CP&L
A Progress Energy Company

John S Keenan
Vice President
Brunswick Nuclear Plant

OCT 0 8 2002

10 CFR 50.90

SERIAL: BSEP 02-0163
TSC-2001-06

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

SUBJECT: Brunswick Steam Electric Plant, Unit No. 2
Docket No. 50-325/License No. DPR-62
Revision of Request For License Amendment -
Frequency of Performance-Based Leakage Rate Testing
(NRC TAC No. MB3471)

REFERENCES:

(1) Letter from John S. Keenan (CP&L) to NRC Document Control Desk, dated November 26, 2001, "Request for License Amendments Regarding Frequency of Performance-Based Leakage Rate Testing"

(2) Letter from John S. Keenan (CP&L) to NRC Document Control Desk, dated January 31, 2002, "Response to Request for Additional Information Regarding Request for License Amendments – Frequency of Performance-Based Leakage Rate Testing (NRC TAC Nos. MB3470 and MB3471)"

(3) Letter from John S. Keenan (CP&L) to NRC Document Control Desk, dated February 11, 2002, "Revision of Request for License Amendments – Frequency of Performance-Based Leakage Rate Testing (NRC TAC Nos. MB3470 and MB3471)"

(4) Letter from Allen G. Hansen (NRC) to J. S. Keenan (CP&L), dated March 6, 2002, "Issuance of Amendment Regarding Containment Leakage Rate Testing Program (TAC No. MB3470)"

Ladies and Gentlemen:

The purpose of this letter is to: (1) revise Carolina Power & Light (CP&L) Company's license amendment application for Brunswick Steam Electric Plant (BSEP), Unit 2 to request an extension of the Unit 2 Type A test frequency to approximately 12 years,

PO Box 10429
Southport, NC 28461

T> 910 457 2496
F> 910 457 2803

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2 months, and (2) provide additional information requested by the NRC regarding the risk increase associated with containment liner corrosion due to extension of the Type A test frequency.

On November 26, 2001 (i.e., Reference 1), CP&L submitted a license amendment application for the BSEP, Units 1 and 2. The application proposed a revision to Technical Specification 5.5.12, "Primary Containment Leakage Rate Testing Program," to incorporate a one-time exception to the 10-year frequency for performance-based Type A leakage rate tests. The proposed exception allowed performance of a Type A test within 15 years, one month from the last Type A test for Unit 1 and within 15 years from the last Type A test for Unit 2.

By letter dated February 11, 2002 (i.e., Reference 3), CP&L revised the Unit 1 license amendment application to request an extension of the Type A test frequency to 13 years, two months. Subsequently, by letter dated March 6, 2002 (i.e., Reference 4), the NRC issued Amendment No. 216 to the Unit 1 Operating License and Technical Specifications approving, on a one-time basis, the 13 year, two month Type A test frequency.

This submittal reduces the proposed Unit 2 Type A leakage rate test frequency from 15 years to 12 years, 2 months (i.e., a 2 year, 2 month extension). The 12 year, 2 month test frequency will result in performance of the next Type A test no later than April 30, 2005.

In a February 11, 2002, letter, CP&L committed to provide additional information requested by the NRC regarding the risk increase associated with containment liner corrosion due to extension of the Type A test frequency. Enclosure 3 provides an evaluation of the change in Large Early Release Frequency (LERF) associated with containment liner corrosion due to the proposed extension of the Type A test frequency.

Regulatory Guide 1.174 defines very small changes in risk as resulting in increases in core damage frequency (CDF) of less than 1E-6 per year and increases in LERF of less than 1E-7 per year. As demonstrated in the evaluation provided in Enclosure 3, the increases in LERF due solely to containment liner corrosion from internal and external events are 1.74E-8 per year and 1.35E-8 per year, respectively, for a Type A test frequency extension from 3 years to 15 years. Therefore, the total increase in LERF is 3.09E-8 per year.

The BSEP-specific risk evaluation previously submitted with Reference 1 and supplemented by Reference 2 determined the total LERF resulting from the proposed Type A test frequency change as 1.03E-5 per year, including the increase in LERF for a Type A test frequency extension (i.e., from 3 years to 15 years). Inclusion of the increase in LERF due to containment liner corrosion and from internal and external events results in a calculated total LERF of 1.033E-5 per year. Based on the conservatism in the external events assessment, and the fact the BSEP-specific risk-evaluation has not been modified to reflect a Type A test frequency of 12 years, 2 months versus the originally requested

15 year test frequency, the total LERF is expected to be less than the 1E-5 per year guideline value in Regulatory Guide 1.174 and supports the conclusion that the Type A test frequency extension represents an acceptable increase in the overall plant risk.

The November 26, 2001, license amendment application included an evaluation of significant hazards considerations, as set forth in 10 CFR 50.92. On January 8, 2002, the NRC published, in the *Federal Register* (i.e., 67 FR 926), a proposed determination that the license amendment application involves no significant hazards considerations. The initial evaluation of significant hazards considerations addressed a one-time extension of the Type A testing frequency to 15 years, one month for Unit 1 and 15 years for Unit 2. The revised one-time extension of the Unit 2 Type A testing frequency to 12 years, 2 months is fully bounded by the bases and conclusions for the original evaluation of significant hazards considerations. Therefore, re-publication in the *Federal Register* of a no significant hazards determination is not necessary.

CP&L requests that the NRC complete review of the revised BSEP, Unit 2 license amendment application by January 31, 2003, to support the Unit 2 refueling outage scheduled to begin early March 7, 2003.

Please refer any questions regarding this submittal to Mr. Edward T. O'Neil, Manager - Regulatory Affairs, at (910) 457-3512.

Sincerely,

for JSK.

John S. Keenan

WRM/wrm

Enclosures:

1. Marked-up Technical Specification Pages - Unit 2
2. Typed Technical Specification Pages - Unit 2
3. Engineering Change 49741, Revision 0, "Evaluation of Risk from Containment Liner Change"

C. J. Gannon, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, and agents of Carolina Power & Light Company.

M. A. Turkal
Notary (Seal)

My commission expires: May 18, 2003

cc: U. S. Nuclear Regulatory Commission, Region II
ATTN: Mr. Luis A. Reyes, Regional Administrator
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, GA 30303-8931

U. S. Nuclear Regulatory Commission
ATTN: Mr. Theodore A. Easlick, NRC Senior Resident Inspector
8470 River Road
Southport, NC 28461-8869

U. S. Nuclear Regulatory Commission
ATTN: Ms. Brenda L. Mozafari (Mail Stop OWFN 8G9) **(Electronic Copy Only)**
11555 Rockville Pike
Rockville, MD 20852-2738

Ms. Jo A. Sanford
Chair - North Carolina Utilities Commission
P.O. Box 29510
Raleigh, NC 27626-0510

Ms. Beverly O. Hall, Section Chief
Radiation Protection Section, Division of Radiation Protection
North Carolina Department of Environment and Natural Resources
3825 Barrett Drive
Raleigh, NC 27609-7221

BSEP 02-0163
Enclosure 1

Marked-up Technical Specification Pages - Unit 2

5.5 Programs and Manuals

5.5.12 <u>Primary Containment Leakage Rate Testing Program</u> (continued)

a. Compensation of instrument accuracies applied to the primary containment leakage total in accordance with ANSI/ANS 56.8-1987 instead of ANSI/ANS 56.8-1994;

b. Following air lock door seal replacement, performance of door seal leakage rate testing with the gap between the door seals pressurized to 10 psig instead of air lock testing at P_a as specified in Nuclear Energy Institute Guideline 94-01, Revision 0;

c. Reduced duration Type A tests may be performed using the criteria and Total Time method specified in Bechtel Topical Report BN-TOP-1, Revision 1.

d. Performance of Type C leak rate testing of the hydrogen and oxygen monitor isolation valves is not required; and

e. Performance of Type C leak rate testing of the main steam isolation valves at a pressure less than P_a instead of leak rate testing at P_a as specified in ANSI/ANS 56.8-1994.

f. NEI 94-01 - 1995, Section 9.2.3: The first Type A test performed after the February 28, 1993, Type A test shall be performed no later than April 30, 2005.

The peak calculated primary containment internal pressure for the design basis loss of coolant accident, P_a, is 49 psig.

The maximum allowable primary containment leakage rate, L_a, shall be 0.5% of primary containment air weight per day at P_a.

Leakage rate acceptance criteria are:

a. Primary containment leakage rate acceptance criterion is $\leq 1.0\ L_a$. During the first unit startup following testing in accordance with this program, the leakage rate acceptance criteria are $< 0.60\ L_a$ for Type B and C tests and $\leq 0.75\ L_a$ for Type A tests.

b. Air lock testing acceptance criteria are:

   1) Overall air lock leakage rate is $\leq 0.05\ L_a$ when tested at $\geq P_a$.

   2) For each air lock door, leakage rate is ≤ 5 scfh when the gap between the door seals is pressurized to ≥ 10 psig.

The provisions of SR 3.0.3 are applicable to the Primary Containment Leakage Rate Testing Program frequencies.

Typed Technical Specification Pages - Unit 2

5.5 Programs and Manuals

5.5.12 Primary Containment Leakage Rate Testing Program (continued)

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b. Air lock testing acceptance criteria are:

1) Overall air lock leakage rate is $\leq 0.05\ L_a$ when tested at $\geq P_a$.

(continued)

Engineering Change 49741, Revision 0,
"Evaluation of Risk from Containment Liner Change"

ATTACHMENT 2
Sheet 1 of 1
Record of Lead Review

L. Engineering Review

(Select, copy and paste the table below into a WORD file and e-mail to Lead ER. Select, copy and paste table from ER response below. Have Lead ER agree that all comments are resolved prior to advancing EC status to H/APPR and subsequently routing the EC for approvals.)

Design EC 49741 Evaluation of Risk from Containment Liner Corrosion **Revision** 0

The signature below of the Lead Reviewer records that:
- the review indicated below has been performed by the Lead Reviewer;
- appropriate reviews were performed and errors/deficiencies (for all reviews performed) have been resolved and these records are included in the design package;
- the review was performed in accordance with EGR-NGGC-0003.

