FPL

OCT 17 2001
L-2001-177
10 CFR §50.36
10 CFR §50.90

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

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Proposed License Amendments
Integrated Leak Rate Testing Interval – One-Time Extension

In accordance with 10 CFR §50.90, Florida Power and Light Company (FPL) requests that Appendix A of Facility Operating Licenses DPR-31 and DPR-41 be amended to modify Technical Specification (TS) 6.8.4.h, Containment Leakage Rate Testing Program. This amendment takes a one-time deviation from the ten-year frequency of the performance-based leakage rate testing program for Type A tests as required by NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," and endorsed by Regulatory Guide 1.163, "Performance-Based Containment Leak-Rate Program."

The deviation is to allow an Integrated Leakage Rate Test (ILRT) no more than fifteen years after the last ILRT, performed on November 14, 1992 for Turkey Point Unit 3 and October 19, 1991 for Turkey Point Unit 4. This application represents a cost beneficial licensing change. The integrated leakage rate tests impose a significant expense on the station, while the increase in risk of performing the ILRT within fifteen years rather than ten years is very small.

The proposed license amendments have been reviewed by the Turkey Point Plant Nuclear Safety Committee and the FPL Company Nuclear Review Board. In accordance with 10 CFR §50.91(b), a copy is being forwarded to the State Designee for the State of Florida. In order to support planning for the next refueling outage, FPL requests approval of the amendments by Febraury 1, 2002.

Should there be any questions, please contact Craig Mowrey at 305-246-6204.

Very truly yours,

John P. McElwain
Vice President
Turkey Point Plant

CLM

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant
Florida Department of Health and Rehabilitative Services

A017

STATE OF FLORIDA)
)ss.
COUNTY OF MIAMI-DADE)

John P. McElwain being first duly sworn, deposes and says:

That he is Vice President, Turkey Point Plant, of Florida Power and Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

John P. McElwain

Subscribed and sworn to before me this

17 day of OCTOBER, 2001,

DARIUS D. REID

Name of Notary Public (Type or Print)

OFFICIAL NOTARY SEAL
DARIUS D REID
COMMISSION NUMBER
CC800424
MY COMMISSION EXPIRES
JAN. 3,2003

NOTARY PUBLIC STATE OF FLORIDA

John P. McElwain is personally known to me.

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DESCRIPTION OF AMENDMENTS REQUEST

1.0 Introduction

This application for amendment to the Turkey Point Units 3 and 4 Technical Specifications (TS) proposes to revise TS section 6.8.4.h, "Containment Leakage Rate Testing Program" (Reference 1). This revision takes a one-time deviation from the ten (10) year frequency of the performance-based leakage rate testing program for Type A tests as required by NEI 94-01 (Reference 2). The one-time deviation is to the requirement of NEI 94-01 to perform an Integrated Leak Rate Test (ILRT) at a frequency of up to ten years with allowance for a 15-month extension. The deviation is to allow ILRT testing no more than 15 years after the last ILRTs, performed in November 1992 and October 1991 for Turkey Point Units 3 and 4 respectively.

The NRC has approved similar risk-informed amendment requests for a one-time extension of a Type A test interval from Entergy's Indian Point 3 Nuclear Power Plant (IP-3) (Reference 5) and Florida Power Corporation's Crystal River Unit 3 (CR-3) (Reference 6). The NRC requested additional information from CR-3 concerning their submittal, in a letter dated July 6, 2001 (Reference 7). Florida Power & Light has provided Turkey Point specific responses to the five NRC questions asked of CR-3; see Attachment 4 of this submittal.

2.0 Purpose of Request

The ILRTs are currently scheduled for the Turkey Point Unit 3 refueling outage of March 2003 (RFO #20) and the Turkey Point Unit 4 refueling outage of March 2002 (RFO #20). With approval of this request, Florida Power & Light Company (FPL) will move the ILRTs to one of the three subsequent refueling outages for each Unit

3.0 Background

The testing requirements of 10 CFR 50, Appendix J (Reference 4), provide assurance that leakage through the containment, including systems and components that penetrate the containment, does not exceed the allowable leakage values specified in the Technical Specifications. The limitation on containment leakage provides assurance that the containment would perform its design function following an accident, up to and including a design basis accident.

10 CFR 50, Appendix J, was revised, effective October 26, 1995, to allow licensees to choose containment leakage testing under Option A, "Prescriptive Requirements," or Option B, "Performance-Based Requirements." Amendments 192 and 186, for Turkey Point Units 3 and 4 respectively, were issued to FPL on October 4, 1996 to permit implementation of Option B (Reference 8). These amendments added Technical Specification section 6.8.4.h, which requires Type A, B, and C testing in accordance with Regulatory Guide (RG) 1.163 (Reference 9). RG 1.163 specifies a method acceptable to the NRC for complying with Option B by approving the use of NEI 94-01 and ANSI/ANS 56.8–1994 (Reference 10), subject to several regulatory positions in the regulatory guide.

Deviations from the requirements of RG 1.163 are allowed by 10 CFR 50, Appendix J, Option B. Section V.B.3 states, "The regulatory guide or other implementation document used by a licensee, or applicant for an operating license, to develop a performance-based leakage-testing program must be included, by general reference, in the plant technical specifications. The submittal for technical specification revisions must contain justification, including supporting analyses, if the licensee chooses to deviate from methods approved by the Commission and endorsed in a regulatory guide." Therefore, this amendment request does not require an exemption from Option B.

The adoption of the Option B performance-based program did not alter the basic method by which Appendix J leakage rate testing is performed, but it did alter the frequency of measuring primary containment leakage in Type A, B, and C tests. The leak test frequency is based upon an evaluation that looks at the "as-found" leakage history to determine a frequency that provides assurance that leakage limits will not be exceeded. The changes to Type A test frequency did not directly result in an increase in containment leakage. Similarly, the proposed change to the Type A test frequency will not directly result in an increase in containment leakage.

The allowed frequency for testing was based upon a generic evaluation documented in NUREG-1493 (Reference 3). NUREG-1493 made the following observations with regard to decreasing the test frequency:

> "Reducing the frequency of Type A tests (ILRTs) from the current three per 10 years to one per 20 years was found to lead to an imperceptible increase in risk. The estimated increase in risk is very small because ILRTs identify only a few potential leakage paths that cannot be identified by Type B and C testing, and the leaks that have been found by Type A tests have been only marginally above existing requirements. Given the insensitivity of risk to containment leakage rate, and the small fraction of leakage detected solely by Type A testing, increasing the interval between integrated leakage-rate tests is possible with minimal impact on public risk."

The surveillance frequency of Type A testing in NEI 94-01 is at least once per 10 years based on the acceptable performance history, i.e., two consecutive periodic Type A tests at least 24 months apart where the calculated performance leakage rates were less than $1.0L_a$, and consideration of the performance factors in NEI 94-01, Section 11.3. Based on the last two consecutive ILRT's, the current interval for both Turkey Point units is once every 10 years.

4.0 Evaluation

A Type A test can detect containment leakage due to a loss of structural capability. All other sources of containment leakage detected in Type A test analyses can be detected by the Type B and C tests. Previous Type A tests confirmed that the Turkey Point Units 3 and 4 containment structures have extremely low leakage and represent minimal risk of increased leakage, when compared to the acceptance criteria of 0.25 wt. %/day ($1.0\ L_a$), as stated in Technical Specification 6.8.4.h.. The risk is minimized by continued Type B and C testing. In addition, the in-service inspection (ISI) program, maintenance rule inspections, and tendon inspection program provide confidence in containment integrity.

The results of the last four Type A tests (ILRT) for both Turkey Point Units 3 and 4 are reported below. All tests passed the as-found acceptance criteria.

UNIT 3 ILRT DATA

Test Date	As-Found Leak Rate* (Wt. % / Day)	Acceptance Criteria $0.75L_a$ (Wt. % / Day)	Test Pressure at start of test (psia)	FPL Submittal Letter	Submittal Date
11-14-92	0.113**	0.1875	66.235	L-93-45	2-18-93
05-28-89	0.064**	0.1875	66.061	L-89-314	8-25-89
06-09-85	0.071**	0.1875	66.561	L-85-368	9-26-85
03-30-82	0.117**	0.1875	68.020	L-82-281	7-13-82

UNIT 4 ILRT DATA

Test Date	As-Found Leak Rate* (Wt. % / Day)	Acceptance Criteria $0.75L_a$ (Wt. % / Day)	Test Pressure at start of test (psia)	FPL Submittal Letter	Submittal Date
10-19-91	0.057***	0.1875	66.632	L-92-21	1-28-82
03-25-89	0.071**	0.1875	66.208	L-89-226	7-3-89
03-27-86	0.087**	0.1875	66.042	L-86-262	6-24-86
05-04-83	0.076**	0.1875	66.463	L-83-435	8-5-83

* The leak rates indicated in the table were calculated using the Mass Point method.
** Test was within acceptable leakage criteria using BN-TOP-1 analysis (Reference 1).
*** 24-hour Mass Point method only.

A Turkey Point plant-specific calculation to quantify the risk of extending the Type A ILRT interval from the current 10 years required by 10 CFR 50 Appendix J (1) to 15 years was performed. The calculation for Turkey Point is consistent with similar calculations performed for Crystal River 3 (Reference 11) and Indian Point 3 (Reference 12), recently approved by the NRC (References 5 and 6 respectively). This calculation uses the guidelines set forth in NEI 94-01, the methodology used in EPRI TR-104285 (Reference 13) and NUREG-1493, and the guidance in RG 1.174 (Reference 14). The calculation applies the Turkey Point probabilistic safety assessment (PSA) plant damage states, release frequencies, and the Level 3 PSA person-rem estimates, in order to estimate the changes in risk due to increasing the ILRT test interval. This information is obtained from the Turkey Point PSA and a Level 3 PSA study performed by Scientech for Turkey Point. The results of this assessment are documented in Engineering Calculation PTN-BF-JR-01-006, Rev. 0, "Turkey Point Units 3 and 4 ILRT Extension." A copy of the Turkey Point specific calculation is enclosed in Attachment 5.

The specific results are summarized in Table 11 of Attachment 5. The Type A contribution to Large Early Release Frequency (LERF) is defined as the contribution from Class 3b.

Based on the data:

1. The person-rem/year increase in risk contribution from extending the ILRT test frequency from the current once every 10 years to once every 15 years is 0.0104 person-rem/yr.
2. The total integrated increase in risk contribution from extending the ILRT test frequency from the current once every 10 years to once every 15 years is 0.049%.
3. The risk increase in LERF from extending the ILRT test frequency from the current once every 10 years to once every 15 years is 1.0×10^{-8}/yr.

The change in Conditional Containment Failure Probability (CCFP) from the current 10-year interval to a 15-year interval is 0.09%.

Based on the above results, the following are conclusions regarding the assessment of the plant risk associated with extending the Type A ILRT test interval from ten years to fifteen years.

The change in Type A test interval from ten years to fifteen years increases the risk impact on the total integrated plant risk by only 0.049%. Also, the change in Type A test frequency from the original three tests every ten years to once every fifteen years increases the risk only 0.146%. Therefore, the risk impact when compared to other severe accident risks is negligible.

RG 1.174 provides guidance for determining the risk impact of plant-specific changes to the licensing basis. RG 1.174 defines very small changes in risk as resulting in increases of Core Damage Frequency (CDF) below 10^{-6}/yr and increases in LERF below 10^{-7}/yr. Since the ILRT does not impact CDF, the relevant criterion is LERF. The increase in LERF resulting from a change in the Type A ILRT test frequency from the current once every 10 years to once every 15 years is 1.0×10^{-8}/yr. Since guidance in RG 1.174 defines very small changes in LERF as below 10^{-7}/yr, increasing the ILRT interval from 10 to 15 years is considered non-risk significant. In addition, the change in LERF resulting from a change in the Type A ILRT test frequency from the original three tests every ten years to once every fifteen years is non-risk significant (3.0×10^{-8}/yr).

The risk is further minimized by continued Local Leakage Rate Testing (LLRT), continued performance of general visual inspections required by RG 1.163, the maintenance rule inspection program, and implementation of the containment inservice inspection program. The effectiveness of these programs is discussed below.

