Evaluation of Risk Significance of Permanent ILRT Extension

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Advancing the Science of Safety

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Evaluation of Risk Significance of Permanent ILRT Extension

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0	Initial Issue
1	Minor updates made based on client comments
2	Minor updates made based on client comments
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1.0 PURPOSE

The purpose of this analysis is to provide a risk assessment of permanently extending the currently allowed containment Type A Integrated Leak Rate Test (ILRT) to fifteen years. The extension would allow for substantial cost savings as the ILRT could be deferred for additional scheduled refueling outages for the Diablo Canyon Power Plant (DCPP). The risk assessment follows the guidelines from NEI 94-01, Revision 3-A [Reference 1], the methodology used in EPRI TR-104285 [Reference 2], the NEI "Interim Guidance for Performing Risk Impact Assessments in Support of One-Time Extensions for Containment Integrated Leakage Rate Test Surveillance Intervals" from November 2001 [Reference 3], the NRC regulatory guidance on the use of Probabilistic Risk Assessment (PRA) as stated in Regulatory Guide 1.200 as applied to ILRT interval extensions, risk insights in support of a request for a plant's licensing basis as outlined in Regulatory Guide (RG) 1.174 [Reference 4], the methodology used for Calvert Cliffs to estimate the likelihood and risk implications of corrosion-induced leakage of steel liners going undetected during the extended test interval [Reference 5], and the methodology used in EPRI 1018243, Revision 2-A of EPRI 1009325 [Reference 24].

2.0 SCOPE

Revisions to 10CFR50, Appendix J (Option B) allow individual plants to extend the Integrated Leak Rate Test (ILRT) Type A surveillance testing frequency requirement from three in ten years to at least once in ten years. The revised Type A frequency is 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 rate was less than limiting containment leakage rate of $1L_a$.

The basis for the current 10-year test interval is provided in Section 11.0 of NEI 94-01, Revision 0, and established in 1995 during development of the performance-based Option B to Appendix J. Section 11.0 of NEI 94-01 states that NUREG-1493, "Performance-Based Containment Leak Test Program," September 1995 [Reference 6], provides the technical basis to support rulemaking to revise leakage rate testing requirements contained in Option B to Appendix J. The basis consisted of qualitative and quantitative assessment of the risk impact (in terms of increased public dose) associated with a range of extended leakage rate test intervals. To supplement the NRC's rulemaking basis, NEI undertook a similar study. The results of that study are documented in Electric Power Research Institute (EPRI) Research Project TR-104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals."

The NRC report on performance-based leak testing, NUREG-1493, analyzed the effects of containment leakage on the health and safety of the public and the benefits realized from the containment leak rate testing. In that analysis, it was determined that for a representative PWR plant (i.e., Surry), that containment isolation failures contribute less than 0.1% to the latent risks from reactor accidents. Consequently, it is desirable to show that extending the ILRT interval will not lead to a substantial increase in risk from containment isolation failures for DCPP.

NEI 94-01 Revision 2-A contains a Safety Evaluation Report that supports using EPRI Report No. 1009325 Revision 2-A, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals," for performing risk impact assessments in support of ILRT extensions [Reference 24]. The Guidance provided in Appendix H of EPRI Report No. 1009325 Revision 2-A builds on the EPRI Risk Assessment methodology, EPRI TR-104285. This methodology is followed to determine the appropriate risk information for use in evaluating the impact of the proposed ILRT changes.

It should be noted that containment leak-tight integrity is also verified through periodic in-service

inspections conducted in accordance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI. More specifically, Subsection IWE provides the rules and requirements for in-service inspection of Class MC pressure-retaining components and their integral attachments, and of metallic shell and penetration liners of Class CC pressure-retaining components and their integral attachments in light-water cooled plants. Furthermore, NRC regulations 10 CFR 50.55a(b)(2)(ix)(E) require licensees to conduct visual inspections of the accessible areas of the interior of the containment. The associated change to NEI 94-01 will require that visual examinations be conducted during at least three other outages, and in the outage during which the ILRT is being conducted. These requirements will not be changed as a result of the extended ILRT interval. In addition, Appendix J, Type B local leak tests performed to verify the leak-tight integrity of containment penetration bellows, airlocks, seals, and gaskets are also not affected by the change to the Type A test frequency.