☐ **Design Verification Review** ☒ **Engineering Review** ☐ **Owner's Review**
☐ Design Review
☐ Alternate Calculation
☐ Qualification Testing

☐ **Special Engineering Review** __________

☐ YES ☐ N/A **Other Records are attached.**

Eric V. Browne	PSA	-
Lead Reviewer (print/sign)	**Discipline**	**Date**

Item No.	Deficiency	Resolution
1)	Diagram - The torus dry area listed in the diagram is not correct. It appears to be a typo and the area should be shown as 18,282 sq ft instead of 8,282 sq ft	Correction made.
2)	Diagram - The units listed for surface area S6 in the diagram are not correct.	Correction made.
3)	Section D Historical Information – replace "reinforced primary containment" With "reinforced concrete primary containment"	Correction made.
4)	Diagram – The area of section S8 appears to be slightly off (2361 vs. 2376) Similarly, the total area for the vent lines is slightly off (3820 vs. 3816) The difference in the estimated area S9 is due to rounding prior to multiplying by the number of lines, but the reason for the difference in the estimated area S8 is undetermined. Correct as needed.	S8 corrected to 2369 sq ft to reflect consistent use of radii of 27' 5.5". Vent line area maintained at 3,816 sq ft to reflect rounding of each vent line to whole number (477 sq ft) prior to multiplying by the number of vent lines (8).

Design EC 49741 Evaluation of Risk from Containment Liner Corrosion **Revision** 0

5)	Section F.2 – reference 9 is missing	References added.
6)	Assumption 5 – replace "ignored" with "excluded"	Change made.
7)	*Assumption Validation #2- The statement "since any liner corrosion would need to coincide with crack formation on both sides" probably needs to be qualified as applicable only to scenarios (evaluated by this analysis) since there is a probably a multitude of "LERF" scenarios that would not require crack formation. In addition, since concrete does not respond well to tension, we should consider providing some statement about potential for failure at the pressure of interest. (see CCNP assumption D)*	Assumption reworded to emphasize application to the scenario evaluated in this EC, leakage due to liner corrosion. Reference to the Calvert Cliffs assumption D added.
8)	Assumption Validation #5 – Replace "The eight vent line penetrations are accounted for" with "The surface areas of the eight vent line penetrations are included, and the areas of the vent openings are excluded	Change made.
9)	Section F.5 – The last two sentences of this section should be changed to indicate that the internal events and external events increase in LERF estimated are solely due to liner corrosion considerations	Change made.
10)	The information for "Drywell Floor Surface Area (sq ft)" discrepancy was noted in comment 4 (area of S8). This also affects the total surface area. Most of the remaining data only differs due to rounding errors, but the basis for this point estimate is undetermined. The net result does not impact the answers significantly, but should be reconciled.	See resolution for comment 4.
11)	What is the purpose of using "Percentage Accessible (to weight Step 6)" instead of weighing using "Percentage Total" area. This just skews the value to the non-accessible drywell floor, and non-conservatively maximizes the accessible portion of the drywell and torus while minimizing the inaccessible portion of the drywell and torus. Overall impact is conservative for this data, but it serves no justifiable purpose.	The Calvert Cliffs analysis did not weight the contribution from the containment cylinder/dome and the basemat when determining the total likelihood of non-detected containment leakage. Rather, the contributions were summed. In other words, the leakage through the basemat was considered a separate phenomenon and included on an equal basis. The percentages shown in the column headings of Table 1 in the Calvert Cliffs licensing document are presumably the applicable areas; however, these are not used. To maintain consistency with the Calvert Cliffs analysis, the contribution from the Drywell floor is not weighted. However, to recognize that the submerged areas of the Torus are inaccessible, area weighting is used for the Drywell walls and Torus.

Design EC 49741 Evaluation of Risk from Containment Liner Corrosion Revision 0		
12)	*Since the NRC requested using the CCNP methodology to address the risk from liner corrosion, provide the basis, and include a note in EC, for using surface area weighing factors since this is a deviation from the methodology.*	Note added to Section F.5.
13)	Total LERF seems to double count the contribution of the "Type A LERF from 3b due to ILRT Extension". The total increase in LERF already includes this contribution.	The contribution from Type A LERF from 3b due to ILRT extension is included to match the LERF value shown in the January 31, 2002 letter to the NRC providing a response to an ILRT-related request.

Note: The Lead Reviewer signature on the EC Engr Review milestone panel signifies that a lead review has been performed in accordance with EGR-NGGC-0003 and that errors/deficiencies (for all reviews performed) have been resolved and included in the EC package.

F. Design Specification

The details of the design change are specified below:

F.1 Scope Description

This Engineering Change has been prepared to document an evaluation of risk increase (change in LERF) associated with containment liner corrosion due to an extension of ILRT frequency. The results of this evaluation are being used to support a technical specification change request submitted under 10CFR50.90. This EC does not initiate or control any change to an SSC, design document, or license document.

See Section D and Section E for formal problem and solution statements.

F.2 References

Industry Standards:

1. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis".
2. ASME Boiler and Pressure Vessel Code, Section XI, 1992 Edition with 1992 Addenda.

Design Basis Documents:

3. DBD-04, "Pressure Suppression System"

Specifications:
None

Drawings:
None

Calculations:

4. BNP-PSA-052, "Modified Level 1 PSA Model Sequence Quantification for MOR98R1".
5. BNP-PSA-055, "Brunswick Level 2 PRA Input to ILRT Evaluation".
6. BNP-PSA-053, Revision 1, "RSC 01-24, Revision 1, Brunswick Nuclear Plant Probabilistic Safety Assessment Evaluation of Risk Significance of ILRT Extension".

Nuclear Generating Group (NGG) Procedures:

7. EGR-NGGC-0003,"Design Review Requirements".
8. EGR-NGGC-0005, "Engineering Change".
9. REG-NGGC-0010, "10 CFR 50.59 Reviews".

Plant Procedures:

10. 0PT-20.5, "Integrated Primary Containment Leak Rate Test (ILRT).
11. 0PT20.5.1, "Primary Containment Inspection".

Plant Change Documents:
None

Regulatory Documents:

12. BSEP 01-0070, "Brunswick Steam Electric Plant, Unit Nos. 1 and 2, Request for License Amendments Regarding Frequency of Performance-Based Leakage Rate Testing", Nov 26, 2001.
13. BSEP 02-0010, "Brunswick Steam Electric Plant, Unit Nos. 1 and 2, Response to Request for Additional Information Regarding Request for License Amendments – Frequency of Performance-Based Leakage Rate Testing", Jan 31, 2002.
14. BSEP 02-0032, "Brunswick Steam Electric Plant, Unit Nos. 1 and 2, Response to Request for Additional Information Regarding Request for License Amendments – Frequency of Performance-Based Leakage Rate Testing", Feb 05, 2002.
15. Appendix J, Part 50 of Title 10 of the Code of Federal Regulations.

<u>Other References:</u>

16. Constellation Nuclear, Calvert Cliffs Nuclear Power Plant, Response to Request for Additional Information Concerning the License Amendment Request for a One-Time Integrated Leak Rate Test Extension, 3/27/02 (See attached document).
17. Brunswick Steam Electric Plant Units 1 and 2, Individual Plant Examination (IPE) Submittal, August 1992.
18. Brunswick Nuclear Plant Individual Plant Examination for External Events (IPEEE) Submittal, June 1995.

F.3 Design Inputs

Following is a list of applicable *design inputs* specified to meet the requirements of ANSI N45.2.11. (See EGR-NGGC-0005, Attachment 2, for details).

PSA evaluations do not provide plant design basis information, nor are PSA evaluations used to modify design outputs. The following design inputs are applicable to this evaluation.

1. <u>Basic Functions of Each Structure, System and Component</u>: The function of the primary containment is to contain the energy released during an accident and limit the release of fission products associated with the accident. The containment liner functions as a barrier supporting this function. This EC evaluates the risk impact (measured in LERF) from containment liner corrosion during an ILRT extension. A change in the function of the containment liner is assumed, based on the Calvert Cliffs methodology. No other change in function of any other SSC is evaluated.

2. <u>Performance Requirements such as Capacity, Rating, and System Output:</u> No performance requirement change is evaluated.

3. <u>Codes, Standards, and Regulatory Requirements:</u> The current Technical Specifications require a 10-year frequency for performing Type A leakage rate testing. This EC evaluates the impact on risk (measured in LERF) from a one-time exception to this requirement.

4. <u>Design Conditions such as Pressure, Temperature, Fluid Chemistry and Voltage:</u> No change to any design condition is evaluated. The containment performance described in the Individual Plant Examination (IPE) is used for this Probabilistic Safety Assessment evaluation. The test pressure obtained during the last two ILRT tests is used as an input to the calculation of the likelihood of a breach in containment given a liner flaw.

5. <u>Loads such as Seismic, Wind, Thermal, and Dynamic:</u> N/A

6. Environmental Conditions: N/A

7. Interface Requirements: N/A

8. Material Requirements: N/A

9. Mechanical Requirements: N/A

10. Structural Requirements: N/A

11. Hydraulic Requirements: N/A

12. Chemistry Requirements: N/A

13. Electrical Requirements: N/A

14. Layout and Arrangement Requirements: N/A

15. Operational Requirements Under Various Conditions: N/A

16. Instrument and Control Requirements: N/A

17. Access and Administrative Control for Plant Security: N/A

18. Redundancy, Diversity, and Separation Requirements of Structures, Systems, and Components: N/A

19. Failure Effects on Requirements of Structures, Systems, and Components: N/A

20. Test Requirements: This evaluation uses the results of the recent ILRT to determine the likelihood of detecting a breach in containment given a liner flaw. This evaluation provides the risk impact from extending the testing interval from the current interval. No other change to testing requirements is evaluated.