<u>Structural Inspections</u>

Structural degradation of containment is a gradual process that occurs due to the effects of pressure, temperature, radiation, chemical, or other such effects. Such effects are identified and corrected when the containment structure is periodically tested and inspected to verify structural integrity under American Society of Mechanical Engineers (ASME) Section XI Subsections IWE and IWL.

IWE Inspections

FPL formalized the Containment Building Metallic Liner Inservice Inspection Program for Turkey Point 3 and 4 by document # ISI/IWE-PTN-3/4 Revision 0, in December of 1999. The first ten-year inspection interval for components required to be examined in accordance with ASME section XI, 1992 Edition with 1992 addenda, Section IWE, is defined as beginning on September 9, 1999 and ending on September 6, 2008 for both units.

The first period general visual examinations were performed during Refueling Outages RFO # 18 (March 2000) for Turkey Point Unit 3, and RFO # 19 (October 2000) for Turkey Point Unit 4. These examinations identified no surfaces likely to experience accelerated degradation and aging that would require being classified Examination Category E-C, in accordance with IWE-1240 and require augmented examinations.

Results of these examinations were submitted to the NRC in the NIS-1 Owner's Data Reports for 2000 in FPL letters L-2000-128 (Reference 15) and L-2001-009 (Reference 16) for Units 3 and 4 respectively. The examinations included visual examination of selected penetrations and a general visual inspection of all accessible surfaces. Areas considered inaccessible were also identified. Any conditions found to be unacceptable were reported and dispositioned in accordance with the plant's corrective action program. The requirements for the first inspection period set forth in 10 CFR50.55a (g)(6)(ii)(B)(1) were met for both Units.

IWL Inspections

Turkey Point Units 3 and 4 have implemented the requirements of ASME Section XI Subsection IWL. This includes tendon surveillance activities, exterior concrete surface examinations, and the repair and replacement provisions of IWL. These requirements have also been integrated into Technical Specification Section 3.6.1.6, "Containment Structural Integrity." The first inspections under the IWL requirements have been completed for both units. These inspections determined that the prestressing systems are performing as designed with no significant corrosion damage or other negative trends. The surface examinations discovered some minor defects but all were considered non-structural in nature and have either been corrected or accepted as is.

In addition, maintenance activities such as coating or replacement of some of the grease caps exhibiting surface corrosion, correction of leaking grease caps, and removal of abandoned attachments were also completed during the inspections. Based on the results of the inspections and the maintenance performed, it was concluded that the containment structures are in excellent condition and performing well within their structural design parameters.

Maintenance Rule

The containment structures are included in the Maintenance Rule and are considered risk significant. The monitoring program consists of reviewing the results of a number of inspection programs that include the ASME Section XI IWL program, internal coatings inspections and IWE inspection results, inspections and tests of the airlocks and penetrations, and visual inspections associated with the containment leak rate tests.

Periodic assessments conducted to date have determined that the containments are in good condition with no structural issues identified and no negative trends identified.

6.0 Current Technical Specification Requirements

Technical Specification 3.6.1.2 requires that containment leakage rates be limited in accordance with the Containment Leakage Rate Testing Program in Modes 1, 2, 3, and 4. With the measured overall integrated containment leakage rate exceeding 1.0 L_a, action must be initiated within one hour to be in hot standby within the next six hours and in cold shutdown within the next 30 hours. The overall integrated leakage rate must be restored to less than 0.75 L_a, and the combined leakage rate for all penetrations subject to Type B and C tests must be restored to less than 0.60 L_a prior to increasing the reactor coolant system temperature above 200 $^{\circ}$F. The surveillance requirements of section 4.6.1.2 state that the containment leakage rates shall be demonstrated at the required test schedule and shall be determined in conformance with the criteria specified in the Containment Leakage Rate Testing Program.

Technical Specification 6.8.4.h describes the Containment Leakage Rate Testing Program. This program was established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, and as modified by approved exemptions. The program is in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995, as modified by the following deviations or exemptions.

1) Type A tests will be performed either in accordance with Bechtel Topical Report BN-TOP-1, Revision 1, dated November 1, 1972, or the guidelines of Regulatory Guide 1.163.

2) A vacuum test will be performed in lieu of a pressure test for airlock door seals at the required intervals (Amendment Nos. 73 and 77, issued by NRC November 11, 1981)

7.0 Technical Specification Change Request

Change TS 6.8.4.h to read as follows **(proposed text additions are shown in bold)**:

Technical Specification 6.8.4.h, Containment Leakage Rate Testing Program: revise the first paragraph and deviations/exemptions to read as follows:

A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, and as modified by approved exemptions. This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995, as modified by the following deviations or exemptions:

1) Type A tests will be performed either in accordance with Bechtel Topical Report BN-TOP-1, Revision 1, dated November 1, 1972, or the guidelines of Regulatory Guide 1.163.

2) **Type A testing frequency in accordance with NEI 94-01, Revision 0, Section 9.2.3, except:**

   a) **For Unit 3, the first Type A test performed after the November 1992 Type A test shall be performed no later than November 2007.**

   b) **For Unit 4, the first Type A test performed after October 1991 shall be performed no later than October 2006.**

3) A vacuum test will be performed in lieu of a pressure test for airlock door seals at the required intervals (Amendment Nos. 73 and 77, issued by NRC November 11, 1981).

Discussion:

These amendments propose a one-time deviation from the ten (10) year frequency of the performance-based leakage rate testing program for Type A tests, required by NEI 94-01 (Reference 2). The one-time deviation is to the requirement of NEI 94-01 to perform an ILRT at a frequency of up to ten years with allowance for a 15-month extension. The deviation is to allow ILRT testing no more than 15 years after the last ILRTs, performed in November 1992 and October 1991 for Turkey Point Units 3 and 4 respectively. The justification for this request is based upon past successful Type A, B, and C tests, containment tendon inspections, and ASME Section XI inspections at Turkey Point Units 3 and 4. Further justification is based on research, documented in NUREG-1493 (Reference 3), demonstrating that generically very few containment leakage paths fail to be identified by Type B and C tests. In fact, an analysis of 144 ILRT results, including 23 failures, found that no failures were were due to containment liner breech. The NUREG concluded that reducing Type A (ILRT) testing frequency to one per 20 years would lead to an imperceptible increase in risk. NUREG-1493 found that, generically, the design containment leakage rate contributed about 0.1 percent to the individual risk and that the decrease in Type A testing frequency would have a minimal effect on this risk since 95 percent of the potential leakage paths are detected by Type B and C testing. Additional justification is provided in a plant-specific calculation (Attachment 5) that quantifies the increase in risk resulting from extending the Type A ILRT interval from the current 10 years required by 10 CFR 50 Appendix J to 15 years.

The NRC has approved similar risk-informed amendment requests related to a one-time extension of a Type A test interval for Entergy's Indian Point 3 Nuclear Power Plant and Florida Power Corporation's Crystal River Unit 3 in letters dated April 17, 2001 and August 30, 2001 respectively.

8.0 Conclusion

Based upon past ILRT test performance, the strength of the Containment Leakage Rate Testing Program, ASME Section XI inspections, and the Maintenance Rule, combined with the low risk associated with the extension of the ILRT test interval, FPL concludes that the proposed changes do not adversely affect or endanger the health and safety of the general public or involve a significant safety hazard. As demonstrated in Attachment 5, the calculated increases in the LERF are "very small" as defined in RG 1.174. The No Significant Hazards Consideration Determination for the proposed changes to TS Section 6.8.4.h is presented in Attachment 2 of this submittal.

9.0 References

1. Turkey Point Units 3 and 4 Technical Specifications, Amendments 214/208, effective May 7, 2001.

2. NEI 94-01, Rev. 0, "Industry Guidance for Implementing Option B of 10 CFR Part 50, Appendix J," July 26, 1995.

3. NUREG-1493, "Performance-Based Containment Leak-Test Program," Final Report, September 1995.

4. 10 CFR 50, Appendix J, "Primary Reactor Containment Testing for Water-Cooled Reactors."

5. NRC Letter to Entergy Nuclear Operations, Inc., "Indian Point Nuclear Generating Unit No. 3 – Issuance of Amendment Re: Frequency of Performance-Based Leakage Rate Testing (TAC No. MB0178)," April 17, 2001.

6. NRC Letter to Crystal River Nuclear Plant, "Crystal River Unit 3 – Issuance of Amendment Regarding Containment Leakage Rate Testing Program (TAC No. MB1349)," August 30, 2001.

7. NRC Letter, "Crystal River Unit 3 – Request for Additional Information Re: Proposed License Amendment Request No. 267, Revision 2, Containment Leakage Rate Testing Program (TAC No. MB1349)," July 6, 2001.

8. NRC Letter, Turkey Point Units 3 and 4, "Issuance of Amendments Re: Implementation of 10 CFR 50 Appendix J, Option B," October 14, 1996.

9. Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," September 1995.

10. ANSI/ANS 56.8, "Containment System Leakage Testing Requirement," 1994.

11. FPC Letter, 3F0601-6, "Crystal River – Unit 3 – License Amendment Request #267, Revision 2, Supplemental Risk-Informed Information in Support of License Amendment Request #267," June 20, 2001.

12. Entergy Letter, IPN-01-007, Indian Point 3 Nuclear Power Plant, "Supplemental Information Regarding Proposed Change to Section 6.14 of the Administrative Section of the Technical Specifications," January 18, 2001.

13. EPRI TR-104285, "Risk Assessment of Revised Containment Leak Rate Testing Intervals," August 1994.

14. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes in the Licensing Basis," July 1998.

15. FPL Letter L-2000-128, "Turkey Point Unit 3 Inservice Inspection Report," June 22, 2000.

16. FPL Letter L-2001-009, "Turkey Point Unit 4, Inservice Inspection Report," January 19, 2001.

17. FPC Letter, "Crystal River Unit 3 – Response to NRC Request for Additional Information Re: Proposed License Amendment #267, Revision 2, Containment Leakage Rate Testing Program (TAC MB1349)," July 16, 2001.

18. FPL Letter, L-2001-080, "Metal Containment Inservice Inspection Program Relief Requests No. 22 and No. 26," April 12, 2001.

19. FPL Letter, L-2001-167, "Response to Request for Additional Information Regarding the Containment Inservice Inspection Program For Relief Requests Nos. 22 and 26," July 18, 2001.

20. NRC Letter, "Evaluation of Relief Requests NOS. 22 and 26, Relating to the Inservice Inspection of Prestreessed Concrete Containments for Turkey Point Plant, Units 3 and 4 (TAC NOS. MB1735 and MB1736)," August 10, 2001.

21. Information Notice 92-20, "Inadequate Local Leak Rate Testing," March 3, 1992.

22. NRC Letter requesting additional information regarding the Turkey Point Units 3 and 4 License Renewal Application (LRA), February 2, 2001.

23. FPL Letter, L-2001-75, "Response to Request for Additional Information for the Review of the Turkey Point Units 3 and 4 License Renewal Application," April 19, 2001

24. FPL Calculation PTN-BFJR-01-006, Rev. 0, "Turkey Point Units 3 and 4 ILRT Extension."

ATTACHMENT 2

NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Description of Proposed License Amendments

The purpose of the proposed license amendment (PLA) is to change the Turkey Point Technical Specification (TS) 6.8.4.h, "Containment Leakage Rate Testing Program." The proposed amendment requests a one-time deviation from the ten-year frequency of the performance-based leakage testing program for Type A tests as required by NEI 94-01. The one-time deviation is to the requirement of NEI 94-01 to perform an Integrated Leak Rate Test (ILRT) at a frequency of up to ten years with allowance for a 15-month extension. The deviation is to allow ILRT testing no more than 15 years after the last ILRTs, performed in November 1992 and October 1991 for Units 3 and 4 respectively.

Introduction

The Nuclear Regulatory Commission has provided standards for determining whether a significant safety hazards consideration exists (10 CFR §50.92(c)). A proposed amendment to an operating license for a facility involves no significant hazards consideration, if operation of the facility in accordance with the proposed amendment would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. Each standard is discussed below for the proposed amendments.