The acceptance guidelines in RG 1.174 are used to assess the acceptability of this permanent extension of the Type A test interval beyond that established during the Option B rulemaking of Appendix J. RG 1.174 defines very small changes in the risk-acceptance guidelines as increases in Core Damage Frequency (CDF) less than 10^{-6} per reactor year and increases in Large Early Release Frequency (LERF) less than 10^{-7} per reactor year. Since the Type A test does not impact CDF, the relevant criterion is the change in LERF. RG 1.174 also defines small changes in LERF as below 10^{-6} per reactor year. RG 1.174 discusses defense-in-depth and encourages the use of risk analysis techniques to help ensure and show that key principles, such as the defense-in-depth philosophy, are met. Therefore, the increase in the Conditional Containment Failure Probability (CCFP), which helps ensure the defense-in-depth philosophy is maintained, is also calculated.

Regarding CCFP, changes of up to 1.1% have been accepted by the NRC for the one-time requests for extension of ILRT intervals. In context, it is noted that a CCFP of 1/10 (10%) has been approved for application to evolutionary light water designs. Given these perspectives, a change in the CCFP of up to 1.5% is assumed to be small.

In addition, the total annual risk (person rem/year population dose) is examined to demonstrate the relative change in this parameter. While no acceptance guidelines for these additional figures of merit are published, examinations of NUREG-1493 and Safety Evaluation Reports (SER) for one-time interval extension (summarized in Appendix G of Reference 24) indicate a range of incremental increases in population dose that have been accepted by the NRC. The range of incremental population dose increases is from ≤0.01 to 0.2 person-rem/year and/or 0.002% to 0.46% of the total accident dose. The total doses for the spectrum of all accidents (NUREG-1493 [Reference 6], Figure 7-2) result in health effects that are at least two orders of magnitude less than the NRC Safety Goal Risk. Given these perspectives, a very small population dose is defined as an increase from the baseline interval (3 tests per 10 years) dose of ≤1.0 person-rem per year or 1% of the total baseline dose, whichever is less restrictive for the risk impact assessment of the proposed extended ILRT interval.

For those plants that credit containment overpressure for the mitigation of design basis accidents, a brief description of whether overpressure is required should be included in this section. In addition, if overpressure is included in the assessment, other risk metrics such as CDF should be described and reported.

3.0 REFERENCES

The following references were used in this calculation:

1. *Revision 3-A to Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J*, NEI 94-01, July 2012.
2. *Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals*, EPRI, Palo Alto, CA EPRI TR-104285, August 1994.
3. *Interim Guidance for Performing Risk Impact Assessments in Support of One-Time Extensions for Containment Integrated Leakage Rate Test Surveillance Intervals*, Revision 4, developed for NEI by EPRI and Data Systems and Solutions, October 2001.
4. An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis, Regulatory Guide 1.174, May 2011.
5. *Response to Request for Additional Information Concerning the License Amendment Request for a One-Time Integrated Leakage Rate Test Extension*, Letter from Mr. C. H. Cruse (Calvert Cliffs Nuclear Power Plant) to NRC Document Control Desk, Docket No. 50-317, March 27, 2002.
6. Performance-Based Containment Leak-Test Program, NUREG-1493, September 1995.
7. *Evaluation of Severe Accident Risks: Surry Unit 1*, Main Report NUREG/CR-4551, SAND86-1309, Volume 3, Revision 1, Part 1, October 1990.
8. Letter from R. J. Barrett (Entergy) to U. S. Nuclear Regulatory Commission, IPN-01-007, January 18, 2001.
9. 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. MB0178), April 17, 2001.
10. *Impact of Containment Building Leakage on LWR Accident Risk*, Oak Ridge National Laboratory, NUREG/CR-3539, ORNL/TM-8964, April 1984.
11. *Reliability Analysis of Containment Isolation Systems*, Pacific Northwest Laboratory, NUREG/CR-4220, PNL-5432, June 1985.
12. Technical Findings and Regulatory Analysis for Generic Safety Issue II.E.4.3 'Containment Integrity Check', NUREG-1273, April 1988.
13. *Review of Light Water Reactor Regulatory Requirements*, Pacific Northwest Laboratory, NUREG/CR-4330, PNL-5809, Volume 2, June 1986.
14. Shutdown Risk Impact Assessment for Extended Containment Leakage Testing Intervals Utilizing ORAM™, EPRI, Palo Alto, CA, TR-105189, Final Report, May 1995.
15. *Severe Accident Risks: An Assessment for Five U. S. Nuclear Power Plants*, NUREG-1150, December 1990.
16. United States Nuclear Regulatory Commission, Reactor Safety Study, WASH-1400, October 1975.
17. Calculation C.9, Revision 13, Diablo Canyon Power Plant, "Quantification of CDF and LERF for the DCPP PRA Model."
18. Email from Nathan R. Barber (PG&E, Diablo Canyon) to Matt Johnson, dated January 6, 2016, 7:40 AM, Fire PRA Numbers for ILRT Report.