21. Accessibility, Maintenance, Repair, and ISI Requirements: N/A

22. Personnel Requirements and Limitations: N/A

23. Transportability Requirements: N/A

24. Fire Protection or Resistance Requirements: N/A

25. Handling, Storage, and Shipping Requirements: N/A

26. Other Requirements to Prevent Undue Risk to the Health and Safety of the Public: N/A

27. Materials, Processes, Parts, and Equipment Suitability for Application: N/A

28. Safety Requirements for Preventing Personnel Injury: N/A

F.4 Assumptions

The Calvert Cliffs methodology, including assumptions are described in the attached Constellation Nuclear licensing document (Reference 16). Key assumptions applicable to use of this methodology at BNP are:

1. The containment liner failure rate is based on the two industry events (BNP Unit 2 drywell corrosion discovered in 1999 and the North Anna containment corrosion, also discovered in 1999). The exposure period of 5.5 years reflects the period since 10 CFR 50.55a required visual inspections (September 1996). Because no failures have been identified for the containment basemat, a half failure is assumed.
2. Leakage through the basemat is assumed to be 10 times less likely than through the containment cylinder and dome.
3. For purposes of evaluating the risk from liner corrosion on the ILRT deferral, the BNP Mark I primary containment is similar to the Calvert Cliffs containment. The Drywell Head is considered to be equivalent to the remainder of the Drywell (i.e., steel liner backed by reinforced concrete).
4. The Drywell surface area has not been reduced to account for the areas for the personnel lock, equipment hatch, containment penetrations and the vent system. The surface area for the portion of the vent lines backed by concrete is included.
5. Ten percent of the Drywell is inaccessible to examination.
6. The Torus is approximately 40 percent filled with water. The area above water is accessible to examination.
7. All non-detectable containment leakage events are considered to be LERF. Accident classes that comprise LERF are unaffected by containment liner corrosion.
8. The contribution to LERF from non-detectable containment leakage events affecting external events may be addressed through a conservative estimate.
9. The BNP primary containment is inspected (Reference 15).

These assumptions are justified or validated as follows:

1. The containment liner corrosion exposure period is bounding as no additional failures have been identified since March 2002 and no failures were identified prior to September 1996. Assumption of a half failure is a typical statistical technique for cases wherein no failures have occurred. The Calvert Cliffs licensing document includes a sensitivity analysis for these values. That analysis supports use of the proposed data, as is.
2. Consistent with the Calvert Cliffs methodology, the leakage potential via the Drywell floor was assumed to be ten times less likely than via other sections of the pressure suppression containment structure. The bottom of the liner (as well as the lower 4 feet of the liner) is sandwiched between a four-foot layer of concrete comprising the Drywell floor and the 17-foot concrete basemat. This arrangement provides an additional barrier to leakage from undetected liner corrosion through the floor, since any liner corrosion would need to coincide with crack formation on both sides. Figure 4.4-2 of the IPE (Reference 17) shows the cumulative failure distribution at vessel failure for the Composite and the Drywell Shell. This supports the pressure capability for the Drywell Shell being more than a factor of ten greater than the Composite failure, at 146 psia. (At a 50% probability of failure, the limiting failure occurs at 146 psia. At this same pressure, the Drywell Shell failure probability is less than 1%.) The Drywell floor is included in the Drywell Shell; therefore, the likelihood of a given pressure causing leakage in the Drywell floor from liner corrosion is at least ten times less likely than the limiting failure assumed in the analysis. (The limiting failure is the drywell flange.)

Assumption D, of the Calvert Cliffs licensing document provides a further discussion of crack formation, as it applies to this analysis.

Note that the basemat is not examined.

3. The BNP primary containment and Calvert Cliffs containment are steel-lined, reinforced concrete structures (Reference 3). The BNP steel liner plates, concrete walls and basemat are of similar thickness to the Calvert Cliffs liner, walls and basemat. The most noteworthy difference between the BNP containment and the Calvert Cliffs containment is the Drywell Head. The Drywell Head is not concrete reinforced; however it is a pressure vessel component, approximately 1.5 inches thick, not merely a liner. Section 4 of the IPE (Reference 17) evaluates the BNP containment limiting failure as the Head Flange connecting the Drywell Head to the Drywell walls. A separate failure is not evaluated for the structural failure of the Drywell Head. The likelihood of structural failure for the Drywell Shell is much lower than for the flange connection. The limiting failure at the flange is an input to the Step 4 calculation of the likelihood of a breach given a liner flaw. Use of the limiting failure bounds a calculation for structural failure of either the Drywell Head or the Drywell walls. Therefore the difference in the Drywell Head and walls does not affect the Step 4 calculation of the likelihood of a breach in containment given a liner flaw. In addition, both the inside and outside surfaces of the Drywell Head are accessible for inspection. Including the Drywell Head with the 10% visual inspection detection failure likelihood is bounding, as both sides of the head are readily inspected. Both sides of the Drywell Head are included in the calculation of liner area.
4. The calculations of the surface area of the relevant containment components are approximations and only used to assign visual inspection detection failure likelihood. The surface areas of the penetrations are small relative to the total surface area and these components are tested under the local leak-rate testing program. In addition, the area for the Drywell and Torus liner is not reduced for these penetrations. For example, the equipment hatch is not treated separately and the area of the Drywell wall is not reduced for the equipment hatch penetration. This is a bounding treatment as the penetrations are tested separately with local leak-rate tests. One exception to this if for the eight vent lines. The surface areas of the lines are treated separately and the areas of the vent opening are excluded.
5. The February 5, 2002 letter to the NRC (Reference 15) provides the basis for the assumption that approximately 10% of the Drywell is inaccessible for examination. This is used as an input to the risk evaluation.
6. The February 5, 2002 letter to the NRC (Reference 15) provides the basis for combining the approximately 40% of the Torus that is submerged with the area of the Drywell that is inaccessible. Note that the submerged areas may be inspected; applying the 100% visual inspection detection failure likelihood is bounding. This evaluation includes a refined calculation of the percent of the Torus surface area below water based on the volumes provided in the IPE, consistent with the areas calculation herein. This is used an input to the risk evaluation.
7. Containment liner corrosion, as a phenomenon does not contribute to Core Damage Frequency (CDF), but is part of the sequence of events leading to accident releases. Thus, CDF is unchanged for an ILRT extension. CDF may be divided into the various EPRI Accident Classes and further sub-divided into the release categories that comprise Large Early Release Frequency (LERF). The High/Early portions of EPRI Accident Classes 2, 3b, 6, 7 and 8 comprise the base LERF (Reference 5). The impact of an ILRT extension is hypothesized to cause an increase in (LERF), and is categorized as

EPRI Accident Class 3b. Assuming an ILRT extension, LERF is the base LERF plus the change in LERF due to the extension. The extension of the ILRT is also hypothesized to allow previously undetected corrosion to progress such that accident sequences previously not contributing to LERF would contribute to LERF. Accident classes comprising LERF are unaffected by the ILRT extension because these classes are already "Large" and "Early". Therefore, the non-LERF accident classes form the source for additional large early releases due to the ILRT extension.

8. The contribution to LERF from external events due to non-detected containment liner corrosion cannot be readily addressed through a quantitative solution because these events are not based exclusively on a systems analysis approach as for the internal events. Neither fire nor weather-related events lead to containment bypass, categorized as EPRI Accident Class 8. A bounding ratio of LERF to CDF that excludes containment bypass provides a conservative estimate of the impact on LERF.
9. As described by Reference 14, BNP performs a general visual examination of the accessible areas of primary containment to the requirements of procedure 0PT-20.5.1, "Primary Containment Inspection" (Reference 11).

F.5 Evaluation

This evaluation responds to the Nuclear Regulatory Commission (NRC) request for additional information regarding the risk impact from containment liner corrosion during an extension of the ILRT interval. As requested, the Calvert Cliffs analytical approach to estimate risk due to concealed containment liner corrosion is applied to the Brunswick Nuclear Plant (BNP). Discussion of the method and underlying assumptions are provided by the Calvert Cliffs submittal (Reference 16), attached hereto. The method determines the total likelihood of non-detected containment leakage given a change in the likelihood given that a flaw exists (i.e., increase in flaw likelihood due to the ILRT extension), that the flaw is not detected and that the flaw results in a breach. Because of similarity in containment, method and CDF, the sensitivity analysis performed for Calvert Cliffs is applicable to BNP.

The table below documents the application of the method to BNP. Steps 1, 2 and 3 are unchanged. As directed by the NRC, plant specific information is input to Step 4. Step 5 is adapted for the BNP-specific configuration wherein a fraction of the Torus is submerged. Step 6 is calculated by multiplying the values from Steps 3, 4 and 5.

The Step 4 likelihood of a breach in containment given a liner flaw is based on the Calvert Cliffs analysis with a BNP-specific value for the upper-end pressure failure (100% likelihood) taken from Figure 4.4-2 of the IPE (Reference 17). A containment pressure of 146 psia corresponds with the 50% probability of failure. The lower-end pressure failure (0.1% likelihood) is set at 20 psia, consistent with Calvert Cliffs. Per the Calvert Cliffs methodology, the failure probability (FP) vs. containment pressure (P) is assumed to be an equation of the form:

$$FP(P) = b * e^{m*P}$$

The two anchor points provide sufficient information to solve for the slope, m and the intercept, b:

$$m = \ln(1.0) - \ln(0.001) / (146 - 20)$$

$$m = 5.48E-2$$

$b = 1 / e^{5\ 48E\text{-}2*146}$

$b = 3.34E\text{-}4$

Intermediate values for FP may then be determined.

The December 1991 ILRT test pressure of 50.8 psig was performed to Revision 25 of BNP procedure 0PT-20.5 (Reference 10). The February 1993 test pressure of 50.4 psig was performed to Revision 27 of this procedure. A representative value of 65 psia is used to calculate the likelihood of a breach in the liner. Then:

$FP(65\ psia) = 3.34E\text{-}4 * e^{5\ 48E\text{-}2 * 65}$

$FP = 0.0118$, or 1.18%

For the Drywell floor, the failure probability is set to one-tenth of the failure probability for the Drywell walls, or 0.12%. See Section F.4, Assumption for a discussion of this.

