45E-06	1 48E+03	5.11E-03	5.19E-06	1 48E+03	7.68E-03
3b	1 04E-07	5.18E+03	5 38E-04	3 45E-07	5 18E+03	1.79E-03	5 19E-07	5 18E+03	2 69E-03
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	1 30E-05	1 73E+05	2.25E+00	1.30E-05	1.73E+05	2 25E+00	1.30E-05	1.73E+05	2 25E+00
8	4 21E-07	2.84E+05	1.20E-01	4 21E-07	2.84E+05	1.20E-01	4 21E-07	2.84E+05	1.20E-01
Total	5 81E-05		2.388	5 81E-05		2.393	5 81E-05		2 396
ILRT Dose Rate from 3a and 3b			2 07E-03			6.90E-03			1.04E-02
% of Total			0 09%			0.29%			0.43%
Delta Total Dose Rate (3 to 15 yr)									**7.62E-03**
3b Total			1.04E-07			3 45E-07			5 19E-07
Estimated LERF from 3b (Note 1)			1.04E-08			3 45E-08			**5.19E-08**
Delta LERF (3 to 15 yr)									**4.15E-08**
CCFP %			23 38%			23.79%			24 09%
Delta CCFP % (3 to 15 yr)									**0.71%**

(1) Based on the analysis presented in Section 5 4 of Reference 1, it can be assumed that 10% of the frequency of Class 3B sequences represents a less conservative first-order estimate to approximate the potential increase in LERF from the ILRT interval extension for Farley Consequently, the risk increase from extending the interval from the original 3-year requirement to 15 years correlates to 4 15E-8/yr for Unit 2, which is below the Regulatory Guide 1.174 [3] acceptance criteria threshold of 1 0E-7.

For Unit 1 the change in LERF from extending the interval from the original 3-year requirement to 15 years is estimated to be 2.00E-8/yr. This is below the Regulatory Guide 1.174 [3] acceptance criteria threshold of 1.0E-7. Additionally, the dose increase was estimated to be 3.68E-3 Person-rem/yr, or 0.24%, and the conditional containment failure probability increase was estimated to be 0.52%. Both of these increases are also considered to be small. As such, the ILRT interval extension is judged to have a minimal impact on plant risk for Unit 1, and is therefore acceptable.

For Unit 2, the risk increase from extending the interval from the original 3-year requirement to 15 years correlates to 4.15E-8/yr, which is below the Regulatory Guide 1.174 [3] acceptance criteria threshold of 1.0E-7. Additionally, the dose increase was estimated to be 7.62E-3 Person-rem/yr, or 0.32%, and the conditional containment failure probability increase was estimated to be 0.71%. Both of these increases are also considered to be small. As such, the ILRT interval extension is judged to have a minimal impact on plant risk for Unit 2, and is therefore acceptable.

Recently, the NRC issued a series of Requests for Additional Information (RAIs) in response to the one-time relief request for the ILRT surveillance interval. The RAI related to the risk assessment is provided below.

> Request for Additional Information No. 5:
>
> Inspections of some reinforced concrete and steel containment structures have found degradation on the uninspectable (embedded) side of the drywell steel shell and steel liner of the primary containment. These degradations cannot be found by visual (i.e., VT-1 or VT-3) examinations unless they are through the thickness of the shell or liner, or, 100% of the uninspectable surfaces are periodically examined by ultrasonic testing. Please provide information (additional analyses) addressing how potential leakage under high pressure during core damage accidents is factored into the risk assessment related to the extension of the ILRT.

The analysis that follows addresses the risk assessment portion of this RAI.

Steel Liner Corrosion Analysis

The analysis utilizes the referenced Calvert Cliffs assessment [4] to estimate the likelihood and risk-implication of degradation-induced leakage occurring and going undetected in visual examinations during the extended test interval. The Calvert Cliffs analysis was performed for a concrete cylinder and dome and a concrete basemat, each with a steel liner. Farley has a similar type of containment. The steps of the analysis are described below.