(1) **Operation of the facility in accordance with the proposed amendments would not involve a significant increase in the probability or consequences of an accident previously evaluated.**

The proposed amendment to the Technical Specifications adds a one-time extension to the current interval for Type A (ILRT) testing. The current test interval of ten years, based on past performance, would be extended on a one-time basis to 15 years from the last Type A test. The proposed extension to Type A testing cannot increase the probability of an accident previously evaluated since the containment Type A testing extension is not a modification, nor a change to the operation of the plant, and the test extension is not a type that could lead to equipment failure or accident initiation. The proposed extension of Type A testing does not involve a significant increase in the consequences of an accident since research documented in NUREG-1493 has found that, generically, very few potential containment leakage paths are not identified with Type B and C tests. In fact, an analysis of 144 ILRT results, including 23 failures, found that no failures were were due to containment liner breech. The NUREG concluded that reducing the Type A frequency to one per twenty years was found to lead to an imperceptible increase in risk.

Florida Power & Light provides a high degree of assurance through testing and inspection that the containment will not degrade in a manner detectable only by Type A testing. The last four Type A tests for both Turkey Point Units 3 and 4 show leakage rates well below acceptance criteria, indicating a leak-tight containment. Inspections required by the Maintenance Rule and ASME code, will identify indications of containment structure degradation that could affect that leak tightness. Type B and C testing required by Technical Specifications will identify any containment openings, such as valves, that would otherwise be detected by the Type A tests. These factors show that the Turkey Point Units 3 and 4 Type A test extension will not represent a significant increase in the consequences of an accident.

Based on the above, it is concluded that the proposed amendments to extend the Type A test frequency does not involve a significant increase in the probability or consequences of any accident previously evaluated.

(2) **Operation of the facility in accordance with the proposed amendments would not create the possibility of a new or different kind of accident from any previously evaluated.**

The proposed change does not create a new or different type of accident for Turkey Point because no physical plant changes are being made, and no compensatory measures are imposed that would create a new failure scenario. The proposed change only requests a one-time extension to the current interval for Type A testing. The current test interval of 10 years, based on past performance, would be extended on a one-time basis to 15 years from the last Type A test.

The proposed extension to Type A testing cannot create the possibility of a new or different type of accident because there are no physical changes being made to the plant, and there are no changes to the operation of the plant that could introduce a new failure mode creating an accident or affecting the mitigation of an accident.

(3) **Operation of the facility in accordance with the proposed amendments would not involve a significant reduction in a margin of safety.**

The proposed license amendment requests a one-time extension to the current interval for Type A testing. The current test interval of ten years, based on past performance, would be extended on a one-time basis to 15 years from the last Type A test. The proposed extension to Type A testing will not significantly reduce the margin of safety. The NUREG-1493 generic study of the effects of extending containment leakage testing found that a 20-year test interval for Type A leakage testing resulted in an imperceptible increase in risk to the public. NUREG-1493 found that, generically, the design containment leakage rate contributed about 0.1 percent to the individual risk and that the decrease in Type A testing frequency would have minimal effect on this risk, since 95 percent of the potential leakage paths are detected by Type B and C testing. A Turkey Point plant-specific risk calculation is consistent with the generic conclusions identified in NUREG-1493.

Therefore, the proposed changes in this license amendment will not result in a significant reduction in the plant's margin of safety.

Summary

Based on the above discussion, FPL has determined that the proposed amendments do not (1) involve a significant increase in the probability or consequences of an accident previously evaluated, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety; and therefore the proposed changes do not involve a significant safety hazards consideration as defined in 10 CFR 50.92.

Environmental Impact Consideration Determination

The proposed license amendments change requirements with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The proposed amendments involve no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite, and no significant increase in individual or cumulative occupational radiation exposure. FPL has concluded that the proposed amendments involve no significant hazards consideration and therefore, meet the criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), an environmental impact statement or environmental assessment need not be prepared in connection with issuance of the amendment.

ATTACHMENT 3

PROPOSED TECHNICAL SPECIFICATION PAGES

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PROCEDURES AND PROGRAMS (Continued)

9. Limitations on the annual and quarterly doses to a member of the public from iodine-131, iodine-133, tritium, and all radionclides in particulate form with half lives greater than 8 days in gaseous effluents released from each unit to areas beyond the site boundary, conforming to 10 CFR 50, Appendix I;

10. Limitations on the annual dose or dose commitment to any member of the public due to releases of radioactivity and to radiation from uranium fuel cycle sources, conforming to 40 CFR 190.

g. Deleted

h. Containment Leakage Rate Testing Program

A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, and as modified by approved exemptions. This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995, as modified by the following deviations or exemptions:

1) Type A tests will be performed either in accordance with Bechtel Topical Report BN-TOP-1, Revision 1, dated November 1, 1972, or the guidelines of Regulatory Guide 1.163.

2) Type A testing frequency in accordance with NEI 94-01, Revision 0, Section 9.2.3, except:

   a) For Unit 3, the first Type A test performed after the November 1992 Type A test shall be performed no later than November 2007.

   b) For Unit 4, the first Type A test performed after October 1991 shall be performed no later than October 2006.

3) A vacuum test will be performed in lieu of a pressure test for airlock door seals at the required intervals (Amendment Nos. 73 and 77, issued by NRC November 11, 1981).

The peak calculated containment interval pressure for the design basis loss of coolant accident, P_a, is 49.9 psig.

The maximum allowable containment leakage rate, L_a, at P_a, shall be 0.25% of containment air weight per day.

Leakage Rate acceptance criteria are:

1) The As-found containment leakage rate acceptance criterion is $\leq$ 1.0 L_a. Prior to increasing primary coolant temperature above 200°F following testing in accordance with this program or restoration from exceeding 1.0 L_a, the As-left leakage rate acceptance criterion is $\leq$ 0.75 L_a, for Type A test.

2) The combined leakage rate for all penetrations subject to Type B or Type C testing is as follows:

PROCEDURES AND PROGRAMS (Continued)

- The combined As-left leakage rates determined on a maximum pathway leakage rate basis for all penetrations shall be verified to be less than 0.60 L_a, prior to increasing primary coolant temperature above 200°F following an outage or shutdown that included Type B and Type C testing only.
- The As-found leakage rates, determined on a minimum pathway leakage rate basis, for all newly tested penetrations when summed with the As-left minimum pathway leakage rate leakage rates for all other penetrations shall be less than 0.6 L_a, at all times when containment integrity is required.

3) Overall air lock leakage acceptance criteria is $\leq$ 0.05 L_a, when pressurized to P_a.

The provisions of Specification 4.0.2 do not apply to the test frequencies contained within the Containment Leakage Rate Testing Program.

6.8.5 Administrative procedures shall be developed and implemented to limit the working hours of plant staff who perform safety-related functions, e.g. licensed Senior Operators, licensed Operators, health physicists, auxiliary operators, and key maintenance personnel. The procedures shall include guidelines on working hours that ensure that adequate shift coverage is maintained without routine heavy use of overtime for individuals.

Any deviation from the working hour guidelines shall be authorized by the applicable department manager or higher levels of management, in accordance with established procedures and with documentation of the basis for granting the deviation. Controls shall be included in the procedures such that individual overtime shall be reviewed monthly by the Plant General Manager or his designee to assure that excessive hours have not been assigned. Routine deviation from the working hour guidelines shall not be authorized.

6.9 REPORTING REQUIREMENTS

ROUTINE REPORTS

6.9.1 In addition to the applicable reporting requirements of Title 10, Code of Federal Regulations, the following reports shall be submitted to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, DC pursuant to 10 CFR 50.4.

STARTUP REPORT

6.9.1.1 A summary report of plant startup and power escalation testing shall be submitted following: (1) receipt of an Operating License, (2) amendment to the license involving a planned increase in power level, (3) installation of fuel that has a different design or has been manufactured by a different fuel supplier, and (4) modifications that may have significantly altered the nuclear, thermal, or hydraulic performance of the unit.

ATTACHMENT 4

NRC REQUEST FOR ADDITIONAL INFORMATION TO CRYSTAL RIVER:

TURKEY POINT RESPONSES

The NRC staff requested that Crystal River Unit 3 (CR-3) provide a response to the following five questions that were asked in the letter from the NRC to FPC dated July 6, 2001 (Attachment 1, Reference 7). The requests are those asked of CR-3 ,with Turkey Point specific responses provided. The Turkey Point responses are modeled after the Crystal River 3 responses submitted to the NRC on July 16, 2001 (Attachment 1, Reference 17).

1. NRC Request

None of the references describe (or summarize) the containment ISI programs being implemented at CR-3. Please describe a description of the ISI programs that provide assurance that in the absence of an ILRT for 15 years, the containment structural and leak-tight integrity will be maintained.

FPL Response

This information is discussed in section 4.0 of Attachment 1.

2. NRC Request

Based on its review of the CR-3 containment, the staff understands that CR-3 is using the 1992 Edition and the 1992 Addenda of Subsections IWE and IWL of the American Society of Mechanical Engineers Section XI Code (the Code). IWE-1240 requires licensees to identify the surface areas requiring augmented examinations. Please provide the locations of the containment liner surfaces which CR-3 have identified as requiring augmented examination and a summary of the findings of the examinations performed.

FPL Response

This information is discussed in section 4.0 of Attachment 1.

3. NRC Request

For the examination of seals and gaskets, and examination and testing of bolts associated with the primary containment pressure boundary (Examination Categories E-D and E-G), CR-3 had requested relief from the requirements of the code. As an alternative, CR-3 plans to examine them during the leak rate testing of the primary containment. With the flexibility provided in Option B of Appendix J for Type B and C testing (as per Nuclear Energy Institute 94-01 and Regulatory Guide 1.163), and the extension requested in this amendment for Type A testing, please provide your schedule for examination and testing of seals, gaskets, and bolts that provide assurance regarding the integrity of the containment pressure boundary.

FPL Response

By letter L-2001-080 dated April 12, 2001 (Attachment 1, Reference 18), as supplemented in letter L-2001-167 dated July, 18, 2001 (Attachment 1, Reference 19), Florida Power & Light submitted Relief Requests Nos. 22 and 26 regarding the Turkey Point containment inservice inspection program. The relief requests, relating to the examination of pressure retaining bolts and seals and gaskets of the pressure-retaining components of the containment were authorized for use by the NRC letter dated August 10, 2001 (Attachment 1, Reference 20).

The seals and gaskets of bolted penetrations are examined by a Type B or Type C local leak-rate test prior to any maintenance that could affect containment integrity, in order to establish an as-found condition of the penetration. Prior to reassembly, the seals and gaskets are examined, and if necessary replaced by maintenance personnel. After the penetration is re-assembled, an as-left test is performed to ensure that the penetration leakage meets the administrative limits. Plant procedures establish the maximum frequency based on acceptable performance at once every 60 months.

Bolting is examined in accordance with Table IWE-2500-1, Examination Category E-G, Pressure Retaining Bolting, Item No. E8.10. Bolted connections shall meet the pressure test requirements of Table IWE-2500-1, Examination Category E-P, all Pressure Retaining Components, Item E9.40.

A general visual examination of the entire containment is conducted once each inspection period in accordance with 10 CFR 50.55a(b)(2)(ix)(E).

4. NRC Request

The stainless steel bellows have been found to be susceptible to trans-granular stress corrosion cracking, and the leakages through them are not readily detectable by Type B testing (see Information Notice 92-20). If applicable, please provide information regarding inspection and testing of the bellows at CR-3, and how such behavior has been factored into the risk assessment.

FPL Response

FPL initially reviewed Information Notice 92-20 (Attachment 1, Reference 21) in 1992 as part of the operating experience feedback program, and determined that the bellows identified in the information notice are not used at Turkey Point. This issue was revisited during the license renewal application in a request for additional information (Attachment 1, Reference 22). FPL responded to RAI 3.9.1.2-4 in a letter to the NRC (Attachment 1, Reference 23) stating that Turkey Point does not have containment penetration bellows.