A deviation from Step 5 is introduced to account for the difference in visual detection failure likelihood for the BNP primary containment liner, relative to the Calvert Cliffs containment liner. Because the liner under the Drywell floor cannot be visually inspected, a visual detection failure likelihood of 100 % is assigned, consistent with the Calvert Cliffs method. As described in the February 5, 2002 letter to the NRC (Reference 14), 1) approximately 10% of the Drywell is considered to be inaccessible, and 2) examination of the area below the water line in the Torus is not required. The submerged area of the Torus is not inaccessible; however, a visual detection failure likelihood of 100 percent is assigned for this area and for the inaccessible area. This is bounding, as the submerged area of the Torus may be examined. The visual inspection detection failure likelihood for the accessible area is set to 10%, consistent with the Calvert Cliffs analysis. This represents a 5% failure to identify a visual flaw and 5% likelihood that the flaw is not visible.

Step 6 is modified to apply the appropriate visual detection failure likelihood to the accessible portion of the Drywell and Torus; and to the inaccessible portion of the Drywell and submerged area of the Torus; weighted by accessible percentage then multiplied by the likelihood of a breach. The visual detection failure likelihood for the Drywell floor is calculated separately.

The figure below documents the calculation of applicable surface area used in Step 6. As documented by the February 5, 2002 letter to the NRC (Reference 14), the Torus is approximately 40% filled with water. The submerged area of the Torus is calculated as 41.4% of the Torus surface area.

The total likelihood of non-detected containment leakage of 0.040% is the sum of the non-detected leakage from the Drywell/Torus and from the Drywell floor. This is not weighted by applicable surface area, consistent with the Calvert Cliffs method.

The change in LERF due to containment liner leakage for an increase in the ILRT interval to 15 years is calculated as the likelihood of non-detected liner leakage multiplied by the applicable non-LERF core damage frequency.

The non-LERF CDF is determined as follows. The base CDF, or internal events CDF is taken from the PSA model of record (Reference 4). The external events CDF from fire and weather are from the IPEEE (Reference 18). The base LERF is taken from the ERIN Engineering report, "Brunswick Level 2 PSA Input to ILRT", as documented in Calculation BNP-PSA-055 (Reference 5) and in the January 31, 2002 letter to the NRC (Reference 13). The increase in LERF due to the ILRT extension is included as LERF (Reference 13). For external events LERF, the ratio of applicable LERF to CDF is from the January 31, 2002 letter to the NRC (Reference 13). The non-LERF frequency is then the difference in CDF and LERF for the internal and external events.

The increases in LERF (ILRT 3 to 15 years) due solely to liner corrosion from internal and external events as shown in the table are 1.74E-8 and 1.35E-8, respectively. The total increase is 3.09E-8.

References 6 and 12 document the increase in Type A LERF (ILRT 3 to 15 years) for Class 3b from an ILRT extension as 1.54E-7. The total increase in LERF from an ILRT extension is the sum of these, 1.85E-7.

Total LERF was previously calculated in Reference 13 as 1.03E-5, including the increase in Type A LERF for Class 3b from an ILRT extension. Inclusion of the increase in LERF (ILRT 3 to 15 years) from internal and external events, due solely to liner corrosion of 3.05E-8 increases total LERF to 1.033E-5.

As discussed in Reference 13, given the conservatism in the external events assessment, this calculation has reasonably shown that the total LERF results are expected to be below the 1E-5 per year guideline value in Regulatory Guide 1.174 (Reference 1) and, therefore continue to support the conclusion that the ILRT extension represents an acceptable increase in the overall risk.

Step	Item	Inputs	Accessible Portion of Drywell and Torus	Inaccessible Portion of Drywell and Submerged Area of Torus	Inaccessible Portion of Drywell Floor
	Percent Drywell Accessible for Inspection	90 0%			
	Torus Surface Area Above Water	58.6%			
	Drywell Head Surface Area, Inside and Outside (sq ft)	3,020	2,718	302	
	Drywell and Vent Line Surface Area (sq ft)	17,409	15,668	1,741	
	Drywell Floor Surface Area (sq ft)	3,106			3,106
	Torus Surface Area (sq ft)	31,198	18,282	12,916	
	Total Surface Area (sq ft)	54,733	36,668	14,959	3,106
	Percentage Total		67 0%	27.3%	5.7%
	Percentage Accessible (to weight Step 6)		71 0%	29 0%	
1	Historic Liner Flaw Likelihood		5.19E-03	5.19E-03	1.30E-03
2	Age Adjusted Liner Flaw Likelihood		6 27E-03	6.27E-03	1 57E-03
3	Increase in Flaw Likelihood between 3 and 15 Years		8.70%	8.70%	2.20%
	Upper End Pressure (100% likelihood), psia	146.00			
	Lower End Pressure (0 1% likelihood), psia	20 00			
	Test Pressure (psia)	65 00			
	Slope (m)	5.48E-02			
	Intercept (b)	3.34E-04			
4	Likelihood of Breach in Containment Given Liner Flaw		1.18%	1.18%	0.12%
5	Visual Inspection Detection Failure Likelihood		10%	100%	100%
6	Likelihood of Non-Detected Containment Leakage		0 0103%	0.1025%	0.0026%
	Total Likelihood of Non-Detected Containment Leakage (weighted)		0 040%		

Internal Events CDF	4.95E-05	
High Early Portions of Classes 2, 6, 7 and 8 (LERF CDF) plus 3b Type A LERF	<5.82E-06>	
Type A LERF from 3b due to ILRT Extension	<1 54E-07>	
Non-LERF CDF - internal	4.35E-05	
Fire CDF	3.40E-05	
Other External Events CDF	4 00E-06	
External Events CDF	3 80E-05	
Ratio LERF/CDF (no bypass)	1.14E-01	
External Events LERF	<4 33E-06>	
Non-LERF CDF - external	3.37E-05	
Increase in LERF due to Liner Corrosion (Internal Events Only)		**1.74E-08**
Increase in LERF due to Liner Corrosion (External Events Only)		**1.35E-08**

SURFACE AREAS

Drywell Head	S1	3,020 sq ft
Drywell Walls	S2	3,086 sq ft
	S3	5,661
	S4	3,419
	S5	2,435
less openings	S7	<1,008>
		13,593 sq ft
Drywell Floor	S8	2,369 sq ft
	S6	737
		3,106 sq ft
Vent Lines	S9	3,816 sq ft
Torus-wet 41.4%		12,916 sq ft
Torus-dry 58.6%		18,282
Torus	S10	31,198 sq ft
Total		54,733 sq ft

SPHERICAL CAP
S=2*PI*R*h
R1=17' 11"; h1=13' 5"
S=1,510 sq ft inside
+ 1,510 sq ft outside
S1 = 3,020 sq ft

VERTICAL RIGHT CYLINDER
S=2*PI*R*h
R1=17' 11"; h2=27' 5"
S2= 3,086 sq ft

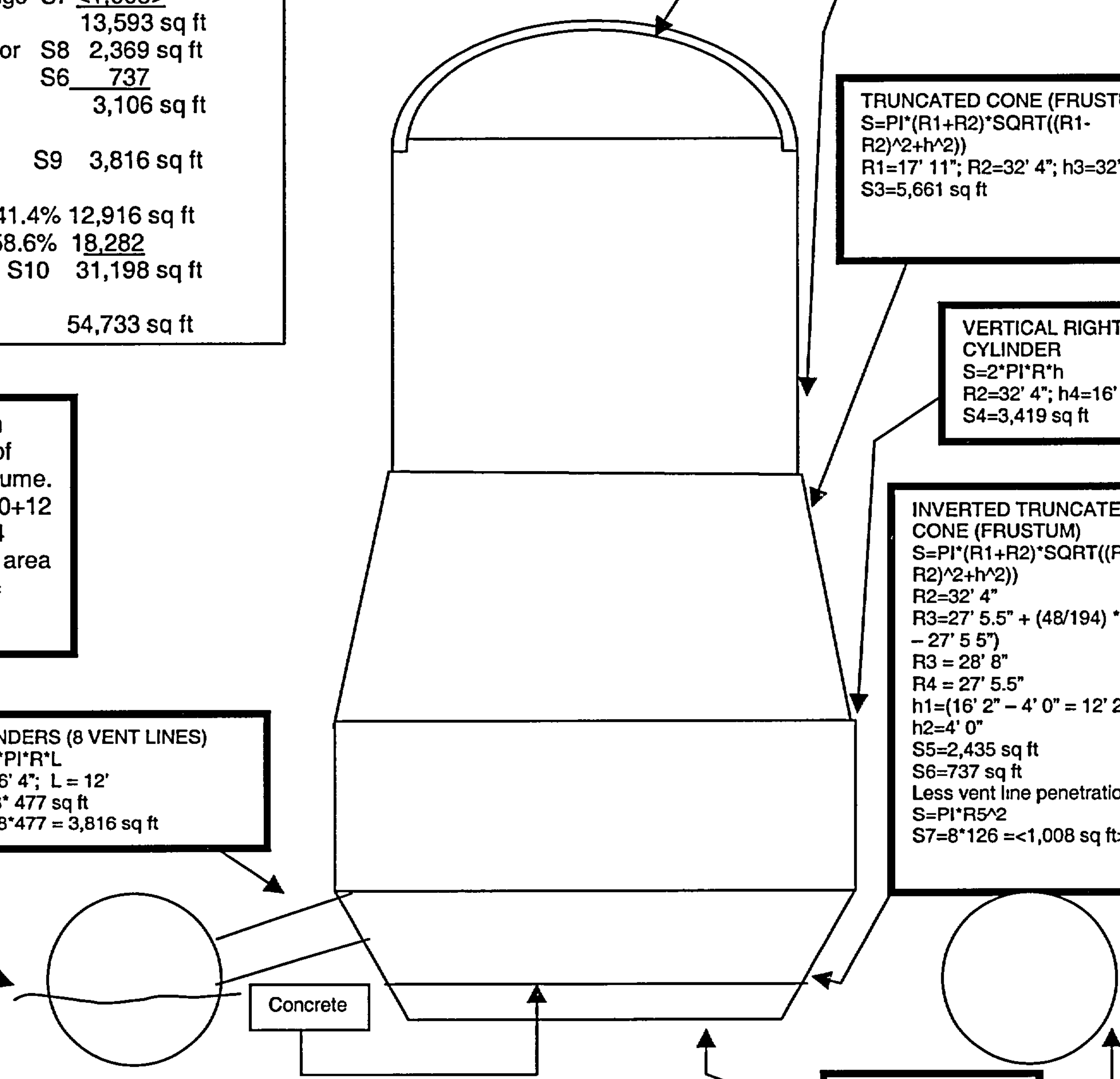
TRUNCATED CONE (FRUSTUM)
S=PI*(R1+R2)*SQRT((R1-R2)^2+h^2))
R1=17' 11"; R2=32' 4"; h3=32' 10"
S3=5,661 sq ft