The following approach is used to determine the change in likelihood, due to extending the ILRT, of detecting corrosion of the containment steel liner. This likelihood is then used to determine the resulting change in risk. Consistent with the Calvert Cliffs analysis, the following issues are addressed:

- Differences between the containment basemat and the containment cylinder and dome;
- The historical steel liner flaw likelihood due to concealed corrosion;

- The impact of aging;
- The corrosion leakage dependency on containment pressure; and
- The likelihood that visual inspections will be effective at detecting a flaw.

Assumptions

A. Consistent with the Calvert analysis, a half failure is assumed for basemat concealed liner corrosion due to the lack of identified failures. (See Table 2, Step 1.)

B. The two corrosion events used to estimate the liner flaw probability in the Calvert Cliffs analysis are assumed to be applicable to the Farley containment analysis. These events, one at North Anna Unit 2 and one at Brunswick Unit 2, were initiated from the non-visible (backside) portion of the containment liner.

C. For consistency with the Calvert Cliffs analysis, the estimated historical flaw probability is also limited to 5.5 years to reflect the years since September 1996 when 10 CFR 50.55a started requiring visual inspection. Additional success data was not used to limit the aging impact of this corrosion issue, even though inspections were being performed prior to this date (and have been performed since the time frame of the Calvert analysis), and there is no evidence that additional corrosion issues were identified. (See Table 2, Step 1.)

D. Consistent with the Calvert analysis, the steel liner flaw likelihood is assumed to double every five years. This is based solely on judgment and is included in this analysis to address the increased likelihood of corrosion as the steel liner ages. (See Table 2, Steps 2 and 3.) Sensitivity studies are included that address doubling this rate every 10 years and every two years.

E. In the Calvert Cliffs analysis, the likelihood of the containment atmosphere reaching the outside atmosphere given that a liner flaw exists was estimated as 1.1% for the cylinder and dome and 0.11% (10% less) for the basemat. These values were determined from an assessment of the probability versus containment pressure, and the selected values are consistent with a pressure that corresponds to the ILRT target pressure of 50 psig. For Farley, the containment failure probabilities are less than these values at 50 psig. Conservative probabilites of 1% for the cylinder and dome and 0.1% for the basemat are used in this analysis, and sensitivity studies are included that increase and decrease the probabilities by an order of magnitude. (See Table 2, Step 4.)

F. An additional assumption that 90% of the liner flaws lead to EPRI release Class 3a, and 10% lead to EPRI release Class 3b was applied for Farley. This is roughly consistent with the NEI Guidance [2] methodology that shows a factor of 10 lower frequency on the Class 3b events compared to the Class 3a events. A sensitivity study is included that addresses a very conservative assumption that 100% of the flaws result in EPRI Class 3b scenarios.

G. Consistent with the Calvert analysis, the likelihood of leakage escape (due to crack formation) in the basemat region is considered to be less likely than the containment cylinder and dome region. (See Table 2, Step 4.)

H. Consistent with the Calvert analysis, a 5% visual inspection detection failure likelihood given the flaw is visible and a total detection failure likelihood of 10% is used. To date, all liner corrosion events have been detected through visual inspection. (See Table 2, Step 5.) Sensitivity studies are included that evaluate total detection failure likelihood of 5% and 15%, respectively.

I. Consistent with the Calvert analysis, all non-detectable containment failures are assumed to result in early releases. This approach avoids a detailed analysis of containment failure timing and operator recovery actions.