5. NRC Request

Inspections of some reinforced and steel containments have found degradation on the un-inspectable (embedded) side of the drywell steel shell and steel liner of the primary containment. These degradations cannot be found by visual (VT-3 or VT-1) examinations unless they are through the thickness of the shell or liner; or 100% of the un-inspectable surfaces are periodically examined by ultrasonic testing. Please provide information addressing how potential leakages under high pressure during core-damage accidents are factored into the risk assessment related to the extension of the ILRT.

FPL Response

The potential for containment leakage is explicitly included in the plant-specific risk assessment (Attachment 5). By definition, the intact containment cases (Class 1) include a leakage term that is independent of the source of the leak. This submittal also includes specific containment failure classes due to extending the ILRT interval (Classes 3a and 3b). These classes include the potential that the leakage is caused by a liner failure such as described in the above question. The assessment shows that even with the increased potential to have an undetected containment flaw or leak path, the increase in risk is insignificant.

ATTACHMENT 5

CALCULATION PTN-BFJR-01-006, REV. 0
TURKEY POINT UNITS 3 AND 4 ILRT EXTENSION

CALCULATION COVER SHEET

Calculation No: PTN-BFJR-01-006, Rev. 0

Title: Turkey Point Units 3 and 4 ILRT Extension

0	INITIAL ISSUE						
No.	Description	By	Date	Chk/Ver	Date	Appr	Date
REVISIONS							

LIST OF EFFECTIVE PAGES

CALCULATION NUMBER: PTN-BFJR-01-006 REV. 0

PAGE	SECTION	REVISION
1	COVER SHEET	0
2	LIST OF EFFECTIVE PAGES	0
3	TABLE OF CONTENTS	0
5	1.0	0
5	2.0	0
6	3.0	0
6	4.0	0
7	5.0	0
26	6.0	0

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CALCULATION NO. PTN-BFJR-01-006 REV. 0

1.0 PURPOSE/SCOPE

The purpose of this calculation is to evaluate the risk of extending the Type A Integrated Leak Rate Test (ILRT) interval from the current 10 years required by 10 CFR 50, Appendix J [1] at Turkey Point Units 3 and 4 (PTN) to 15 years. The results will be used to support a plant license amendment (PLA).

This calculation evaluates the risk associated with various ILRT intervals as follows:

- 3 years - interval based on the original requirements of 3 tests per 10 years
- 10 years – current test interval required for PTN
- 15 years – interval extension approved for Indian Point 3 and proposed for Turkey Point

2.0 REFERENCES

1. Title 10, Code of Federal Regulations, Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors".
2. Florida Power, 3F0601-06, "Crystal River – Unit 3 – License Amendment Request #267, Revision 2, Supplemental Risk-Informed Information in Support of License Amendment Request #26," June 20, 2001.
3. Entergy, IPN-01-007, Indian Point 3 Nuclear Power Plant, "Supplemental Information Regarding Proposed Change to Section 6.14 of the Administrative Section of the Technical Specification", January 18,2001.
4. United States Nuclear Regulatory Commission, Indian Point Nuclear Generating Unit No.3 – Issuance of Amendment Re: Frequency of Performance-Based Leakage Rate Testing (TAC NO. MBO178), April 17, 2001.
5. NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J", July 26, 1995, Revision 0
6. EPRI TR-104285, "Risk Assessment of Revised Containment Leak Rate Testing Intervals" August 1994.
7. NUREG-1493, "Performance-Based Containment Leak-Test Program", July 1995.
8. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis" July 1998.
9. PTN Calculation, PTN-BFJR-00-001, Revision 3, "PTN PSA Model Update, 8/30/01.
10. PTN Calculation, PTN-BFJR-99-010, Revision 0, "Level 2 Analysis Update for Turkey Point Units 3 and 4," 10/12/99.
11. Scientech 17087-001, "Turkey Point MACCS2 Model and Level 3 Application," 9/22/99.
12. Turkey Point Units 3 and 4 Probabilistic Risk Assessment Individual Plant Examination Submittal, Revision 0, Florida Power and Light Corporation, 6/25/91.

3.0 METHODOLOGY

The evaluation for Turkey Point is consistent with similar assessments performed for Crystal River 3 (CR3) [2] and Indian Point 3 (IP3) [3]. The IP3 submittal was recently approved by the NRC [4]. This assessment utilizes the guidelines set forth in NEI 94-01 [5], the methodology used in EPRI TR-104285 [6] and NUREG-1493 [7], and the regulatory guidance on the use of Probabilistic Safety Assessment (PSA) findings in support of a licensee request to a plant's licensing basis, RG 1.174 [8]. The calculation applies the Turkey Point PSA plant damage states and the Level 3 PRA person-rem estimates in order to estimate the changes in risk due to increasing the ILRT test interval. This information is obtained from the Turkey Point PSA [9,10] and a Level 3 PSA study [11] performed by Scientech for Turkey Point.

The basic analysis steps are listed below:

1. Calculate the Level 3 release category population dose frequencies.
2. Map the Level 3 release categories into the 8 release classes defined by the EPRI report.
3. Calculate the Type A leakage estimate to define the analysis baseline.
4. Calculate the Type A leakage estimate to address the current inspection frequency.
5. Modify the Type A leakage estimates to address extension of the Type A test interval.
6. Calculate increase in risk due to extending Type A inspection intervals.
7. Estimate the change in LERF due to the Type A testing..
8. Estimate the change in conditional containment failure probability due to the Type A testing.

4.0 ASSUMPTIONS/BASES

1. The maximum containment leakage for Class 1 sequences is 1 L_a because a new Class 3 has been added to account for increased leakage due to Type A inspections.
2. The maximum containment leakage for Class 3a sequences is 10 L_a based on the previously approved methodology [3,4].
3. The maximum containment leakage for Class 3b sequences is 35 L_a based on the previously approved methodology [3,4].
4. Class 3b is conservatively categorized LERF based on the previously approved methodology [3,4]
5. Containment leakage due to Classes 4 and 5 are considered negligible based on the previously approved methodology [3,4].
6. The containment releases are not impacted with time.
7. The containment releases for Classes 2, 6, 7, and 8 are not impacted by the ILRT Type A test frequency. These classes already include containment failure with release consequences equal or greater than those impacted by Type A.

8. Because Class 8 sequences are containment bypass sequences, potential releases are directly to the environment. Therefore, the containment structure will not impact the release magnitude.

5.0 CALCULATION

The current Turkey Point PSA is a non-safety-related tool and is intended to provide "best-estimate" results which can be used as input when making risk-informed decisions. The Turkey Point IPE [12] is an earlier version of the PSA submitted to NRC in response to Generic Letter 88-20. Neither the PSA nor the IPE is considered as design basis information.

The inputs for this calculation come from the information documented in the Turkey Point PSA [9,10] and a Level 3 PSA study performed by Scientech for Turkey Point [11]. The Level 3 study used the MACCS2 computer code to develop person-rem dose results. The study also used site-specific inputs for meteorological and population data. The results are summarized in the following Table 1. Other inputs to this calculation include ILRT test data from NUREG-1493 [7] and the EPRI report [6], and are referenced in the body of the calculation.

Table 1
Level 3 PSA Population Dose Estimates By Release Category

Release Mode	Description	Population Dose (sieverts)
A1	Recovered in-vessel, late containment failure, in-vessel fission product release mitigated	5.46E+01
A2	Recovered in-vessel, late containment failure, in-vessel fission product release not mitigated	2.48E+04
B1	Recovered ex-vessel, late containment failure, in-vessel fission product release mitigated	8.46E+02
B2-L	Recovered ex-vessel, late containment failure, in-vessel fission product release not mitigated, leak	2.64E+04
B2-R	Recovered ex-vessel, late containment failure, in-vessel fission product release not mitigated, rupture	3.73E+04
B3-L	No CCI, late containment failure, in-vessel fission product release mitigated by sprays, leak	8.46E+02
B3-R	No CCI, late containment failure, in-vessel fission product release mitigated by sprays, rupture	1.92E+03
B4-L	No CCI, late containment failure, in-vessel fission product release not mitigated, leak	2.64E+04
B4-R	No CCI, late containment failure, in-vessel fission product release not mitigated, rupture	3.78E+04
B5-L	No CCI, late containment failure, in-vessel fission product release mitigated by sprays, leak	1.54E+03
B5-R	No CCI, late containment failure, in-vessel fission product release mitigated by sprays, rupture	3.28E+03
B6-L	No CCI, late containment failure, in-vessel and late fission product release not mitigated, leak	2.29E+04
B6-R	No CCI, late containment failure, in-vessel and late fission product release not mitigated, rupture	2.74E+04
BY_EV V	Containment bypass, ISLOCA sequences	4.46E+04
BY-SGTR	Containment bypass, SGTR sequences	8.07E+03
C1-L	CCI occurs, late containment failure, ex-vessel fission product release mitigated by overlying pool, in-vessel release mitigated by sprays, leak	8.46E+02
C1-R	CCI occurs, late containment failure, ex-vessel fission product release mitigated by overlying pool, in-vessel release mitigated by sprays, rupture	1.92E+03
C2-L	CCI occurs, late containment failure, ex-vessel fission product release mitigated by overlying pool, in-vessel release not mitigated, leak	2.65E+04
C2-R	CCI occurs, late containment failure, ex-vessel fission product release mitigated by overlying pool, in-vessel release not mitigated, rupture	3.79E+04
C3-L	Significant CCI occurs, late containment failure, in- and ex-vessel fission product release mitigated by sprays, leak	8.46E+02
C3-R	Significant CCI occurs, late containment failure, in- and ex-vessel fission product release mitigated by sprays, rupture	1.92E+03

Table 1
Level 3 PSA Population Dose Estimates By Release Category

Release Mode	Description	Population Dose (sieverts)
C4-L	Significant CCI occurs, late containment failure, in- and ex-vessel fission product release not mitigated, leak	2.65E+04
C4-R	Significant CCI occurs, late containment failure, in- and ex-vessel fission product release not mitigated, rupture	3.79E+04
C5-L	Moderate CCI occurs, late containment failure, in- and ex-vessel fission product release mitigated by sprays, leak	1.54E+03
C5-R	Moderate CCI occurs, late containment failure, in- and ex-vessel fission product release mitigated by sprays, rupture	3.28E+03
C6-L	Moderate CCI occurs, late containment failure, in- and ex-vessel fission product release not mitigated, leak	2.29E+04
C6-R	Moderate CCI occurs, late containment failure, in- and ex-vessel fission product release not mitigated, rupture	3.27E+04
D1-L	No CCI, early containment failure, in-vessel fission product release mitigated, leak, leak	5.63E+03
D1-R	No CCI, early containment failure, in-vessel fission product release mitigated, rupture	8.20E+03
D2-L	No CCI, early containment failure, in-vessel fission product release not mitigated, leak	3.04E+04
D2-R	No CCI, early containment failure, in-vessel fission product release not mitigated, rupture	2.87E+04
D3-L	No CCI, early containment failure, in-vessel and late fission product release mitigated, leak	1.63E+04
D3-R	No CCI, early containment failure, in-vessel and late fission product release mitigated, rupture	1.89E+04
D4-L	No CCI, early containment failure, in-vessel and late fission product release not mitigated, leak	2.73E+04
D4-R	No CCI, early containment failure, in-vessel and late fission product release not mitigated, rupture	2.69E+04
E1-L	Significant CCI occurs, early containment failure, in- and ex-vessel fission product release mitigated, leak	5.70E+03
E1-R	Significant CCI occurs, early containment failure, in- and ex-vessel fission product release mitigated, rupture	8.38E+03
E2-L	Significant CCI occurs, early containment failure, ex-vessel fission product release mitigated by overlying pool, in-vessel fission product release not mitigated, leak	3.20E+04
E2-R	Significant CCI occurs, early containment failure, ex-vessel fission product release mitigated by overlying pool, in-vessel fission product release not mitigated, rupture	3.05E+04
E3-L	Significant CCI occurs, early containment failure, in- and ex-vessel fission product release mitigated by sprays, leak	5.70E+03
E3-R	Significant CCI occurs, early containment failure, in- and ex-vessel fission product release mitigated by sprays, rupture	8.38E+03

Table 1
Level 3 PSA Population Dose Estimates By Release Category

Release Mode	Description	Population Dose (sieverts)
E4-L	Significant CCI occurs, early containment failure, fission product release not mitigated, leak	3.20E+04
E4-R	Significant CCI occurs, early containment failure, fission product release not mitigated, rupture	3.05E+04
E5-L	Moderate CCI occurs, early containment failure, in- and ex-vessel fission product release mitigated by sprays, no late fission product release, leak	1.63E+04
E5-R	Moderate CCI occurs, early containment failure, in- and ex-vessel fission product release mitigated by sprays, no late fission product release, rupture	1.89E+04
E6-L	Moderate CCI occurs, early containment failure, ex-vessel and late fission product release not mitigated, leak	2.83E+04
E6-R	Moderate CCI occurs, early containment failure, ex-vessel and late fission product release not mitigated, rupture	2.83E+04

Table 3
Turkey Point Release Category Frequencies
by Plant Damage State

For comparison, the IP3 analysis [3] assumed the doses were a function of the DBA LOCA leakage (L_a) using the following factors:

Table 2
Indian Point Assumed Dose Factors [3]

Class	Dose Factor
1	1 L_a
2	35 L_a
3a	10 L_a
3b	35 L_a
4	0
5	0
6	35 L_a
7	100 L_a

Step 1 - Calculate the Level 3 release category population dose frequencies.