VERTICAL RIGHT CYLINDER
S=2*PI*R*h
R2=32' 4"; h4=16' 10"
S4=3,419 sq ft

Water Level in Torus = ratio of wet to free volume. 87,600/(87,600+124,000) = 0.414
Torus surface area above water = 58.6%

INVERTED TRUNCATED CONE (FRUSTUM)
S=PI*(R1+R2)*SQRT((R1-R2)^2+h^2))
R2=32' 4"
R3=27' 5.5" + (48/194) * (32"4" – 27' 5 5")
R3 = 28' 8"
R4 = 27' 5.5"
h1=(16' 2" – 4' 0" = 12' 2"
h2=4' 0"
S5=2,435 sq ft
S6=737 sq ft
Less vent line penetrations (8)
S=PI*R5^2
S7=8*126 =<1,008 sq ft>

CYLINDERS (8 VENT LINES)
S = 2*PI*R*L
R5 = 6' 4"; L = 12'
S9 =8* 477 sq ft
S9 = 8*477 = 3,816 sq ft



CIRCLE (BOTTOM)
S=PI*R^2
R6=27' 5 5"
S8=2.369 sq ft

TORUS
S=4*PI^2*Rmajor*Rminor
Rmajor=54' 6"; Rminor=14' 6"
S10=31,198 sq ft

Dimensions for Drywell and Torus from Figure 4.1-3 of the IPE (also UFSAR Figure 3.8.2-1)
Reference for Surface Area of Drywell and Torus Formulas:
http://www.geom.umn.edu/docs/reference/CRC-formulas/node59.html

F.6 Interfaces

This EC should receive concurrent reviews from System Engineering, ISI/IST, and PSA.

F.7 Quality Class Determination

Quality class of SSC's involved in this EC are as follows:

This EC only provides a risk evaluation using the PSA model (non-safety related, quality class D) of postulated concealed containment liner corrosion. Although the evaluation is associated with the primary containment (safety related, quality class A), there are no changes to the primary containment associated with the EC. Therefore the resultant quality class is D.

G. Document/Drawing and Equipment Database Mark-Ups

None.

Controlled documents requiring revision are listed on the EC Affected Document List (ADL). Drawings required for turnover are designated with the "OpSVc" flag on the ADL. Either drawing mark-ups or descriptions of changes for each affected document are given below.

Changes to the Equipment database which are under PassPort revision tracking and control are listed on the EC Affected Equipment List (AEL) with pending changes specified in minor revisions to each item on the AEL. Changes to the equipment database outside the scope of PassPort revision tracking and control are also given below.

G.1 Document/Drawing Updates

Doc. Type	Document Number	Sht	Description Of Change or Reference to Mark-Up
N/A	N/A	N/A	N/A

Hit Ctrl-Enter to insert a new page as required to hold each electronic or scanned mark-up or to act as a place holder for each hard-copy mark-up.

G.2 Equipment Parameter Notes

CAUTION

PassPort equipment database **Parameter Notes** appear to be under Revision Tracking & Control (RT&C) because they are open to the RE for input. However, the PassPort software design does not include **Parameter Notes** under RT&C. Any change made by the RE would immediately change the latest equipment database record. Any change to **Parameter Notes** is provided by the RE in the EC Design Specification and implemented only by Configuration Management.

No parameter notes are required.

U	System	Tag # or Equipment #	Parameter
	N/A	N/A	N/A
Current Major Revision		N/A	
Pending Minor Revision		N/A	

G.3 Equipment Document References

No equipment document references are applicable.

Unit	System	Tag # or Equipment #		
N/A	N/A	N/A		
Doc. Type	**Sub-Type**	**Document Number**	**Sht**	**Title**
N/A	N/A	N/A	N/A	N/A

H. Installation Package

Installation is not required for this evaluation.

H.1 Installation Requirements

None.

H.2 Label Requests

None.

H.3 Testing Requirements

<u>Precautions, Limitations, and Outage Requirements:</u>
This EC evaluates the risk impact from containment liner corrosion occurring during the interval between ILRTs (from 3 years to 15 years). This EC does not evaluate the results of the ILRTs, nor does this EC recommend an appropriate interval between ILRTs.

<u>Test and Acceptance Criteria:</u>

None.

H.4 EC Parts List

<u>Unique and Long Lead Procurement Items:</u>

No unique or long lead procurement actions are required by this EC:

Installation	Item #	N/A	
Installation	Quantity/Units	N/A	
Installation	PO Number	N/A	
Installation	PE Request	N/A	
Installation	Catalog #	N/A	
Design	Description	N/A	
Design	Manufacturer	N/A	
Design	Model	N/A	
Design	Version	N/A	
Design	Spec. or CGI	N/A	
Design	Q for use	N/A	
Design	Q for buy	N/A	

<u>Other Materials:</u>

A Bill of Material Forms for other materials is not required by this EC.

Installation	Item #	N/A	
Installation	Quantity/Units	N/A	
Installation	PO Number	N/A	

Design	PE Request	N/A	
	Catalog #	N/A	
	Description	N/A	
	Manufacturer	N/A	
	Model	N/A	
	Version	N/A	
	Spec. or CGI	N/A	
	Q for use	N/A	
	Q for buy	N/A	

I. Installation Sketches

No sketches are required for this EC.

Sketch Number	Sht	Rev	Title
N/A	N/A	N/A	N/A

J. 50.59 Screen/Evaluation

Identification No:	02-1241	**Revision No:**	0						
REG-NGGC-0010 Rev. 4 Sheet 1 of 4 Screen									
Plant Applicability:		X	**BNP**		**CR3**		**HNP**		**RNP**
Implementing Document No:		EC 49741				**Revision No:**	0		
Implementing Activity Description:									
EC 49741 provides the PSA risk evaluation for postulated containment liner corrosion occurring during the interval between the Primary Containment ILRT (Integrated Leak Rate Test). The results of the risk evaluation are measured by increase in LERF (Large Early Release Frequency). The risk evaluation responds to a Nuclear Regulatory Commission request for additional information in follow-up to a prior Technical Specification 5.5.12 licensing change request submittal. The impact of this licensing change is assessed by TSC-2001-06.									

	SECTION 1: Predetermination	**("x" below the answer)**	
1a	Is a change to the Technical Specifications or Operating License necessary to implement the proposed activity?	**Yes** Initiate a change in accordance with applicable procedure and go to Section 2	**No** **X** Continue to the next question

		Yes	No
1b	Is the proposed activity fully bounded by a previously completed screen or evaluation performed in accordance with REG-NGGC-0010? Or	**X** Enter the Reference below and go to Section 4	Go to Section 2
1c	Has the proposed activity been formally approved by the NRC?		

Reference:

This activity is fully bound by a previously completed screen as documented by RAINS 01-1466 (which supported the Technical Specification Change package for the ILRT deferral) and is summarized below.

> Request For License Amendments - Extension of Frequency For Performance of Integrated (Type A) Leakage Rate Testing. This changes involves a one-time extension to the 10-year frequency for performing performance-based Type A leakage rate testing. Based on the results from a plant-specific risk-based evaluation, on a one-time basis, the Unit 1 Type A leakage test frequency is being extended to 15 years and the Unit 2 Type A leakage test frequency is being extended to 15 years, 1 month. This change involves a revision of the Technical Specifications which will require issuance of a license amendment prior to implementation; consequently, in accordance with 10 CFR 50.59(c)(4), this change is not required to be reviewed under the requirements of 10 CFR 50.59 since 10 CFR 50.90 establishes more specific criteria for accomplishing such a change.

BNP Technical Specifications (Unit 1 and Unit 2) including SR 3.6.1.1, 5.5.12; Operating License (Unit 1 and Unit 2); TS Bases (Unit 1 and Unit 2) including B3.6.1.1; TRM (Unit 1 and Unit 2)

Identification No:	02-1241	Revision No:	0	

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Screen

SECTION 2: Applicability of Regulatory Processes Other Than 10 CFR 50.59

Address the questions below for all aspects of the activity. If the answer is "Yes" for any portion of the activity, complete the associated attachment (e.g. Question 3 and Attachment 3). Note that it is not unusual to have more than one process apply to a given activity.