Analysis

Table 2
Steel Liner Corrosion Base Case

Step	Description	Containment Cylinder and Dome		Containment Basemat	
1	**Historical Steel Liner Flaw Likelihood** Failure Data: Containment location specific (consistent with Calvert Cliffs analysis).	Events: 2 2/(70 * 5.5) = **5.2E-3**		Events: 0 (assume half a failure) 0.5/(70 * 5.5) = **1.3E-3**	
2	**Age Adjusted Steel Liner Flaw Likelihood** During 15-year interval, assume failure rate doubles every five years (14.9% increase per year). The average for 5th to 10th year is set to the historical failure rate (consistent with Calvert Cliffs analysis).	Year	Failure Rate	Year	Failure Rate
		1 avg 5-10 15	2.1E-3 5.2E-3 1.4E-2	1 avg 5-10 15	5.0E-4 1.3E-3 3.5E-3
		15 year average = 6.27E-3		**15 year average = 1.57E-3**	

Table 2
Steel Liner Corrosion Base Case

Step	Description	Containment Cylinder and Dome	Containment Basemat
3	**Flaw Likelihood at 3, 10, and 15 years** Uses age adjusted liner flaw likelihood (Step 2), assuming failure rate doubles every five years (consistent with Calvert Cliffs analysis – See Table 6 of Reference [4]).	**0.71% (1 to 3 years)** **4.06% (1 to 10 years)** **9.40% (1 to 15 years)** (Note that the Calvert analysis presents the delta between 3 and 15 years of 8.7% to utilize in the estimation of the delta-LERF value. For this analysis, however, the values are calculated based on the 3, 10, and 15 year intervals consistent with the original evaluation shown in Table 1, and then the delta-LERF values are determined from there)	**0.18% (1 to 3 years)** **1.02% (1 to 10 years)** **2.35% (1 to 15 years)** (Note that the Calvert analysis presents the delta between 3 and 15 years of 2.2% to utilize in the estimation of the delta-LERF value For this analysis, however, the values are calculated based on the 3, 10, and 15 year intervals consistent with the original evaluation shown in Table 1, and then the delta-LERF values are determined from there)
4	**Likelihood of Breach in Containment Given Steel Liner Flaw** The failure probability of the cylinder and dome is assumed to be 1% (compared to 1.1% in the Calvert Cliffs analysis). The basemat failure probability is assumed to be a factor of ten less, 0.1%, (compared to 0.11% in the Calvert analysis).	**1%** (Assume 90% result in EPRI Release Class 3a and 10% result in EPRI Release Class 3b)	**0.1%** (Assume 90% result in EPRI Release Class 3a and 10% result in EPRI Release Class 3b)

Table 2
Steel Liner Corrosion Base Case

Step	Description	Containment Cylinder and Dome	Containment Basemat
5	**Visual Inspection Detection Failure Likelihood** Utilize assumptions consistent with Calvert Cliffs analysis.	**10%** 5% failure to identify visual flaws plus 5% likelihood that the flaw is not visible (not through-cylinder but could be detected by ILRT) All events have been detected through visual inspection. 5% visible failure detection is a conservative assumption.	**100%** Cannot be visually inspected.
6	**Likelihood of Non-Detected Containment Leakage** (Steps 3 * 4* 5)	**0.00071% (at 3 years)** 0.71% * 1% * 10% **0.0041% (at 10 years)** 4.1% * 1% * 10% **0.0094% (at 15 years)** 9.4% * 1% * 10%	**0.00018% (at 3 years)** 0.18% * 0.1% * 100% **0.0010% (at 10 years)** 1.0% * 0.1% * 100% **0.0024% (at 15 years)** 2.4% * 0.1% * 100%

The total likelihood of the corrosion-induced, non-detected containment leakage is the sum of Step 6 for the containment cylinder and dome and the containment basemat as summarized below.

<u>Total Likelihood of Non-Detected Containment Leakage due to Corrosion</u>

At 3 years: 0.00071% + 0.00018% = 0.00089%

At 10 years: 0.0041% + 0.0010% = 0.0051%

At 15 years: 0.0094% + 0.0024% = 0.0118%

Tables 3A and 3B show the results of the updated ILRT assessment including the potential impact from non-detected containment leakage scenarios assuming that 90% of the leakages result in EPRI Class 3a and 10% result in EPRI Class 3b.