The plant damage states from the current Turkey Point PSA model [9] were combined with the CET conditional probabilities of release category from the current Turkey Point Level 2 model [10] to produce the current Turkey Point CET release category frequencies shown below in Table 3.

Table 3
Turkey Point Release Category Frequencies by Plant Damage State

	IC	ID	IE	IF	IH	IIC	IID	IIE	IIF	IIH	IIIC	IIID	IIIG	IIIH
A1	3.15E-08	3.46E-11	1.23E-08	1.63E-10	2.22E-08	0.00E+00	9.63E-11	0.00E+00	0.00E+00	0.00E+00	4.24E-08	6.90E-10	1.79E-10	1.42E-09
A2	1.44E-08	3.96E-11	9.41E-09	3.29E-11	2.54E-08	0.00E+00	1.10E-10	0.00E+00	0.00E+00	0.00E+00	1.94E-08	7.87E-10	8.14E-11	1.62E-09
B1	1.43E-07	8.18E-13	1.99E-10	3.81E-10	4.67E-10	0.00E+00	2.27E-12	0.00E+00	0.00E+00	0.00E+00	1.93E-07	1.63E-11	6.16E-10	2.29E-11
B2-L	3.27E-08	4.65E-13	7.60E-11	3.83E-11	5.31E-10	0.00E+00	1.29E-12	0.00E+00	0.00E+00	0.00E+00	4.41E-08	9.26E-12	1.40E-10	1.31E-11
B2-R	3.27E-08	4.65E-13	7.60E-11	3.83E-11	1.33E-12	0.00E+00	1.29E-12	0.00E+00	0.00E+00	0.00E+00	4.41E-08	9.26E-12	1.40E-10	1.31E-11
B3-L	4.94E-08	0.00E+00	0.00E+00	1.31E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.65E-08	0.00E+00	2.12E-10	0.00E+00
B3-R	4.94E-08	0.00E+00	0.00E+00	1.31E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.65E-08	0.00E+00	2.12E-10	0.00E+00
B4-L	2.24E-08	0.00E+00	0.00E+00	2.63E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.02E-08	0.00E+00	9.64E-11	0.00E+00
B4-R	2.24E-08	0.00E+00	0.00E+00	2.63E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.02E-08	0.00E+00	9.64E-11	0.00E+00
B5-L	3.70E-11	2.09E-16	5.18E-14	1.00E-13	1.82E-13	0.00E+00	5.81E-16	0.00E+00	0.00E+00	0.00E+00	5.98E-11	4.98E-15	1.90E-13	7.02E-15
B5-R	3.70E-11	2.09E-16	5.18E-14	1.00E-13	4.58E-16	0.00E+00	5.81E-16	0.00E+00	0.00E+00	0.00E+00	5.98E-11	4.98E-15	1.90E-13	7.02E-15
B6-L	1.69E-11	2.38E-16	3.96E-14	2.01E-14	2.09E-13	0.00E+00	6.61E-16	0.00E+00	0.00E+00	0.00E+00	2.72E-11	5.67E-15	8.68E-14	7.99E-15
B6-R	1.69E-11	2.38E-16	3.96E-14	2.01E-14	5.22E-16	0.00E+00	6.61E-16	0.00E+00	0.00E+00	0.00E+00	2.72E-11	5.67E-15	8.68E-14	7.99E-15
C1-L	1.65E-07	0.00E+00	3.68E-08	4.49E-10	0.00E+00	0.00E+00	4.17E-10	0.00E+00	0.00E+00	0.00E+00	2.22E-07	2.99E-09	9.46E-10	4.25E-09
C1-R	1.65E-07	0.00E+00	3.68E-08	4.49E-10	0.00E+00	0.00E+00	4.17E-10	0.00E+00	0.00E+00	0.00E+00	2.22E-07	2.99E-09	9.46E-10	4.25E-09
C2-L	7.51E-08	3.22E-10	2.81E-08	9.01E-11	2.83E-07	0.00E+00	4.75E-10	0.00E+00	0.00E+00	0.00E+00	1.01E-07	3.40E-09	4.30E-10	4.84E-09
C2-R	7.51E-08	3.22E-10	2.81E-08	9.01E-11	7.09E-10	0.00E+00	4.75E-10	0.00E+00	0.00E+00	0.00E+00	1.01E-07	3.40E-09	4.30E-10	4.84E-09
C3-L	1.70E-07	0.00E+00	3.00E-08	4.51E-10	0.00E+00	0.00E+00	3.43E-10	0.00E+00	0.00E+00	0.00E+00	2.28E-07	2.45E-09	9.71E-10	3.46E-09
C3-R	1.70E-07	0.00E+00	3.00E-08	4.51E-10	0.00E+00	0.00E+00	3.43E-10	0.00E+00	0.00E+00	0.00E+00	2.28E-07	2.45E-09	9.71E-10	3.46E-09
C4-L	7.74E-08	2.64E-10	2.29E-08	9.07E-11	2.31E-07	0.00E+00	3.90E-10	0.00E+00	0.00E+00	0.00E+00	1.04E-07	2.79E-09	4.43E-10	3.94E-09
C4-R	7.74E-08	2.64E-10	2.29E-08	9.07E-11	5.78E-10	0.00E+00	3.90E-10	0.00E+00	0.00E+00	0.00E+00	1.04E-07	2.79E-09	4.43E-10	3.94E-09
C5-L	4.54E-11	0.00E+00	1.15E-11	1.23E-13	0.00E+00	0.00E+00	1.28E-13	0.00E+00	0.00E+00	0.00E+00	7.31E-11	1.77E-12	3.11E-13	1.55E-12
C5-R	4.54E-11	0.00E+00	1.15E-11	1.23E-13	0.00E+00	0.00E+00	1.28E-13	0.00E+00	0.00E+00	0.00E+00	7.31E-11	1.77E-12	3.11E-13	1.55E-12
C6-L	2.07E-11	9.88E-14	8.75E-12	2.48E-14	8.65E-11	0.00E+00	1.46E-13	0.00E+00	0.00E+00	0.00E+00	3.34E-11	5.83E-13	1.42E-13	1.77E-12
C6-R	2.07E-11	9.88E-14	8.75E-12	2.48E-14	2.17E-13	0.00E+00	1.46E-13	0.00E+00	0.00E+00	0.00E+00	3.34E-11	5.83E-13	1.42E-13	1.77E-12
D1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D1-R	5.51E-11	3.03E-16	7.40E-14	1.46E-13	1.81E-13	0.00E+00	8.44E-16	0.00E+00	0.00E+00	0.00E+00	7.41E-11	6.04E-15	3.15E-13	8.45E-15
D2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D2-R	3.62E-11	4.35E-16	7.44E-14	5.35E-14	2.60E-13	0.00E+00	1.21E-15	0.00E+00	0.00E+00	0.00E+00	4.88E-11	8.65E-15	2.07E-13	1.21E-14
D3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D3-R	7.54E-13	4.18E-18	3.67E-16	7.22E-16	1.83E-15	0.00E+00	1.16E-17	0.00E+00	0.00E+00	0.00E+00	1.42E-12	9.96E-17	5.17E-15	1.40E-16
D4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D4-R	4.96E-13	5.99E-18	3.69E-16	2.65E-16	2.63E-15	0.00E+00	1.66E-17	0.00E+00	0.00E+00	0.00E+00	5.91E-13	1.42E-16	3.39E-15	2.01E-16
E1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E1-R	1.01E-09	4.55E-13	1.83E-10	2.22E-12	2.00E-10	0.00E+00	2.54E-12	0.00E+00	0.00E+00	0.00E+00	1.37E-09	1.82E-11	5.81E-12	2.56E-11
E2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E2-R	0.00E+00	4.57E-13	0.00E+00	0.00E+00	2.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E3-R	7.66E-10	3.16E-13	1.27E-10	1.68E-12	1.38E-10	0.00E+00	1.76E-12	0.00E+00	0.00E+00	0.00E+00	1.03E-09	1.26E-11	4.39E-12	1.78E-11
E4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E4-R	0.00E+00	3.18E-13	0.00E+00	0.00E+00	1.39E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E5-R	6.42E-12	3.16E-15	4.60E-13	5.09E-15	1.38E-12	0.00E+00	1.76E-14	0.00E+00	0.00E+00	0.00E+00	1.04E-11	1.51E-13	4.40E-14	2.13E-13
E6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E6-R	0.00E+00	3.18E-15	0.00E+00	0.00E+00	1.39E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NCF	1.11E-06	8.03E-10	1.53E-07	2.30E-09	3.34E-07	0.00E+00	2.23E-09	0.00E+00	0.00E+00	0.00E+00	1.49E-06	1.60E-08	6.83E-09	2.14E-08