("x" below the answer)

		Yes	No
2	Does the proposed activity involve a change to the Emergency Plan or an Emergency Plan implementing procedure needed to comply with the requirements of 10 CFR 50 Appendix E? (Attachment 2)		
3	Does the proposed activity involve a change to the Security Plan, the Safeguards Contingency Plan or the Security Personnel Training and Qualification Plan? (Attachment 3)		
4	Does the proposed activity involve a change to the Quality Assurance Program Description? (Attachment 4)		
5	Does the proposed activity involve a change to the Fire Protection Program? (Attachment 5)		
6	Does the proposed activity involve a change to the licensed operator requalification program? (Attachment 6)		
7	Does the proposed activity involve a change in thermal or chemical effluents, involve a change to the Environmental Protection Plan, or involve a significant change to land use that could impact the environment? (Attachment 7)		
8	Does the proposed activity involve a change to the Emergency Response Data System? (Attachment 8)		
9	**[RNP Only - A response to this question is not to be provided by Evaluators at BNP, CR3, and HNP]** Does the implementing activity affect the ISFSI? (Attachment 9)	NA	NA
	Are all aspects of the activity controlled by one or more of the Regulatory Processes identified in question 1a and questions 2 through 9 above?	Complete the required attachments and go to Section 4	Complete the required attachments and go to Section 3

Identification No:	02-1241	Revision No:	0	

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Screen

SECTION 3: 10 CFR 50.59 Screen

		("x" below the answer) Yes	No
10a	Does the proposed activity involve a change to an SSC that adversely affects any FSAR-described design function?		
10b	Does the proposed activity involve a change to a procedure that adversely affects how any FSAR-described SSC design functions are performed or controlled?		
10c	Does the proposed activity involve revising or replacing any FSAR-described evaluation methodology that is used in establishing the design bases or used in the safety analyses?		
10d	Does the proposed activity involve a test or experiment not described in the FSAR, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the FSAR?		
	Are any of these questions (10a, 10b, 10c, or 10d) answered "Yes?"	Complete and attach Attachment 10 and go to Section 4	Enter Justification and References below and go to Section 4

Justification:

References:

Identification No:	02-1241	Revision No:	0	

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Sheet 4 of 4
Screen

SECTION 4: Signatures and Distribution

Evaluator:		Date:	
Reviewer:		Date:	
Supervisor:		Date:	
Additional Reviews (if required)			
Reviewer:		Date:	
Reviewer:		Date:	
Reviewer:		Date:	

ELECTRONIC SIGNATURES ARE PROVIDED IN EC MILESTONES

K. Reviewer Comments

Select, copy and paste the table below into a WORD file and e-mail message to reviewers. Select (Table/Select/Table), copy (Ctrl-C) and paste (Ctrl-V) tables from reviewer's responses below. Have reviewer sign EC milestone when comments are resolved.

Discipline/Program Review	Scope of Review
PSA	Consistency with prior application of methodology

Reviewer	Discipline	Date	Turnover Required?
Brad Dolan	PSA	07/29/02	No

Item	Comment	Resolution
1	"In response, the NRC requested that BNP determine the change in likelihood..." Can you confirm the RAI asks this? Would it be more precise to say something like, "NRC requested that BNP evaluate the impact of the change in ILRT interval on the risk of containment failure associated with concealed liner corrosion...?"	Change made to Section D as suggested to clarify the nature of the NRC request.
2	Reference no 3, p. 8: "individual" should be capitalized.	Correction made.
3	Assumptions: Clarify in assumption (or justification discussion) 4 that it is conservative to assume that failures on the "backside" (top) of the drywell head would be as difficult to detect as the backside of Calvert Cliffs containment liner. Also, impact would be minor but suggest recalculation of drywell head surface area to incorporate inside liner area only. Suggest deleting reference to flange leak, this is not relevant to "3b" LERF.	Clarification added. Discussion of flange maintained as it provides the basis that the Calvert Cliffs assumptions are applicable to the Drywell head as well as the Drywell walls. Both sides of head included as both sides are inspected.
4	Assumptions, #8: "All non-detectable containment leakage events are considered to be LERF." Should this say "All LARGE ....?"	Calvert Cliffs method does not distinguish between Large and non-Large and therefore assumption not changed. Note that the assumptions were renumbered and this assumption is now #7.

5	Justification #2: Suggest clarifying. Adequate basis for assumption #2 could be something like "Consistent with Calvert Cliffs methodology, the leakage potential via the drywell base was assumed to be 10x less likely than via other sections of the pressure suppression containment structure."	Clarification added.
6	Justification #8: Suggest rephrasing, maybe striking "and the extension cannot make these classes larger or earlier."	Phrase stricken. Note that the assumptions were renumbered and this assumption is now #7.
7	Somewhere indicate procedural basis for assumption that liner will be inspected.	New assumption #9 added.

Discipline/Program Review	Scope of Review		
Civil	System Engineer Review		
Reviewer	**Discipline**	**Date**	**Turnover Required?**
Martin E. Souther	Civil	08/02/02	No

Item	Comment	Resolution
1	Sec F.3.1; Basic function of primary containment with respect to ILRT should be provided.	Discussion of the basic function of primary containment and the specific function of the liner, as it relates to this EC added.
2	Sec F.3.3; State current requirement and that this evaluation is a basis for requesting an extension of the ILRT interval.	Discussion of the current T/S requirement added.
3	Sec F.4.3; The discussion of similarities is confusing. With respect to corrosion of the liner, the fact that both designs are concrete backed steel liner with a concrete floor seems adequate. Also, there is a section of 1 ½" liner plate that extends above the concrete backing that is welded to the bottom head flange. Comparing dimensional differences does not seem relevant.	Discussion simplified to remove reference to actual thickness of BNP liner and concrete. These dimension are not used in the calculation.
4	Sec F.4.4; How is the difference accounted for by stating that the BNP containment limiting failure is the flange between the head and liner? Provide ref.	Reference for the IPE added to this item. Additional discussion added to explain basis for lumping the Drywell Head with remainder of drywell when calculating the likelihood of breach.
5	Sec F.5, 1st sent.; 'impact from' vs. 'impact of from'	Correction made.
6	Sec F.5, pg. 7, 1st para, 3rd sent.; 'approximately 10%' vs. 'less than 10%'	Change made.
7	Sec F.5, pg. 7, last sent.; You state the submerged area of the torus is readily examined but previously stated that it is inaccessible.	Revised to not use term "inaccessible" when referring to the submerged area of the Torus.
8	Sec F.7; Provide discussion via email regarding selection of quality class.	Discussion added to section to augment basis for classifying PSA evaluations as "Non Safety".

Discipline/Program Review		Scope of Review	
ISI/IST	System Engineer Review		
Reviewer	**Discipline**	**Date**	**Turnover Required?**
Patrick Godsey	Civil	08/02/02	No

Item	Comment	Resolution
1	Submerged area to be inspected in the third period (2006 to 2008).	Assumption #6 revised to discuss bounding assumption (100% visual detection failure probability assumed for liner in submerged area) for the submerged area of the Torus.
2	ASME Section 11 provides industry standard for inspection. 0PT20.5.1 provides basis for inspections. 10 CFR 50 Appendix J provides basis for ILRT.	References added.
3	Liner thickness used in EC is the design value. Actual thickness may vary as required for structural purpose.	Liner thickness removed from discussion. This dimension not used in evaluation.
4	Penetrations are subject to local leak rate testing.	Assumption #4 reworded to provide basis for ignoring penetrations in this evaluation.
5	Drywell seals are subject to inspections and replaced.	Drywell flange seal is the limiting failure as shown in the IPE, Figure 4.4-2. This failure point is an input to the calculation of Step 4. This supports assuming that the likelihood of a breach in the floor is less than the likelihood of a breach in the walls.

M. Turnover Summary

No turnover is required by this EC. This EC evaluates plant risk (measured in LERF) from containment liner corrosion during the interval between ILRTs. This EC does not modify any plant SSC or procedure and does not evaluate any actual or existing corrosion. Therefore, turnover is not required.

Charles H. Cruse
Vice President
Nuclear Energy

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 495-4455

Constellation Nuclear

Calvert Cliffs
Nuclear Power Plant

A Member of the Constellation Energy Group

March 27, 2002

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1; Docket No. 50-317
Response to Request for Additional Information Concerning the License Amendment Request for a One-Time Integrated Leakage Rate Test Extension

REFERENCES:

(a) Telephone Conferences between Ms. D. J. Moeller, et al. (CCNPP) and Ms. D. M. Skay, et al., dated March 1, March 7, March 14, and March 19, 2002, same subject

(b) Letter from Mr. C. H. Cruse (CCNPP) to NRC Document Control Desk, dated January 31, 2002, "License Amendment Request: One-Time Integrated Leakage Rate Test Extension"

(c) Letter from Mr. C. H. Cruse (CCNPP) to NRC Document Control Desk, dated November 19, 2001, "License Amendment Request: Revision to the Containment Leakage Rate Testing Program Technical Specification to Support Steam Generator Replacement"

This letter provides the information requested in a series of teleconferences (Reference a) and supplements the information provided in Reference (b). Specifically, we were asked to provide information addressing how the potential leakage due to age-related degradation mechanisms were factored into the risk assessment for our requested Integrated Leakage Rate Test (ILRT) one-time extension. In addition, we are submitting a correction to the marked-up pages originally provided in Reference (b). This information does not change the conclusions of the significant hazards determination provided in Reference (b).

REQUESTED CHANGE

The final Technical Specification pages are included in Attachment (1). In Reference (b), the term "exempted" was used in the marked-up version of the Technical Specification pages. The correct term that should have been used was "excepted." The final Technical Specification pages reflect this correction. This correction should also be applied to the change requested in Reference (c).

A047

SUPPLEMENTAL INFORMATION

Structural Design

Walls

The Containment Structure is a post-tensioned, reinforced concrete cylinder and dome connected to and supported by a massive reinforced concrete slab (basemat). The liner plate is ¼-inch thick and is attached and anchored to the containment concrete structure. The concrete vertical wall thickness is 3-¾ feet. The concrete dome thickness is 3-¼ feet. Since the concealed side of the liner plate is in contact with the concrete, leakage requires a localized transmission path connecting a breach in the containment concrete with a flaw in the liner.

Floor

The containment basemat is a 10-foot thick base slab that was constructed monolithically with steel sections (H or W sections) laid out to match the liner plate joints and embedded such that one flange surface was flush with the finished concrete. The liner plates were then laid out on top of these sections and welded. The liner plates are full penetration welded to each other with a gap of sufficient thickness to allow the root of the weld to partially penetrate the embedded steel. This provides a segmented area under the floor liner plates where free communication from one area to the other is heavily constrained.

After welding was complete, the welds themselves were covered with channel sections (leak chases), seal welded to the plates, and ported to allow pressure testing of the liner welds. The floor liner plates were oiled and the interior slab was poured with the test connections left in place to provide for future weld testing during ILRTs.

The liner plates under the interior slab are in contact with the concrete on both sides except for a small area at the leak chases and at the edge of the concrete where an expansion material was used. Since concrete acts to protect steel in contact with it, we feel that there is little likelihood of corrosion occurring in the floor liner plates. During replacement of the moisture barrier, the area directly behind the old barrier material was determined to be the area most affected by corrosion. This area was evaluated on both units and has been incorporated into an augmented examination population required by the American Society of Mechanical Engineers (ASME) Code.