19. ERIN Report No. C114140001-8420, "Level 3 PRA Consequence Analysis (MACCS2 MODEL) for Diablo Canyon Severe Accident Mitigation Alternatives (SAMA) Evaluation," December 2014.

20. Anthony R. Pietrangelo, One-time extensions of containment integrated leak rate test interval – additional information, NEI letter to Administrative Points of Contact, November 30, 2001.

21. Letter from J. A. Hutton (Exelon, Peach Bottom) to U. S. Nuclear Regulatory Commission, Docket No. 50-278, License No. DPR-56, LAR-01-00430, dated May 30, 2001.

22. *Risk Assessment for Joseph M. Farley Nuclear Plant Regarding ILRT (Type A) Extension Request*, prepared for Southern Nuclear Operating Co. by ERIN Engineering and Research, P0293010002-1929-030602, March 2002.

23. Letter from D. E. Young (Florida Power, Crystal River) to U. S. Nuclear Regulatory Commission, 3F0401-11, dated April 25, 2001.

24. *Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals*, Revision 2-A of 1009325, EPRI, Palo Alto, CA. 1018243, October 2008.

25. Risk Assessment for Vogtle Electric Generating Plant Regarding the ILRT (Type A) Extension Request, prepared for Southern Nuclear Operating Co. by ERIN Engineering and Research, February 2003.

26. Perspectives Gained from the IPEEE Program, USNRC, NUREG-1742, April 2002.

27. Calculation E.16, Revision 2, Diablo Canyon Power Plant, "DCPP PRA Success Criteria Notebook."

28. Letter L-14-121, ML14111A291, FENOC Evaluation of the Proposed Amendment, Beaver Valley Power Station, Unit Nos. 1 and 2, April 2014.

29. Technical Letter Report ML112070867, Containment Liner Corrosion Operating Experience Summary, Revision 1, August 2011.

30. Calculation PRA 01-07, Pacific Gas & Electric Company, "Risk Impact Assessment of Extending Containment Type A Test Interval," Revision 1, October 2011.

31. Armstrong, J., Simplified Level 2 Modeling Guidelines: WOG PROJECT: PA-RMSC-0088, Westinghouse, WCAP-16341-P, November 2005.

32. Calculation C.10, Revision 5, Diablo Canyon Power Plant, "DCPP PRA Model Technical Adequacy."

33. Transition Report, "Pacific Gas and Electric Company Diablo Canyon Power Plant Units 1 and 2 Docket 50-275 and 50-323: Transition to 10 CFR 50.48(c) - NFPA 805: Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition," June 2013.

34. Calculation N.2, Revision 1, Diablo Canyon Power Plant, "DCPP PRA Level 2 and Containment Event Tree Model."

35. Calculation G.2, Revision 7, Diablo Canyon Power Plant, "Human Action Analysis – Failure Likelihood and Range Factor Calculation."

4.0 ASSUMPTIONS AND LIMITATIONS

The following assumptions were used in the calculation:

- The technical adequacy of the DCPP PRA is either consistent with the requirements of Regulatory Guide 1.200 or where gaps exist, the gaps have been addressed, as is relevant to this ILRT interval extension, as detailed in Attachment 1.
- The DCPP CDF and LERF internal events PRA models provide representative results.
- It is appropriate to use the DCPP internal events PRA model to effectively describe the risk change attributable to the ILRT extension. An extensive sensitivity study is done in Section 5.3.1 to show the effect of including external event models for the ILRT extension. The Fire PRA (model DC03M) and Seismic PRA [Reference 17] are used for this sensitivity analysis.
- Accident classes describing radionuclide release end states are defined consistent with EPRI methodology [Reference 2].
- The representative containment leakage for Class 1 sequences is $1L_a$. Class 3 accounts for increased leakage due to Type A inspection failures.
- The representative containment leakage for Class 3a sequences is $10L_a$ based on the previously approved methodology performed for Indian Point Unit 3 [Reference 8, Reference 9].
- The representative containment leakage for Class 3b sequences is $100L_a$ based on the guidance provided in EPRI Report No. 1009325, Revision 2-A (EPRI 1018243) [Reference 24].
- The Class 3b can be very conservatively categorized as LERF based on the previously approved methodology [Reference 8, Reference 9].
- The impact on population doses from containment bypass scenarios is not altered by the proposed ILRT extension, but is accounted for in the EPRI methodology as a separate entry for comparison purposes. Since the containment bypass contribution to population dose is fixed, no changes in the conclusions from this analysis will result from this separate categorization.
- The reduction in ILRT frequency does not impact the reliability of containment isolation valves to close in response to a containment isolation signal.

5.0 METHODOLOGY AND ANALYSIS

5.1 Inputs

This section summarizes the general resources available as input (Section 5.1.1) and the plant specific resources required (Section 5.1.2).