	IVC	IVD	IVE	IVF	IVH	VA	VB	VD	VE	VF	VH	VIA	VIB	VID	VIE	VIF	VIH	Sum
A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-10	4.31E-09	6.88E-11	9.21E-11	0.00E+00	8.15E-11	1.20E-09	2.43E-08	3.28E-11	7.05E-10	1.96E-10	3.04E-11	1.43E-07
A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E-10	8.68E-10	7.86E-11	7.03E-11	0.00E+00	9.31E-11	9.22E-10	4.90E-09	3.74E-11	5.38E-10	3.93E-11	3.47E-11	7.93E-08
B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-11	1.96E-08	1.62E-12	1.48E-12	0.00E+00	1.32E-12	2.84E-11	1.11E-07	1.01E-12	1.14E-11	4.56E-10	6.41E-13	4.69E-07
B2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.40E-12	1.97E-09	9.24E-13	5.68E-13	0.00E+00	7.49E-13	1.09E-11	1.11E-08	1.15E-12	4.35E-12	4.58E-11	7.28E-13	9.08E-08
B2-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.40E-12	1.97E-09	9.24E-13	5.68E-13	0.00E+00	7.49E-13	1.09E-11	1.11E-08	2.87E-15	4.35E-12	4.58E-11	1.82E-15	9.03E-08
B3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.75E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.81E-08	0.00E+00	0.00E+00	1.57E-10	0.00E+00	1.61E-07
B3-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.75E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.81E-08	0.00E+00	0.00E+00	1.57E-10	0.00E+00	1.61E-07
B4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-09	0.00E+00	0.00E+00	3.15E-11	0.00E+00	6.18E-08
B4-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-09	0.00E+00	0.00E+00	3.15E-11	0.00E+00	6.18E-08
B5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-11
B5-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-11
B6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-11
B6-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-11
C1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E-08	0.00E+00	2.75E-10	0.00E+00	0.00E+00	0.00E+00	1.28E-07	0.00E+00	2.10E-09	5.37E-10	0.00E+00	5.86E-07
C1-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E-08	0.00E+00	2.75E-10	0.00E+00	0.00E+00	0.00E+00	1.28E-07	0.00E+00	2.10E-09	5.37E-10	0.00E+00	5.86E-07
C2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E-09	4.54E-09	6.39E-10	2.10E-10	0.00E+00	5.21E-10	9.22E-09	2.56E-08	6.05E-10	1.61E-09	1.08E-10	3.87E-10	5.45E-07
C2-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E-09	4.54E-09	6.39E-10	2.10E-10	0.00E+00	5.21E-10	9.22E-09	2.56E-08	1.52E-12	1.61E-09	1.08E-10	9.70E-13	2.62E-07
C3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-08	0.00E+00	2.24E-10	0.00E+00	0.00E+00	0.00E+00	1.31E-07	0.00E+00	1.71E-09	5.40E-10	0.00E+00	5.93E-07
C3-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-08	0.00E+00	2.24E-10	0.00E+00	0.00E+00	0.00E+00	1.31E-07	0.00E+00	1.71E-09	5.40E-10	0.00E+00	5.93E-07
C4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-09	4.68E-09	5.25E-10	1.71E-10	0.00E+00	4.26E-10	7.57E-09	2.64E-08	4.99E-10	1.31E-09	1.09E-10	3.16E-10	4.89E-07
C4-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-09	4.68E-09	5.25E-10	1.71E-10	0.00E+00	4.26E-10	7.57E-09	2.64E-08	1.25E-12	1.31E-09	1.09E-10	7.91E-13	2.58E-07
C5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-10
C5-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-10
C6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-10
C6-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.58E-11
D1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D1-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.20E-15	7.53E-12	7.33E-16	5.46E-16	0.00E+00	5.87E-16	1.04E-14	4.25E-11	3.90E-16	4.18E-15	1.75E-13	2.51E-16	1.80E-10
D2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D2-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.23E-15	2.76E-12	7.37E-16	5.50E-16	0.00E+00	5.91E-16	1.05E-14	1.56E-11	5.61E-16	4.21E-15	6.40E-14	3.59E-16	1.04E-10
D3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D3-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-12
D4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D4-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-12
E1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E1-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.48E-12	1.15E-10	9.04E-13	1.37E-12	0.00E+00	1.47E-12	1.30E-11	6.46E-10	4.31E-13	1.05E-11	2.66E-12	2.73E-13	3.62E-09
E2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E2-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.51E-12	0.00E+00	9.08E-13	0.00E+00	0.00E+00	0.00E+00	1.31E-11	0.00E+00	4.33E-13	0.00E+00	0.00E+00	2.74E-13	2.22E-10
E3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E3-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-12	8.65E-11	6.27E-13	9.49E-13	0.00E+00	5.08E-13	9.04E-12	4.88E-10	2.99E-13	7.26E-12	2.01E-12	1.89E-13	2.70E-09
E4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E4-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.53E-12	0.00E+00	6.31E-13	0.00E+00	0.00E+00	5.12E-13	9.10E-12	0.00E+00	3.01E-13	0.00E+00	0.00E+00	1.91E-13	1.55E-10
E5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E5-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-11
E6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E6-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-12
NCF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-08	1.25E-07	1.59E-09	1.14E-09	0.00E+00	1.23E-09	2.30E-08	7.04E-07	7.60E-10	8.74E-09	2.75E-09	4.57E-10	4.01E-06

Step 2: Map the Level 3 release categories into the 8 release classes defined by the EPRI Report [6]

EPRI Report TR-104285 defines eight (8) release classes as follows:

Table 4
EPRI Containment Failure Classifications

Class 1	Containment remains intact including accident sequences that do not lead to containment failure in the long term. The release of fission products (and attendant consequences) is determined by the maximum allowable leakage rate values La, under Appendix J for that plant. The allowable leakage rates (La), are typically 0.1 weight percent of containment volume per day for PWRs and 0.5 weight percent per day for BWRs (all measured at Pac, calculated peak containment pressure related to the design basis accident). Changes to leak rate testing frequencies do not affect this classification.
Class 2	Containment isolation failures (as reported in the IPEs) include those accidents in which the pre-existing leakage is due to failure to isolate the containment. These include those that are dependent on the core damage accident in progress (e.g., initiated by common cause failure or support system failure of power) and random failures to close a containment path. Changes in Appendix J testing requirements do not impact these accidents.
Class 3	Independent (or random) isolation failures include those accidents in which the pre-existing isolation failure to seal (i.e., provide a leak-tight containment) is not dependent on the sequence in progress. This accident class is applicable to sequences involving ILRTs (Type A tests) and potential failures not detectable by LLRTs.
Class 4	Independent (or random) isolation failures include those accidents in which the pre-existing isolation failure to seal is not dependent on the sequence in progress. This class is similar to Class 3 isolation failures, but is applicable to sequences involving Type B tests and their potential failures. These are the Type B-tested components that have isolated but exhibit excessive leakage.
Class 5	Independent (or random) isolation failures include those accidents in which the pre-existing isolation failure to seal is not dependent on the sequence in progress. This class is similar to Class 4 isolation failures, but is applicable to sequences involving Type C tests and their potential failures.
Class 6	Containment isolation failures include those leak paths not identified by the LLRTs. The type of penetration failures considered under this class includes those covered in the plant test and maintenance requirements or verified per in service inspection and testing (ISI/IST) program. This failure to isolate is not typically identified in LLRT. Changes in Appendix J LLRT test intervals do not impact this class of accidents.
Class 7	Accidents involving containment failure induced by severe accident phenomena. Changes in Appendix J testing requirements do not impact these accidents.
Class 8	Accidents in which the containment is bypassed (either as an initial condition or induced by phenomena) are included in class 8. Changes in Appendix J testing requirements do not typically impact these accidents, particularly for PWRs.

Table 5 presents the Turkey Point release category mapping for these eight accident classes. Person-Rem per year is the product of the frequency and the Person-Rem.

Table 5
EPRI Classification of PTN Release Category Data

CET End State	Release Frequency*	Population Dose** (Sieverts)	Population Dose (person-rem)	Population Dose Frequency (person-rem/yr)	EPRI Class
A1	1.43E-07	5.46E+01	5.46E+03	7.79E-04	7
A2	7.93E-08	2.48E+04	2.48E+06	1.97E-01	7
B1	4.69E-07	8.46E+02	8.46E+04	3.97E-02	7
B2-L	9.08E-08	2.64E+04	2.64E+06	2.40E-01	7
B2-R	9.03E-08	3.73E+04	3.73E+06	3.37E-01	7
B3-L	1.61E-07	8.46E+02	8.46E+04	1.36E-02	7
B3-R	1.61E-07	1.92E+03	1.92E+05	3.09E-02	7
B4-L	6.18E-08	2.64E+04	2.64E+06	1.63E-01	7
B4-R	6.18E-08	3.78E+04	3.78E+06	2.34E-01	7
B5-L	9.73E-11	1.54E+03	1.54E+05	1.50E-05	7
B5-R	9.71E-11	3.28E+03	3.28E+05	3.18E-05	7
B6-L	4.44E-11	2.29E+04	2.29E+06	1.02E-04	7
B6-R	4.42E-11	2.74E+04	2.74E+06	1.21E-04	7
BY_EV V	1.14E-09	4.46E+04	4.46E+06	5.09E-03	8
BY-SGTR	2.56E-07	8.07E+03	8.07E+05	2.07E-01	8
C1-L	5.86E-07	8.46E+02	8.46E+04	4.96E-02	7
C1-R	5.86E-07	1.92E+03	1.92E+05	1.13E-01	7
C2-L	5.45E-07	2.65E+04	2.65E+06	1.44E+00	7
C2-R	2.62E-07	3.79E+04	3.79E+06	9.92E-01	7
C3-L	5.93E-07	8.46E+02	8.46E+04	5.02E-02	7
C3-R	5.93E-07	1.92E+03	1.92E+05	1.14E-01	7
C4-L	4.89E-07	2.65E+04	2.65E+06	1.30E+00	7
C4-R	2.58E-07	3.79E+04	3.79E+06	9.78E-01	7
C5-L	1.34E-10	1.54E+03	1.54E+05	2.06E-05	7
C5-R	1.34E-10	3.28E+03	3.28E+05	4.39E-05	7
C6-L	1.52E-10	2.29E+04	2.29E+06	3.48E-04	7
C6-R	6.58E-11	3.27E+04	3.27E+06	2.15E-04	7
D1-L (iso)	0.00E+00	5.63E+03	5.63E+05	0.00E+00	2
D1-R (iso)	1.50E-10	8.20E+03	8.20E+05	1.23E-04	2
D2-L (iso)	0.00E+00	3.04E+04	3.04E+06	0.00E+00	2
D2-R (iso)	8.67E-11	2.87E+04	2.87E+06	2.49E-04	2
D1-L (non-iso)	0.00E+00	5.63E+03	5.63E+05	0.00E+00	7
D1-R (non-iso)	3.00E-11	8.20E+03	8.20E+05	2.46E-05	7

Table 5
EPRI Classification of PTN Release Category Data

CET End State	Release Frequency*	Population Dose** (Sieverts)	Population Dose (person-rem)	Population Dose Frequency (person-rem/yr)	EPRI Class
D2-L (non-iso)	0.00E+00	3.04E+04	3.04E+06	0.00E+00	7
D2-R (non-iso)	1.73E-11	2.87E+04	2.87E+06	4.97E-05	7
D3-L	0.00E+00	1.63E+04	1.63E+06	0.00E+00	7
D3-R	2.19E-12	1.89E+04	1.89E+06	4.13E-06	7
D4-L	0.00E+00	2.73E+04	2.73E+06	0.00E+00	7
D4-R	1.09E-12	2.69E+04	2.69E+06	2.94E-06	7
E1-L (iso)	0.00E+00	5.70E+03	5.70E+05	0.00E+00	2
E1-R (iso)	3.01E-09	8.38E+03	8.38E+05	2.52E-03	2
E2-L (iso)	0.00E+00	3.20E+04	3.20E+06	0.00E+00	2
E2-R (iso)	1.85E-10	3.05E+04	3.05E+06	5.65E-04	2
E1-L (non-iso)	0.00E+00	5.70E+03	5.70E+05	0.00E+00	7
E1-R (non-iso)	6.03E-10	8.38E+03	8.38E+05	5.05E-04	7
E2-L (non-iso)	0.00E+00	3.20E+04	3.20E+06	0.00E+00	7
E2-R (non-iso)	3.70E-11	3.05E+04	3.05E+06	1.13E-04	7
E3-L	0.00E+00	5.70E+03	5.70E+05	0.00E+00	7
E3-R	2.70E-09	8.38E+03	8.38E+05	2.26E-03	7
E4-L	0.00E+00	3.20E+04	3.20E+06	0.00E+00	7
E4-R	1.55E-10	3.05E+04	3.05E+06	4.73E-04	7
E5-L	0.00E+00	1.63E+04	1.63E+06	0.00E+00	7
E5-R	1.91E-11	1.89E+04	1.89E+06	3.60E-05	7
E6-L	0.00E+00	2.83E+04	2.83E+06	0.00E+00	7
E6-R	1.40E-12	2.83E+04	2.83E+06	3.95E-06	7
NCF***	4.01E-06		1.69E+04	6.78E-02	1
Total	9.51E-06			6.58E+00	

* From last column in Table 3.

** From Turkey Point MACCS2 Model and Level 3 Application [11].

*** Population dose (person-rem) for EPRI Class 1 was not calculated in the PTN Level 3 analysis; therefore, the dose was estimated using the IP3 assumptions. The dose was estimated to be 1/100 of the dose for EPRI Class 7. This was calculated by totaling the Class 7 population dose frequencies and dividing by the sum of the Class 7 release frequencies, then dividing by 100.

Note: The D1, D2, E1, and E2 release categories were split into containment isolation and non-containment isolation failures using the probabilities in the top logic for CFE (see PTN Level 2 analysis [10]). The containment isolation contribution to CFE is 1.0E-03. The non-containment isolation contribution is 2E-04. The release frequencies were multiplied by (1E-03/1.2E-03) for the containment isolation portion and by (2E-04/1.2E-03) for the non-containment isolation portion.

Step 3: Calculate the Type A leakage estimate to define the analysis baseline (3 year test interval)

As displayed in Table 5, the Turkey Point PSA did not identify any release categories specifically associated with EPRI Classes 3, 4, 5, or 6. Therefore, each of these classes must be evaluated for applicability to Turkey Point.