Table 3A
FNP Unit 1 ILRT Cases: Base, 3 to 10, and 3 to 15 Yr Extensions (Including Age Adjusted Steel Liner Corrosion Likelihood) [1]

	Base Case 3 Years			**Extend to 10 Years**			**Extend to 15 Years**		
EPRI Class	**CDF/Yr**	**Per-Rem**	**Per-Rem/Yr**	**CDF/Yr**	**Per-Rem**	**Per-Rem/Yr**	**CDF/Yr**	**Per-Rem**	**Per-Rem/Yr**
1	2.96E-05	1.48E+02	4.37E-03	2.83E-05	1 48E+02	4.18E-03	2 73E-05	1.48E+02	4.05E-03
2	2.39E-08	2.26E+05	5.40E-03	2.39E-08	2 26E+05	5 40E-03	2 39E-08	2 26E+05	5 40E-03
3a	4 99E-07	1 48E+03	7.39E-04	1.67E-06	1.48E+03	2 47E-03	2 50E-06	1 48E+03	3 71E-03
3b	4 99E-08	5 18E+03	2 59E-04	1.67E-07	5 18E+03	8 64E-04	2 50E-07	5.18E+03	1 30E-03
7	8 00E-06	1.73E+05	1.38E+00	8 00E-06	1.73E+05	1 38E+00	8 00E-06	1.73E+05	1.38E+00
8	4 18E-07	2 84E+05	1 19E-01	4 18E-07	2.84E+05	1.19E-01	4 18E-07	2.84E+05	1.19E-01
Total	3 85E-05		1.513	3 85E-05		1 516	3.85E-05		1 517
ILRT Dose Rate from 3a and 3b			9 98E-04 (+3 0E-07)			3.33E-02 (+1.7E-06)			5 00E-03 (+4 0E-06)
% of Total			0 07% (+2 E-5%)			0.22% (+1.E-4%)			0.33% (+3 E-4%)
Delta Total Dose Rate (3 to 15 yr)									**3.68E-03** **(+3.4E-06)**
3b Total			4 99E-08			1.67E-07			2 50E-07
Estimated LERF from 3b (Note 1)			5 01E-09 (+1 6E-11)			1.68E-08 (+9 4E-11)			2 52E-08 (+2 2E-10)
Delta LERF (3 to 15 yr)									**2.02E-08** **(+2.0E-10)**
CCFP %			22 03% (+4 E-5%)			22 34% (+2.E-4%)			22 55% (+6 E-4%)
Delta CCFP % (3 to 15 yr)									**0.52%** **(+5.2E-4%)**

[1] Note that the numbers in parenthesis represent the incremental change (compared to Table 1A) from including the impact from the corrosion analysis.

Table 3B
FNP Unit 2 ILRT Cases: Base, 3 to 10, and 3 to 15 Yr Extensions
(Including Age Adjusted Steel Liner Corrosion Likelihood) [1]