Inspectable Area

Approximately 85 percent of the interior surface of the liner is accessible for visual inspections. The 15 percent that is inaccessible for visual inspections includes the fuel transfer tube and area under the containment floor.

Liner Corrosion Events.

Two events of corrosion that initiated from the non-visible (backside) portion of the containment liner have occurred in the industry. These events are summarized below:

- On September 22, 1999, during a coating inspection at North Anna Unit 2, a small paint blister was observed and noted for later inspection and repair. Preliminary analysis determined this to be a through-wall hole. On September 23, a local leak rate test was performed and was well below the allowable leakage. The corrosion appeared to have initiated from a 4"x4"x6' piece of lumber embedded in the concrete.

An external inspection of the North Anna Containment Structures was performed in September 2001. This inspection (using the naked eye, binoculars, and a tripod-mounted telescope) found several additional pieces of wood in both Unit 1 and Unit 2 Containments. No liner degradation associated with this wood was discovered.

- On April 27, 1999, during a visual inspection of the Brunswick 2 drywell liner, two through-wall holes and a cluster of five small defects (pits) in the drywell shell were discovered. The through-wall holes were believed to have been started from the coated (visible side). The cluster of defects was caused by a worker's glove embedded in the concrete.

Calvert Cliffs Inspection Program

To help assure continued containment integrity, the containment liners at Calvert Cliffs Nuclear Power Plant (CCNPP) are examined in accordance with the requirements of ASME Boiler and Pressure Vessel (B&PV) Code Section XI, Subsection IWE (as amended and modified by 10 CFR 50.55a) and the plant Protective Coatings Program, both as a natural consequence of maintenance activities and as planned events. Each will be discussed separately.

During the course of maintenance activities requiring repairs to the containment liner plate coatings, ASME XI Subsection IWE requires visual exams to evaluate the condition of the liner plate. Typically, these repairs are done to correct blisters, peeling, flaking, delamination, and mechanical damage of the coating system of the liner. To date, there have been over 500 exams of this nature (one repair generates multiple exams) performed at CCNPP since the requirements of Subsection IWE were imposed with no indication of liner base metal degradation.

The safety-related Protective Coatings Program at CCNPP requires a walkdown of the containment interior be performed at the beginning of each refueling outage to determine areas requiring repair. This walkdown, performed by engineering personnel, maintenance personnel, and National Association of Corrosion Engineers (NACE)-trained coatings examiners, looks at accessible coated structures in the Containment as well as the liner.

Repair of items found on these walkdowns is then planned, staged, and performed, with any postponement of repairs beyond the current outage requiring engineering approval. Liner coating repairs are witnessed and documented at the beginning stage and upon completion by a Certified Non-Destructive Examination (NDE) Examiner. This is to allow proper assessment of the cause of the damage prior to repair and to document the as-left condition. The specific goal of this approach is to identify any indication of liner damage. As stated above, over 500 documented exams have shown no evidence of liner degradation.

Scheduled inservice inspection (ISI) exams are performed in accordance with the scheduling requirements of the ASME Section XI, Subsection IWE, and 10 CFR 50.55a. These documents require visual examination of essentially 100% of the containment liner accessible surface area once per ISI period (three in ten years). This exam is performed and documented by Certified NDE Examiners during the outage and/or before an ILRT.

This exam is performed both directly and remotely, depending upon the accessibility to the various areas. Remote exams are performed with binoculars to provide a clear view of all areas. To date, this exam has been performed twice on Unit 1 and once on Unit 2 with no recordable indications of liner plate degradation.

Several areas were identified on both units as candidate areas for Augmented Examination, in accordance with IWE-1241. These included areas beneath the liner to floor slab moisture barriers, potential ponding areas at structural steel attachments, and several areas with photographic evidence of dark areas. Further evaluation of these areas yielded the following conclusions:

- No ponding areas were evident either as being presently wet or by the presence of watermarks.
- The dark areas were identified in both cases to be insulation at a penetration.
- The area beneath the moisture barrier on both units showed degradation that required engineering evaluation. The area beneath the moisture barrier was found to suffer from scaling, rust, and pitting. Areas visually representative of the worst of these were selected for detailed examination and documented using a combination of ultrasonic thickness measurement, pit depth measurement, and detailed visual examination. These areas are now designated as Augmented Examination in accordance with Subsection IWE, and are subject to repeat examination once per ISI period as required by Subsection IWE.

The bolting examinations required by Table IWE-2500-1, Category E8.10 and E8.20, are performed during preventive maintenance activities of certain components. These maintenance activities are scheduled to support replacement of the seals and gaskets used in the component connections. Additionally, some of these connections are routinely used during outages, and the examination and testing of these connections is performed to re-establish containment integrity at the end of the outage. Any parts (except for seals and gaskets, which are exempt) that are replaced are subject to compliance with our Repair and Replacement Program and receive the appropriate inspections at that time.

Non-destructive examination examiner qualifications are governed by Calvert Cliffs procedure MP-3-105, "Qualification of Non-Destructive Examination Personnel and Procedures." This procedure requires documenting the necessary experience, training, visual acuity, and certifications in accordance with American National Standards Institute/American Society for Nondestructive Testing CP-189. Additionally the CCNPP coating examiners are NACE trained.

Effectiveness of the CCNPP inspection programs is judged to be high. This is based on the use of both NACE and CP-189-certified examiners for the different exams that are conducted. The depth that is provided by this approach yields a level of redundancy due to the differing focus of each examination.

Rigor of the examinations is provided by compliance with our Protective Coatings, NDE, and ISI programs. The coatings program controls the initial walkdown and focuses on the condition of the safety-related Level 1 coatings. This effort provides an initial assessment of the gross liner condition. In addition, the NDE Program provides a CP-189 certified examiner when preparation is started on each area to be repaired. This is done to verify the condition of the base metal as the defective coating is removed. As noted previously, this activity has resulted in over 500 documented examinations with no indications of liner deterioration.

Further, the ISI Program for Subsections IWE and IWL requires examination of the accessible portions of the liner once per period. This exam is conducted using a mixture of direct and remote examination techniques. Both units have been examined completely through these joint programs at least one time each with no defects noted. We will perform an additional Subsection IWE visual exam during the 2004 Unit 1 refueling outage.

Liner Corrosion Analysis

The following approach was used to determine the change in likelihood, due to extending the ILRT, of detecting liner corrosion. This likelihood was then used to determine the resulting change in risk. The following issues are addressed:

- Differences between the containment basemat and the containment cylinder and dome;
- The historical liner flaw likelihood due to concealed corrosion;
- The impact of aging;
- The liner corrosion leakage dependency on containment pressure; and
- The likelihood that visual inspections will be effective at detecting a flaw.

Assumptions

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

B. The success data was 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 there is no evidence that liner corrosion issues were identified. (See Table 1, Step 1.)

C. The 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 increase likelihood of corrosion as the liner ages. Sensitivity studies are included that address doubling this rate every 10 years and every two years. (See Table 1, Steps 2 and 3, and Tables 5 and 6.)

D. The likelihood of the containment atmosphere reaching the outside atmosphere given a liner flaw exists is a function of the pressure inside the Containment. Even without the liner, the Containment is an excellent barrier. But as the pressure in Containment increases, cracks will form. If a crack occurs in the same region as a liner flaw, then the containment atmosphere can communicate to the outside atmosphere. At low pressures, this crack formation is extremely unlikely. Near the point of containment failure, crack formation is virtually guaranteed. Anchored points of 0.1% at 20 psia and 100% at 150 psia were selected. Intermediate failure likelihoods are determined through logarithmic interpolation. Sensitivity studies are included that decrease and increase the 20 psia anchor point by a factor of 10. (See Table 4 for sensitivity studies.)

E. The likelihood of leakage escape (due to crack formation) in the basemat region is considered to be 10 times less likely than the containment cylinder and dome region. (See Table 1, Step 4.)

F. 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 1, Step 5.) Sensitivity studies are included that evaluate total detection failure likelihoods of 5% and 15%. (See Table 4 for sensitivity studies.)

G. All non-detectable containment over-pressurization failures are assumed to be large early releases. This approach avoids a detailed analysis of containment failure timing and operator recovery actions.

Analysis

Table 1

Liner Corrosion Base Case

Step	Description	Containment Cylinder and Dome 85%		Containment Basemat 15%	
1	**Historical Liner Flaw Likelihood** Failure Data: Containment location specific Success Data: Based on 70 steel-lined Containments and 5.5 years since the 10 CFR 50.55a requirement for periodic visual inspections of containment surfaces.	Events: 2 (Brunswick 2 and North Anna 2) 2/(70 * 5.5) = 5.2E-3		Events: 0 Assume half a failure 0.5/(70 * 5.5) = 1.3E-3	
2	**Aged Adjusted Liner Flaw Likelihood** During 15-year interval, assumed failure rate doubles every five years (14.9% increase per year). The average for 5th to 10th year was set to the historical failure rate. (See Table-5 for an example.)	Year 1 avg 5 – 10 15	Failure Rate 2.1E-3 5.2E-3 1.4E-2	Year 1 avg 5 – 10 15	Failure Rate 5.0E-4 1.3E-3 3.5E-3
		15 year avg = 6.27E-3		15 year avg = 1.57E-3	
3	**Increase in Flaw Likelihood Between 3 and 15 years** Uses aged adjusted liner flaw likelihood (Step 2), assuming failure rate doubles every five years. See Tables 5 and 6.	8.7%		2.2%	
4	**Likelihood of Breach in Containment given Liner Flaw** The upper end pressure is consistent with the Calvert Cliffs Probabilistic Risk Assessment (PRA) Level 2 analysis. 0.1% is assumed for the lower end. Intermediate failure likelihoods are determined through logarithmically interpolation. The basemat is assumed to be 1/10 of the cylinder/dome analysis	Pressure (psia) 20 64.7 (ILRT) 100 120 150	Likelihood of Breach 0.1% **1.1%** 7.02% 20.3% 100%	Pressure (psia) 20 64.7 (ILRT) 100 120 150	Likelihood of Breach 0.01% **0.11%** 0.7% 2.0% 10.0%
5	**Visual Inspection Detection Failure Likelihood**	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.	