Class 3:

Containment failures in this class are due to leaks such as liner breaches which would only be detected by performing a Type A ILRT.

For this estimation, the question on containment isolation was modified consistent with the previously approved methodology [3,4], to include the probability of a liner breach (due to excessive leakage) at the time of core damage. Using this methodology, Class 3 is divided into two classes. These are Class 3a (small liner breach) and Class 3b (large liner breach).

To calculate the probability that a liner leak will be large (Class 3b), use was made of the data presented in NUREG-1493 [7]. One data set found in NUREG-1493 reviewed 144 ILRTs. The largest reported leak rate from those 144 tests was 21 times the allowable leakage rate (L_a). Since 21 L_a does not constitute a large release, no large releases have occurred based on the 144 ILRTs reported in NUREG-1493.

To estimate the failure probability given that no failures have occurred, a conservative estimate is obtained from the 95th percentile of the X^2 distribution. In statistical theory, the X^2 distribution can be used for statistical testing, goodness-of-fit tests. The X^2 distribution is really a family of distributions, which range in shape from that of the exponential to that of the normal distribution. Each distribution is identified by the degrees of freedom, v. For time-truncated tests (versus failure-truncated tests), an estimate of the probability of a large leak using the X^2 distribution can be calculated as $[X^2_{95}(v = 2n+2)]/2N$, where n represents the number of large leaks and N represents the number of ILRTs performed to date. With no large leaks (n = 0) in 144 events (N = 144) and $X^2_{95}(2) = 5.99$, the 95th percentile estimate of the probability of a large leak is calculated as 5.99/(2*144) = 0.021.

Therefore the frequency of a Class 3b failure is calculated as:

$$FREQ_{class3b} = PROB_{class3b} \times CDF = 0.021 \times 9.51E\text{-}06/yr = 2.00E\text{-}07/yr$$

To calculate the probability that a liner leak will be small (Class 3a), use was made of the data presented in NUREG-1493 [7]. The data found in NUREG-1493 states that 144 ILRTs were conducted. The data reported that 23 of 144 tests had allowable leak rates in excess of 1.0L_a. However, of these 23 'failures,' only 4 were found by an ILRT. The others were found by Type B and C testing or errors in test alignments. Therefore, the number of failures considered for

'small releases' are 4 of 144. Similar to the Class 3b probability, the estimated failure probability for small release is found by using the X^2 distribution. The X^2 distribution is calculated by n=4 (number of small leaks) and N=144 (number of events) which yields a $X^2(10)$ = 18.3070. Therefore, the 95th percentile estimate of the probability of a small leak is calculated as 18.3070/(2*144) = 0.064.

Therefore, the frequency of a Class 3a failure is calculated as:

$$FREQ_{class3a} = PROB_{class3a} \times CDF = 0.064 \times 9.51E\text{-}06/yr = 6.09E\text{-}07/yr$$

Note: Using the methodology discussed above is conservative compared to the typical mean estimates used for PSA analysis. The mean probability of a Class 3 failure would be the (number of failures)/(number of tests) or 4/144 = 0.03.

Class 4:

This group consists of all core damage accidents for which a failure-to-seal containment isolation failure of Type B test components occurs. By definition, these failures are dependent on Type B testing, and the probability will not be impacted by Type A testing. Therefore, this group is not evaluated any further, consistent with the approved methodology.

Class 5:

This group consists of all core damage accidents for which a failure-to-seal containment isolation failure of Type C test components occurs. By definition, these failures are dependent on Type C testing, and the probability will not be impacted by Type A testing. Therefore, this group is not evaluated any further, consistent with the approved methodology.

Class 6:

This group is similar to Class 2, and addresses additional failure modes not typically modeled in PSAs due to the low probability of occurrence. The low failure probabilities are based on the need for multiple failures, the presence of automatic closure signals, and control room indication. Based on the purpose of this calculation, and the fact that this failure class is not impacted by Type A testing, no further evaluation is needed. This is consistent with the EPRI guidance. However, in order to maintain consistency with the previously approved methodology (i.e.– $PROB_{class6} > 0$), a conservative screening value of 1.0E-03 will be used to evaluate this class.

$$FREQ_{class6} = (\text{screening value}) \times CDF = 1.00E\text{-}03 \times 9.51E\text{-}06/yr = 9.51E\text{-}09/yr$$

Class 1:

Although the frequency of this class is not directly impacted by Type A testing, the Turkey Point PSA did not model Class 3 or Class 6 type failures, and the frequency for Class 1 should be reduced by the estimated frequencies in the new Class 3a, Class 3b and Class 6 in order to preserve the total CDF. The revised Class 1 frequency is therefore:

$$FREQ_{class1} = FREQ_{PSAclass1} - (FREQ_{class3a} + FREQ_{class3b} + FREQ_{class6})$$

$$FREQ_{class1} = 4.01E\text{-}06/yr - (6.08E\text{-}07/yr + 2.00E\text{-}07/yr + 9.51E\text{-}09) = 3.19E\text{-}06/yr$$

Class 2:

The frequency of Class 2 is the sum of those release categories identified in Table 5 as Class 2.

$$FREQ_{class2} = 3.43E\text{-}09/yr$$

Class 7:

The frequency of Class 7 is the sum of those release categories identified in Table 5 as Class 7.

$$FREQ_{class7} = 5.23E\text{-}06/yr$$

Class 8:

The frequency of Class 8 is the sum of those release categories identified in Table 5 as Class 8.

$$FREQ_{class8} = 2.57E\text{-}07/yr$$

Table 6 summarizes the above information by the EPRI defined classes. This table also presents exposures using the results of the Turkey Point Level 3 analysis or the IP3 assumed L_a factors. For the Level 3 exposures, the highest exposure from any release category was used for each classification.

Table 6
Release Data Summarized by EPRI Class

Class	Description	Frequency (per year)	Person-Rem (Level 3)	Person-Rem (La factors)
1	No Containment Failure	3.19E-06		16900
2	Large Containment Isolation Failures (failure to close)	3.43E-09	3200000	
3a*	Small Isolation Failures (Type A test)	6.08E-07		169000
3b*	Large Isolation Failures (Type A test)	2.00E-07		591500
4	Small Isolation Failures - failure-to-seal (Type B test)			
5	Small Isolation Failures - failure-to-seal (Type C test)			
6	Other Isolation Failures (dependent failures)	9.51E-09		591500
7	Failure Induced by Phenomena (Early and late failures)	5.23E-06	3790000	
8	Containment Bypasses (SGTR)	2.57E-07	4460000	
CDF	All Classes	9.51E-06		

Based on the above table, it can be seen that the Turkey Point Level 3 results do not contain specific dose results for Classes 1, 3a, 3b, and Class 6. Therefore the dose factors for these classes from the previously approved methodology (see Table 2) will be applied for this calculation.

Table 7 presents the person-rem frequency data determined by multiplying the frequency for each failure class by the corresponding exposure.

Table 7
Baseline Mean Consequence Measures for 3-Year Test Interval

Class	Description	Frequency (per year)	Person-Rem (Level 3)	Person-Rem per year
1	No Containment Failure	3.19E-06	16900	0.0540
2	Large Containment Isolation Failures (failure to close)	3.43E-09	3200000	0.0110
3a*	Small Isolation Failures (Type A test)	6.08E-07	169000	0.1028
3b*	Large Isolation Failures (Type A test)	2.00E-07	591500	0.1181
4	Small Isolation Failures - failure-to-seal (Type B test)			
5	Small Isolation Failures - failure-to-seal (Type C test)			
6	Other Isolation Failures (dependent failures)	9.51E-09	591500	0.0056
7	Failure Induced by Phenomena (Early and late failures)	5.23E-06	3790000	19.8405
8	Containment Bypasses (SGTR)	2.57E-07	4460000	1.1483
CDF	All Classes	**9.51E-06**		**21.2803**

The percent risk contribution due to Type A testing is as follows:

$\%Risk_{BASE} = [(Class3a_{BASE} + Class3b_{BASE}) / Total_{BASE}] \times 100$

Where:

$Class3a_{BASE}$ = Class 3a person-rem/year = 0.1028 person-rem/year

$Class3b_{BASE}$ = Class 3b person-rem/year = 0.1181 person-rem/year

$Total_{BASE}$ = total person-rem year for baseline interval = 21.2803 person-rem/year

$\%Risk_{BASE} = [(0.1028 + 0.1181) / 21.2803] \times 100 = 1.04\%$

Step 4: Calculate the Type A leakage estimate to address the current inspection interval

The current surveillance testing requirements as proposed in NEI 94-01 [5] for Type A testing and allowed by 10 CFR 50, Appendix J [1] is at least once per 10 years based on an acceptable performance history (defined as two consecutive periodic Type A tests at least 24 months apart in which the calculated performance leakage was less than $1.0L_a$).

According to NUREG-1493 [7], extending the Type A ILRT interval from 3 in I0 years to 1 in I0 years will increase the average time that a leak detectable only by an ILRT goes undetected from 18 to 60 months. The average time for undetection is calculated by multiplying the test interval by 0.5 and multiplying by 12 to convert from "years" to "months." Since ILRTs only detect about 3% of leaks (4/144), the result for a 10-yr ILRT interval is a 10% increase in the overall probability of leakage. This value is determined by multiplying 3% and the ratio of the average time for undetection for the increased ILRT test interval (60 months) to the baseline average time for undetection of 18 months (i.e., 3 * 60/18).

Risk Impact Due to 10-year Test Interval

Based on the previously approved methodology [3,4], the increased probability of not detecting excessive leakage due to Type A tests directly impacts the frequency of the Class 3 sequences. The risk contribution is determined by multiplying the Class 3 accident frequency by the increase in probability of leakage of 1.10. Recall that for a 10-year interval there is a 10% increase on the overall probability of leakage. The results of this calculation are presented in Table 8 below.

As with the baseline case, the PSA frequency of Class 1 has been reduced by the frequency of Class 3a, 3b, and Class 6 in order to preserve total CDF.

Table 8
Mean Consequence Measures for 10-Year Test Interval

Class	Description	Frequency (per year)	Person-Rem (Level 3)	Person-Rem per year
1	No Containment Failure	3.11E-06	16900	0.0526
2	Large Containment Isolation Failures (failure to close)	3.43E-09	3200000	0.0110
3a*	Small Isolation Failures (Type A test)	6.69E-07	169000	0.1131
3b*	Large Isolation Failures (Type A test)	2.20E-07	591500	0.1299
4	Small Isolation Failures - failure-to-seal (Type B test)			
5	Small Isolation Failures - failure-to-seal (Type C test)			
6	Other Isolation Failures (dependent failures)	9.51E-09	591500	0.0056
7	Failure Induced by Phenomena (Early and late failures)	5.23E-06	3790000	19.8405
8	Containment Bypasses (SGTR)	2.57E-07	4460000	1.1483
CDF	All Classes	9.51E-06		21.3010

Using the same methods as for the baseline, and using the data in Table 8, the percent risk contribution due to Type A testing is as follows:

$\%Risk_{10} = [(Class3a_{10} + Class3b_{10}) / Total_{10}] \times 100$

Where:

$Class3a_{10}$ = Class 3a person-rem/year = 0.1131 person-rem/year

$Class3b_{10}$ = Class 3b person-rem/year = 0.1299 person-rem/year

$Total_{10}$ = total person-rem year for baseline interval = 21.3010 person-rem/year

$\%Risk_{10} = [(0.1131 + 0.1299) / 21.3010] \times 100 = 1.14\%$

The percent risk increase ($\Delta\%Risk_{10}$) due to a ten-year ILRT over the baseline case is as follows:

$\Delta\%Risk_{10} = [(Total_{10} - Total_{BASE}) / Total_{BASE}] \times 100$

Where:

$Total_{BASE}$ = total person-rem/year for baseline interval = 21.2803 person-rem/year

$Total_{10}$ = total person-rem/year for 10-year interval = 21.3010 person-rem/year

$\Delta\%Risk_{10}$ = [(21.3010 – 21.2803) / 21.2803] x 100.0 = 0.097%

Step 5: Calculate the Type A leakage estimate to address extended inspection intervals

Risk Impact due to 15-year Test Interval

If the test interval is extended to 1 in 15 years, the average time that a leak detectable only by an ILRT test goes undetected increases to 90 months (0.5 * 15 * 12). For a 15-year test interval, the result is a 15% increase in the overall probability of leakage (i.e., 3 * 90/18). Thus, increasing the ILRT test interval from 10 years to 15 years results in a 5% increase in the overall probability of leakage (Recall that for a 10-year interval there is a 10% increase on the overall probability of leakage).