	Base Case 3 Years			Extend to 10 Years			Extend to 15 Years		
EPRI Class	**CDF/Yr**	**Per-Rem**	**Per-Rem/Yr**	**CDF/Yr**	**Per-Rem**	**Per-Rem/Yr**	**CDF/Yr**	**Per-Rem**	**Per-Rem/Yr**
1	4 35E-05	1.48E+02	6 43E-03	4.08E-05	1 48E+02	6 04E-03	3.89E-05	1.48E+02	5.76E-03
2	5 03E-08	2 26E+05	1.14E-02	5.03E-08	2.26E+05	1.14E-02	5 03E-08	2 26E+05	1 14E-02
3a	1.04E-06	1 48E+03	1 54E-03	3 46E-06	1.48E+03	5.12E-03	5 19E-06	1.48E+03	7.68E-03
3b	1.04E-07	5 18E+03	5 38E-04	3 46E-07	5.18E+03	1.79E-03	5.19E-07	5 18E+03	2 69E-03
7	1 30E-05	1.73E+05	2 25E+00	1.30E-05	1 73E+05	2.25E+00	1.30E-05	1 73E+05	2 25E+00
8	4 21E-07	2.84E+05	1.20E-01	4 21E-07	2 84E+05	1.20E-01	4 21E-07	2 84E+05	1.20E-01
Total	5.81E-05		2.388	5.81E-05		2.393	5 81E-05		2.396
ILRT Dose Rate from 3a and 3b **% of Total** **Delta Total Dose Rate (3 to 15 yr)**			2.07E-03 (+6 3E-07) 0.09% (+2.E-5%)			6 91E-03 (+3.6E-06) 0 29% (+2 E-4%)			1.04E-02 (+8 3E-06) 0 43% (+3 E-4%) **7.62E-03** **(+7.1E-06)**
3b Total **Estimated LERF from 3b (Note 1)** **Delta LERF (3 to 15 yr)**			1 04E-07 1.04E-08 (+3.4E-11)			3.46E-07 3 47E-08 (+2 0E-10)			5 19E-07 5.23E-08 (+4 5E-10) **4.19E-08** **(+4.2E-10)**
CCFP % **Delta CCFP % (3 to 15 yr)**			23 38% (+6 E-5%)			23.79% (+3 E-4%)			24 09% (+8 E-4%) **0.72%** **(+7.2E-4%)**

[1] Note that the numbers in parenthesis represent the incremental change (compared to Table 1B) from including the impact from the corrosion analysis.

Based on the results in Table 3A and 3B, it can be seen that including corrosion effects in the ILRT assessment for both Units 1 and 2 is not significant. It does not alter the conclusions from the original analysis, which is that the ILRT interval extension will have a minimal impact on plant risk, and is therefore acceptable.

Sensitivity Studies

Sensitivity cases were also developed to gain an understanding of the sensitivity of this analysis to the various key parameters. The time for the flaw likelihood to double was adjusted from every five years to every two and every ten years. The failure probabilities for the cylinder and dome and the basemat were increased and decreased by an order of magnitude. The total detection failure likelihood was adjusted from 10% to 15% and 5%.

The likelihood that the flaw leads to an EPRI Class 3b scenario (LERF) was adjusted from 10% to 100% and 1%. These results of the sensitivity cases are summarized in Tables 4A and 4B. In almost every case the impact from including the corrosion effects is very minimal. Even the upper bound estimates with very conservative assumptions for all of the key parameters yield increases in LERF of only 8.45E-8 /yr for Unit 1 and 1.75E-7 /yr for Unit 2 as the test interval is extended from 3 years to 15 years.

Table 4A
FNP Unit 1 Steel Liner Corrosion Sensitivity Cases

Age (Step 3)	Containment Breach (Step 4)	Visual Inspection & Non-Visual Flaws (Step 5)	Likelihood Flaw is LERF (i.e., EPRI Class 3b)	LERF Increase From Corrosion (3 to 15 years)	Total LERF Increase From ILRT Extension (3 to 15 years)
Base Case Doubles every 5 yrs	**Base Case** (1% Cylinder, 0 1% Basemat)	**Base Case** 10%	**Base Case** 10%	**Base Case** 2.0E-10	**Base Case** 2.02E-08
Doubles every 2 yrs	Base	Base	Base	4.6E-10	2.05E-08
Doubles every 10 yrs	Base	Base	Base	1.7E-10	2.02E-08
Base	Base	*15%*	Base	2.8E-10	2.03E-08
Base	Base	*5%*	Base	1.2E-10	2.01E-08
Base	Base	Base	*100%*	2.0E-09	2.20E-08
Base	Base	Base	*1%*	2.0E-11	2.00E-08
Base	10% Cylinder, 1% Basemat	Base	Base	2.0E-09	2.20E-08
Base	0.1% Cylinder, 0 01% Basemat	Base	Base	2.0E-11	2.00E-08
Lower Bound					
Doubles every 10 yrs	0 1% Cylinder, 0 01% Basemat	5%	1%	1.0E-12	2.00E-08
Upper Bound					
Doubles every 2 yrs	10% Cylinder, 1% Basemat	15%	100%	6 4E-08	8 45E-08