Table 1

Liner Corrosion Base Case

Step	Description	Containment Cylinder and Dome 85%	Containment Basemat 15%
6	**Likelihood of Non-Detected Containment Leakage** (Steps 3 * 4* 5)	0.0096% 8.7% * 1.1% * 10%	0.0024% 2.2% * 0.11% * 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.

Total Likelihood of Non-Detected Containment Leakage = 0.0096% + 0.0024% = 0.012%

The non-large early release frequency (LERF) containment over-pressurization failures for CCNPP Unit 1 are estimated at 8.6E-5 per year. This is based on the Revision 0 Unit 1 Model. This model includes both internal and external events. The external events portion of the model was recently finalized. External events represents 55% of the total core damage frequency (CDF) with fire being by far the largest external event contributor. The total CDF is 8.9E-5. This current CDF is used to re-generate the delta LERF/rem impacts for both the Crystal River (CR) method and Combustion Engineering Owners Group (CEOG) method. If all non-detectable containment leakage events are considered to be LERF, then the increase in LERF associated with the liner corrosion issue is:

Increase in LERF (ILRT 3 to 15 years) = 0.012% * 8.6E-5 = 1E-8 per year.

Change in Risk

The risk of extending the ILRT from 3 in 10 years to 1 in 15 years is small and estimated as being less than 1E-7. It is evaluated by considering the following elements:

1. The risk associated with the failure of the Containment due to a pre-existing containment breach at the time of core damage (Class 3 events).
2. The risk associated with liner corrosion that could result in an increased likelihood that containment over-pressurization events become LERF events.
3. The likelihood that improved visual inspections (frequency and quality) will be effective in discovering liner flaws that could lead to LERF.

These elements are discussed in detail below.

Pre-existing Containment Breach

The original submittal addressed Item 1. The submittal calculated the increase risk using a new CEOG methodology and a previously NRC-approved methodology. This supplement modifies, in Table 2, these values to reflect the recent update of the CCNPP Unit 1 PRA.

Table 2

Original Submitted with Updated Values

Method	LERF Increase	Person-rem/yr increase	Percentage Increase in Person-rem/yr
CEOG Method	5.4E-8	236	0.36%
NRC Approved Method	2.9E-7	19.4	0.24%

The numerical results for the previously-approved methodology shows an LERF increase that is greater than 1E-7. However, as noted in the original submittal, the calculated LERF would likely be lower than 1E-7 if conservatisms associated with the modeling of the steam generator tube rupture sequences were removed (note that this improvement was not incorporated into the modified values). In addition, the steam generators for Unit 1 are being replaced and should further reduce this likelihood.

Liner Corrosion

The original submittal also did not fully address the risk associated with liner corrosion. This supplement shows an additional small increase in LERF of 1E-8. Table 2 would be modified as follows:

Table 3

Updated Values with Corrosion Impact

Method	LERF Increase	Person-rem/yr increase	Percentage Increase in Person-rem/yr
CEOG Method	5.4E-8	236	0.36%
CEOG Method with Liner Corrosion	6.4E-8	250	0.38%
NRC-Approved Method	2.9E-7	19.4	0.24%
NRC-Approved Method with Liner Corrosion	3.0E-7	20.3	0.25%

Visual Inspections

The original submittal did not fully address the benefit of the Subsection IWE visual inspections. Visual inspections following the 1996 change in the ASME Code are believed to be more effective in detecting flaws. In addition, the flaws that are of concern for LERF are considerably larger than those of concern for successfully passing the ILRT. Integrated leakage rate test failures have occurred even though visual inspections have been performed. However, the recorded ILRT flaw sizes for these failed tests are much smaller than that for LERF. Therefore, it is likely that future inspections would be effective in detecting the larger flaws associated with a LERF.

An additional visual inspection is now planned for 2004 to further increase the likelihood for flaw detection.

Impact of Improved Visual Inspections

The raw data for both the CEOG method and the NRC-approved method is contained in NUREG-1493. This containment performance data is pre-1994. An amendment to 10 CFR 50.55a became effective September 9, 1996. This amendment, by endorsing the use of Subsections IWE and IWL of Section XI of the ASME B&PV Code, provides detailed requirements for ISI of Containment Structures. Inspection (which includes examination, evaluation, repair, and replacement) of the concrete containment liner plate, in accordance with the 10 CFR 50.55a requirements, involves consideration of the potential corrosion areas. Although the improvement gained by this requirement varies from plant to plant, it is believed that this requirement makes the detection of flaws post-September 1996 much more likely than pre-September 1996 using visual inspections.

Visual inspection improvements directly reduce the delta LERF increases as calculated in the CEOG method and NRC-approved method. The CCNPP Unit 1 Containment was visually inspected in 2000 and 2002. The Unit 1 containment is scheduled for inspection in 2004. This increased inspection frequency further reduces the delta LERF as calculated by both the CEOG and NRC-approved methods.

Table 7 illustrates the benefit of visual inspection improvements on the delta LERF calculations:

If the improved inspections (additional inspection, improved effectiveness, and larger flaw size) were 90% effective in detecting the flaws in the visible regions of the containment (5% for failure to detect and 5% for flaw not detectable [not-through-wall]), then the increase ILRT LERF frequency could be reduced by 23.5%. See Table 7 for additional sensitivity cases. This would result in a LERF increase of less than 1E-7 (without consideration of the LERF reduction due to PRA model improvements).

Sensitivity Studies

The following cases were developed to gain an understanding of the sensitivity of this analysis to the various key parameters.

Table 4

Liner Corrosion Sensitivity Cases

Age (Step 2)	Containment Breach (Step 4)	Visual Inspection & Non-Visual Flaws (Step 5)	Likelihood Flaw is LERF	LERF Increase
Base Case Doubles every 5 years	**Base Case** 1.1/0.11	**Base Case** 10%	**Base Case** 100%	**Base Case** 1E-8
Doubles every 2 years	Base	Base	Base	8E-8
Doubles every 10 years	Base	Base	Base	5E-9
Base	Base point 10 times lower (0.24/0.02)	Base	Base	2E-9
Base	Base point 10 times higher (4.9/0.49)	Base	Base	5E-8
Base	Base	5%	Base	6E-9
Base	Base	15%	Base	1E-8
Lower Bound				
Doubles every 10 years	Base point 10 times lower (0.24/0.02)	5%	10%	7E-11
Upper Bound				
Double every 2 years	Base point 10 times higher (4.9/0.49)	15%	100%	5E-7

Table 5

Flaw Failure Rate as a Function of Time

Year	Failure Rate (FR)	Success Rate (1-FR)
0	1.79E-03	9.98E-01
1	2.05E-03	9.98E-01
2	2.36E-03	9.98E-01
3	2.71E-03	9.97E-01
4	3.11E-03	9.97E-01
5	3.57E-03	9.96E-01
6	4.10E-03	9.96E-01
7	4.71E-03	9.95E-01
8	5.41E-03	9.95E-01
9	6.22E-03	9.94E-01
10	7.14E-03	9.93E-01
11	8.20E-03	9.92E-01
12	9.42E-03	9.91E-01
13	1.08E-02	9.89E-01
14	1.24E-02	9.88E-01
15	1.43E-02	9.86E-01

Table 6

Average Failure Rate

Years	Average Success Rate (SR)	Average Failure Rate (1-SR)
1 to 3	9.93E-1	0.71%
1 to 10	9.59E-1	4.06%
1 to 15	9.06E-1	9.40%

Δ = 9.40% - 0.71% = 8.7% (delta between 1 in 3 years to 1 in 15 years)

Table 7

Benefit of Visual Inspection Improvements

Factor Improvement due to Visual Inspections	Reduction in Delta LERF	NRC Approved Method Delta LERF	NRC Approved Method w/Liner Corrosion Considered Delta LERF	CEOG Method Delta LERF	CEOG Method w/Liner Corrosion Considered Delta LERF
Pre-1996 Inspection Approach (Base Case)	0%	3E-07	3E-07	5E-08	6E-08
Post-1996 with Visual Inspections Perfectly Accurate	85%	4E-08	5E-08	8E-09	2E-08
Post-1996 with Visual Inspections 95% Accurate	80.8%	6E-08	7E-08	1E-08	2E-08
Post-1996 with Visual Inspections 95% Accurate and 5% chance of Undetectable Leakage	76.5%	7E-08	8E-08	1E-08	2E-08
Post-1996 with Visual Inspections 80% accurate and a 5% Chance of Undetectable Leakage	63.8%	1E-07	1E-07	2E-08	3E-08

Conclusion

Considering increased frequency of visual inspections and the benefit of improved visual inspections post-1996, the increase in risk is considered to be less than 1E-7 for LERF. Changes less than 1E-7 are considered small per Regulatory Guide 1.174. The one-time extension of the ILRT interval from 3-in-10 years to 1-in-15 years is considered an acceptable risk increase.

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,

STATE OF MARYLAND :
: **TO WIT:**
COUNTY OF CALVERT :

I, Charles H. Cruse, being duly sworn, state that I am Vice President - Nuclear Energy, Calvert Cliffs Nuclear Power Plant, Inc. (CCNPP), and that I am duly authorized to execute and file this License Amendment Request on behalf of CCNPP. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other CCNPP employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.

Subscribed and sworn before me, a Notary Public in and for the State of Maryland and County of Calvert, this 27th day of March, 2002.

WITNESS my Hand and Notarial Seal:

Notary Public

My Commission Expires: 02/02/06
Date

CHC/DJM/dlm

Attachment: (1) Final Technical Specification Pages

cc: R. S. Fleishman, Esquire
J. E. Silberg, Esquire
Director, Project Directorate I-1, NRC
D. M. Skay, NRC
H. J. Miller, NRC
Resident Inspector, NRC
R. I. McLean, DNR