Based on the previously approved methodology [3,4], the risk contribution for a 15-year interval is similar to the 10-year interval. The difference is in the increase in probability of leakage value. For this case, the value is 15 percent, or 1.15. In addition, the containment leakage used for the 10-year test interval for Class 3 is used in the 15-year interval evaluation. The results for this calculation are presented in Table 9.

As with the baseline case, the PSA frequency of Class 1 has been reduced by the frequency of Class 3a, 3b, and Class 6 in order to preserve total CDF.

Table 9
Mean Consequence Measures for 15-Year test Interval

Class	Description	Frequency (per year)	Person-Rem (Level 3)	Person-Rem per year
1	No Containment Failure	3.07E-06	16900	0.0519
2	Large Containment Isolation Failures (failure to close)	3.43E-09	3200000	0.0110
3a*	Small Isolation Failures (Type A test)	7.00E-07	169000	0.1182
3b*	Large Isolation Failures (Type A test)	2.30E-07	591500	0.1358
4	Small Isolation Failures - failure-to-seal (Type B test)			
5	Small Isolation Failures - failure-to-seal (Type C test)			
6	Other Isolation Failures (dependent failures)	9.51E-09	591500	0.0056
7	Failure Induced by Phenomena (Early and late failures)	5.23E-06	3790000	19.8405
8	Containment Bypasses (SGTR)	2.57E-07	4460000	1.1483
CDF	All Classes	**9.51E-06**		**21.3114**

Using the same methods as for the baseline, and the data in Table 9, the percent risk contribution due to Type A testing is as follows:

$\%Risk_{15} = [(Class3a_{15} + Class3b_{15}) / Total_{15}] \times 100$

where:

$Class3a_{15}$ = Class 3a person-rem/year = 0.1182 person-rem/year

$Class3b_{15}$ = Class 3b person-rem/year = 0.1358 person-rem/year

$Total_{15}$ = total person-rem year for baseline interval = 21.3114 person-rem/year

$\%Risk_{15} = [(0.1182 + 0.1358) / 21.3114] \times 100 = 1.19\%$

The percent risk increase ($\Delta\%Risk_{15}$) due to a fifteen-year ILRT over the baseline case is as follows:

$\Delta\%Risk_{15} = [(Total_{15} - Total_{BASE}) / Total_{BASE}] \times 100.0$

Where:

$Total_{BASE}$ = total person-rem/year for baseline interval = 21.2803 person-rem/year

$Total_{15}$ = total person-rem/year for 15-year interval = 21.3114 person-rem/year

$\Delta\%Risk_{15} = [(21.3114 - 21.2803) / 21.2803] \times 100.0 = 0.146\%$

Step 6: Calculate increase in risk due to extending Type A inspection intervals

Extension of interval from 10 years to 15 years

Based on the previously approved methodology [3,4], the percent increase in risk (in terms of person-rem/yr) of these associated specific sequences is computed as follows.

$\%Risk_{10\text{-}15} = [(PER\text{-}REM_{15} - PER\text{-}REM_{10}) / PER\text{-}REM10] \times 100$

where:

$PER\text{-}REM_{10}$ = person-rem/year for ten-year interval (for classes 1, 3a, and 3b)
= (0.0526 + 0.1131 + 0.1299) person-rem/yr [Table 8]
= 0.2956 person-rem/yr

$PER\text{-}REM_{15}$ = person-rem/year for fifteen-year interval (for classes 1, 3a, and 3b)
= (0.0519 + 0.1182 + 0.1358) person-rem/yr [Table 9]
= 0.3059 person-rem/yr

$\%Risk_{10\text{-}15}$ = [(0.3059 – 0.2956) / 0.2956] x 100 = 3.48%

The percent increase on the total integrated plant risk for these accident sequences is computed as follows.

$\%Total_{10\text{-}15} = [(Total_{15} - Total_{10}) / Total_{10}] \times 100$

where:

$Total_{10}$ = total person-rem/year for ten-year interval

= 21.3010 person-rem/year [Table 8]

$Total_{15}$ = total person-rem/year for fifteen-year interval

= 21.3114 person-rem/year [Table 9]

$\% Total_{10\text{-}15}$ = [(21.3114 –21.3010) / 21.3010] x 100 = 0.049%

Step 7: Calculate the change in risk in terms of Large Early Release Frequency (LERF)

The risk impact associated with extending the ILRT interval involves the potential that a core damage event that normally would result in only a small radioactive release from containment could in fact result in a large release due to failure to detect a pre-existing leak during the relaxation period. Based on the previously approved methodology [3,4], only Class 3 sequences have the potential to result in large releases if a pre-existing leak is present. Class 1 sequences are not considered as potential large release pathways because for these sequences the containment remains intact. Therefore, the containment leak rate is expected to be small (less than $2L_a$). A larger leak rate would imply an impaired containment, such as classes 2, 3, 6 and 7.

Late releases are excluded regardless of the size of the leak because late releases are, by definition, not a LERF event. At the same time, sequences in the Turkey Point PSA [9,10], which result in large releases, are not impacted because a LERF will occur regardless of the presence of a pre-existing leak. Therefore, the increase in frequency of Class 3b sequences is used as the increase in LERF for Turkey Point, and the change in LERF can be determined by the differences. The following table summarizes the results:

Table 10
Change in LERF Due to Extending Type A testing Intervals

	3-Year Interval (baseline)	10-Year Interval	15-Year Interval
Type A LERF (Class 3b)	2.00E-07/yr	2.20E-07/yr	2.30E-07/yr
ΔLERF (10- to 15-year interval)			1.00E-08/yr
ΔLERF (3-- to 15-year interval)			3.00E-08/yr

Reg. Guide 1.174 [8] provides guidance for determining the risk impact of plant-specific changes to the licensing basis. Reg. Guide 1.174 defines very small changes in risk as resulting in increases of core damage frequency (CDF) below 1E-6/yr and increases in LERF below 1E-7/yr. Since the ILRT does not impact CDF, the relevant metric is LERF. Calculating the increase in LERF requires determining the impact of the ILRT interval on the leakage probability.

Since guidance in Reg. Guide 1.174 defines very small changes in LERF as below 1.0E-7/yr, increasing the ILRT interval to 15 years (1.00E-08/yr) is non-risk-significant. It should be noted that if the risk increase is measured from the original frequency of three every ten years, the

increase in LERF is 3.00E-08/yr, which is still below the 1.0E-07/yr screening criterion in Reg.Guide 1.174.

Step 8: Calculate the change in Conditional Containment Failure Probability (CCFP)

The conditional containment failure probability (CCFP) is defined as the probability of containment failure given the occurrence of an accident. This probability can be expressed using the following equation:

$$CCFP = 1 - \left[\frac{f(ncf)}{CDF} \right]$$

Where f(ncf) is the frequency of those sequences which result in no containment failure (ncf). This frequency is determined by summing the Class 1 and Class 3a results, and CDF is the total frequency of all core damage sequences.

Therefore the change in CCFP for this analysis is the CCFP using the results for 15 years ($CCFP_{15}$) minus the CCFP using the results for 10 years ($CCFP_{10}$). This can be expressed by the following:

$$\Delta CCFP_{10-15} = \left[\frac{f_{Class1} + f_{Class3a}}{CDF} \right]_{10} - \left[\frac{f_{Class1} + f_{Class3a}}{CDF} \right]_{15}$$

Using the data from Table 8 and Table 9:

$$\Delta CCFP_{10-15} = \left[\frac{(3.11E-06)+(6.69E-07)}{9.51E-06} \right]_{10} - \left[\frac{(3.07E-06)+(7.00E-07)}{9.51E-06} \right]_{15}$$

$$\Delta CCFP_{10-15} = .0009 = 0.09\%$$

Using the data from Table 7 and Table 9 provide the change in CCFP from the baseline case:

$$\Delta CCFP_{3-15} = \left[\frac{(3.19E-06)+(6.08E-07)}{9.51E-06}\right]_3 - \left[\frac{(3.07E-06)+(7.00E-07)}{9.51E-06}\right]_{15}$$

$$\Delta CCFP_{3-15} = .0029 = 0.29\%$$

6.0 RESULTS

The specific results are summarized in Table 11 below. The Type A contribution to LERF is defined as the contribution from Class 3b.

Based on the data:

1. The person-rem/year increase in risk contribution from extending the ILRT test frequency from the current once every 10 years to once every 15 years is 0.0104 person-rem/yr.
2. The total integrated increase in risk contribution from extending the ILRT test frequency from the current once every 10 years to once every 15 years is 0.049%.
3. The risk increase in LERF from extending the ILRT test frequency from the current once every 10 years to once every 15 years is 1.0 x 10^{-8}/yr.

The change in CCFP from the current 10-year interval to a 15-year interval is 0.09%.

Based on the above results, the following are conclusions regarding the assessment of the plant risk associated with extending the Type A ILRT test interval from ten years to fifteen years.

The change in Type A test frequency from once every ten years to once every fifteen years increases the risk impact on the total integrated plant risk by only 0.049%. Also, the change in Type A test frequency from the original three every ten years to once every fifteen years increases the risk only 0.146%. Therefore, the risk impact when compared to other severe accident risks is negligible.

Reg. Guide 1.174 provides guidance for determining the risk impact of plant-specific changes to the licensing basis. Reg. Guide 1.174 defines very small changes in risk as resulting in increases of CDF below 10^{-6}/yr and increases in LERF below 10^{-7}/yr. Since the ILRT does not impact CDF, the relevant criterion is LERF. The increase in LERF resulting from a change in the Type A ILRT test frequency from the current once every 10 years to once every 15 years is 1.0x10^{-8}/yr. Since guidance in Reg. Guide 1.174 defines very small changes in LERF as below 10^{-7}/yr, increasing the ILRT interval from 10 to 15 years is therefore considered non-risk

significant. In addition, the change in LERF resulting from a change in the Type A ILRT test frequency from the original three every ten years to once every fifteen years is $3.0x10^{-8}$/yr, is also non-risk significant.

R.G. 1.174 also encourages the use of risk analysis techniques to help ensure and show that the proposed change is consistent with the defense-in-depth philosophy. Consistency with defense-in-depth philosophy is maintained by demonstrating that the balance is preserved among prevention of core damage, prevention of containment failure, and consequence mitigation. The change in conditional containment failure probability was estimated to be 0.09% for the proposed change and 0.29% for the cumulative change of going from a test frequency of three every ten years to once every fifteen years. These changes are small and demonstrate that the defense-in-depth philosophy is maintained.

Table 11
Summary of Risk Impact on Extending Type A ILRT Test Frequency

	Risk Impact for 3-year interval (baseline)	Risk Impact for 10-year interval (current requirement)	Risk Impact for 15-year interval (proposed)
Total Integrated Risk (Person-Rem/yr)	21.2803	21.3010	21.3114
Type A Testing Risk (Person-Rem/yr)	0.2209	0.2430	0.2540
% Total Risk (Type A / Total)	1.04%	1.14%	1.19%
Type A LERF (Class 3b) (per year)	2.00E-07	2.20E-07	2.30E-07
Changes due to extension from 10 years (current)			
Δ Risk from current (Person-rem/yr)			0.0104
% Increase from current (Δ Risk / Total Risk)			0.049%
Δ LERF from current (per year)			1.00E-08
Δ CCFP from current			0.09%
Changes due to extension from 3 years (baseline)			
Δ Risk from baseline (Person-rem/yr)			0.0311
% Increase from baseline (Δ Risk / Total Risk)			0.146%
Δ LERF from baseline (per year)			3.00E-08
Δ CCFP from baseline			0.29%