Table 4B
FNP Unit 2 Steel Liner Corrosion Sensitivity Cases

Age (Step 3)	Containment Breach (Step 4)	Visual Inspection & Non-Visual Flaws (Step 5)	Likelihood Flaw is LERF (i.e., EPRI Class 3b)	LERF Increase From Corrosion (3 to 15 years)	Total LERF Increase From ILRT Extension (3 to 15 years)
Base Case Doubles every 5 yrs	**Base Case** (1% Cylinder, 0 1% Basemat)	**Base Case** 10%	**Base Case** 10%	**Base Case** 4.2E-10	**Base Case** 4 19E-08
Doubles every 2 yrs	Base	Base	Base	9 5E-10	4.24E-08
Doubles every 10 yrs	Base	Base	Base	3.5E-10	4.18E-08
Base	Base	*15%*	Base	5.8E-10	4.21E-08
Base	Base	*5%*	Base	2.5E-10	4.17E-08
Base	Base	Base	*100%*	4 2E-09	4.57E-08
Base	Base	Base	*1%*	4 2E-11	4.15E-08
Base	10% Cylinder, 1% Basemat	Base	Base	4 2E-09	4 57E-08
Base	0.1% Cylinder, 0.01% Basemat	Base	Base	4 2E-11	4.15E-08
		Lower Bound			
Doubles every 10 yrs	0.1% Cylinder, 0.01% Basemat	5%	1%	2.1E-12	4.15E-08
		Upper Bound			
Doubles every 2 yrs	10% Cylinder, 1% Basemat	15%	100%	1.3E-07	1.75E-07

External Events Impact

In the Farley IPEEE, the dominant risk contributor from external events was found to be from fire events. Other potential contributors such as seismic and high winds were found to be negligible.

At the time of the IPEEE, the internal events CDF was calculated as 1.3E-04/reactor-year (single model for both units) and the calculated Fire CDF was 1.43E-04/reactor-year for Unit 1 and 1.11E-04/reactor-year for Unit 2. The higher risk areas involved switchgear rooms and other areas that would cause loss of RCP Seal cooling.

Since the IPEEE, the Farley PRA was converted from a large event tree model to a linked fault tree model based on CAFTA software and separate models were developed for each unit. During the conversion process and through 4 subsequent updates, incorporation of design changes to install high-temperature o-rings in the Reactor Coolant Pumps and removal of other conservative treatments of the loss of RCP Seal Cooling scenarios have resulted in a reduction of the internal events CDF to 3.85E-05 per reactor-year for Unit 1 and to 5.81E-05 per reactor-year for Unit 2. Some calculations have been done for individual fire compartments (specifically the electrical penetration rooms) which indicate that the Fire CDF for those areas is reduced by 1 to 2 orders of magnitude if the current model is used. Therefore, it seems reasonable to assume that the External Events CDF could be approximated as equivalent to the Internal Events CDF for calculating the potential impact of the ILRT extension.

For Farley, the total internal events LERF for Unit 1 is 4.19E-07/reactor-year and for Unit 2 it is 4.26E-07/reactor-year. With regards to the total LERF, the External Events baseline LERF would be expected to be less than the Internal Events baseline LERF because the majority of the Internal Events baseline LERF comes from events that are not events that are initiated by fires (i.e., ISLOCA). However, as shown below, even if it is conservatively assumed that the External Events baseline LERF is equivalent to the Internal Events baseline LERF, the total LERF would still be far below the Regulatory Guide 1.174 criteria of 1.0E-05 following the ILRT extension.

Two cases are examined. The first case utilizes the NEI methodology directly in estimating the LERF increase from the ILRT extension (i.e., no reduction in the 3b LERF contribution is made). The second case utilizes the 10% reduction factor in applying what could be considered a more reasonable LERF contribution from the ILRT extension for Farley. The results from each of these calculations are shown in Table 5A and 5B for Unit 1 and 2, respectively.

Table 5A
FNP Unit 1 Estimated Total LERF including External Events Impact

Contributor	NEI Directly (With 100% of Class 3b to LERF from ILRT)	NEI Enhanced (With 10% of Class 3b to LERF from ILRT)
Internal Events LERF	4.19E-07	4.19E-07
External Events LERF	4.19E-07	4.19E-07
Internal Events LERF due to ILRT (at 15 years)	2.50E-07	2.50E-08
External Events LERF due to ILRT (at 15 years)	2.50E-07	2.50E-08
Total:	1.34E-06	8.88E-07

Table 5B
FNP Unit 2 Estimated Total LERF including External Events Impact

Contributor	NEI Directly (With 100% of Class 3b to LERF)	NEI Enhanced (With 10% of Class 3b to LERF)
Internal Events LERF	4.26E-07	4.26E-07
External Events LERF	4.26E-07	4.26E-07
Internal Events LERF due to ILRT (at 15 years)	5.19E-07	5.19E-08
External Events LERF due to ILRT (at 15 years)	5.19E-07	5.19E-08
Total:	1.89E-06	9.56E-07

Summary and Conclusions

This analysis provides a sensitivity evaluation of considering potential corrosion impacts within the framework of the ILRT interval extension risk assessment. For the Unit 1 base case, the best estimate increase in LERF due to extending the test interval from 3 to 15 years due to corrosion considerations is 2.0E-10. For Unit 2, the increase in LERF is 4.2E-10. The analysis confirms that the ILRT interval extension has a minimal impact on plant risk. Additionally, a series of parametric sensitivity studies regarding the potential age related corrosion effects on the steel liner also indicate that even with very conservative assumptions, the conclusions from the original analysis would not change.

Regulatory Guide 1.174 [3] states that when the calculated increase in LERF is in the range of 1.0E-06 per reactor year to 1.0E-07 per reactor year, applications will be considered only if it can be reasonably shown that the total LERF is less than 1.0E-05 per reactor year. If the 10% reduction factor is not applied to the Class 3b frequencies for determining LERF from the ILRT interval extension, then the overall results could fall into this range. As such, an additional assessment of the impact from external events was also made. In that case, the total LERF was conservatively estimated as 1.34E-06 for Unit 1 and 1.89E-06 for Unit 2. Both of these are well below the RG 1.174 acceptance criteria for total LERF of 1.0E-05.

In conclusion, the impact from corrosion was found to have a negligible impact on the calculated results from the ILRT interval extension assessment, and even with the potential additional LERF scenarios from external event sequences, the ILRT interval extension is judged to have a minimal impact on plant risk and is therefore acceptable.

References

[1] *Risk Assessment for Joseph M. Farley Nuclear Plant Regarding ILRT (Type A) Extension Request*, Prepared for Southern Nuclear Operating Co. by ERIN Engineering and Research, Inc., P0293010002-1929, March 2002.

[2] *Interim Guidance for Performing Risk Impact Assessments In Support of One-Time Extensions for Containment Integrated Leakage Rate Test Intervals*, Developed for NEI by John M. Gisclon, EPRI Consultant, William Parkinson and Ken Canavan, Data Systems and Solutions, November 2001.

[3] *An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,* Regulatory Guide 1.174, July 1998.

[4] *Response to Request for Additional Information Concerning the License Amendment Request for a One-Time Integrated Leakage Rate Test Extension,* Letter from Mr. C. H. Cruse (Calvert Cliffs Nuclear Power Plant) to NRC Document Control Desk, March 27, 2002.