5.1.1 General Resources Available

Various industry studies on containment leakage risk assessment are briefly summarized here:

1. NUREG/CR-3539 [Reference 10]
2. NUREG/CR-4220 [Reference 11]
3. NUREG-1273 [Reference 12]
4. NUREG/CR-4330 [Reference 13]
5. EPRI TR-105189 [Reference 14]
6. NUREG-1493 [Reference 6]
7. EPRI TR-104285 [Reference 2]
8. NUREG-1150 [Reference 15] and NUREG/CR-4551 [Reference 7]
9. NEI Interim Guidance [Reference 3, Reference 20]
10. Calvert Cliffs liner corrosion analysis [Reference 5]
11. EPRI Report No. 1009325, Revision 2-A (EPRI 1018243), Appendix H [Reference 24]

This first study is applicable because it provides one basis for the threshold that could be used in the Level 2 PRA for the size of containment leakage that is considered significant and is to be included in the model. The second study is applicable because it provides a basis of the probability for significant pre-existing containment leakage at the time of a core damage accident. The third study is applicable because it is a subsequent study to NUREG/CR-4220 that undertook a more extensive evaluation of the same database. The fourth study provides an assessment of the impact of different containment leakage rates on plant risk. The fifth study provides an assessment of the impact on shutdown risk from ILRT test interval extension. The sixth study is the NRC's cost-benefit analysis of various alternative approaches regarding extending the test intervals and increasing the allowable leakage rates for containment integrated and local leak rate tests. The seventh study is an EPRI study of the impact of extending ILRT and local leak rate test (LLRT) intervals on at-power public risk. The eighth study provides an ex-plant consequence analysis for a 50-mile radius surrounding a plant that is used as the basis for the consequence analysis of the ILRT interval extension for DCPP. The ninth study includes the NEI recommended methodology (promulgated in two letters) for evaluating the risk associated with obtaining a one-time extension of the ILRT interval. The tenth study addresses the impact of age-related degradation of the containment liners on ILRT evaluations. Finally, the eleventh study builds on the previous work and includes a recommended methodology and template for evaluating the risk associated with a permanent 15-year extension of the ILRT interval.

<u>NUREG/CR-3539 [Reference 10]</u>

Oak Ridge National Laboratory documented a study of the impact of containment leak rates on public risk in NUREG/CR-3539. This study uses information from WASH-1400 [Reference 16] as the basis for its risk sensitivity calculations. ORNL concluded that the impact of leakage rates on LWR accident risks is relatively small.

<u>NUREG/CR-4220 [Reference 11]</u>

NUREG/CR-4220 is a study performed by Pacific Northwest Laboratories for the NRC in 1985. The study reviewed over two thousand LERs, ILRT reports and other related records to

calculate the unavailability of containment due to leakage.

NUREG-1273 [Reference 12]

A subsequent NRC study, NUREG-1273, performed a more extensive evaluation of the NUREG/CR-4220 database. This assessment noted that about one-third of the reported events were leakages that were immediately detected and corrected. In addition, this study noted that local leak rate tests can detect "essentially all potential degradations" of the containment isolation system.

NUREG/CR-4330 [Reference 13]

NUREG/CR-4330 is a study that examined the risk impacts associated with increasing the allowable containment leakage rates. The details of this report have no direct impact on the modeling approach of the ILRT test interval extension, as NUREG/CR-4330 focuses on leakage rate and the ILRT test interval extension study focuses on the frequency of testing intervals. However, the general conclusions of NUREG/CR-4330 are consistent with NUREG/CR-3539 and other similar containment leakage risk studies:

"...the effect of containment leakage on overall accident risk is small since risk is dominated by accident sequences that result in failure or bypass of containment."

EPRI TR-105189 [Reference 14]

The EPRI study TR-105189 is useful to the ILRT test interval extension risk assessment because it provides insight regarding the impact of containment testing on shutdown risk. This study contains a quantitative evaluation (using the EPRI ORAM software) for two reference plants (a BWR-4 and a PWR) of the impact of extending ILRT and LLRT test intervals on shutdown risk. The conclusion from the study is that a small, but measurable, safety benefit is realized from extending the test intervals.

NUREG-1493 [Reference 6]

NUREG-1493 is the NRC's cost-benefit analysis for proposed alternatives to reduce containment leakage testing intervals and/or relax allowable leakage rates. The NRC conclusions are consistent with other similar containment leakage risk studies:

Reduction in ILRT frequency from 3 per 10 years to 1 per 20 years results in an "imperceptible" increase in risk.

Given the insensitivity of risk to the containment leak rate and the small fraction of leak paths detected solely by Type A testing, increasing the interval between integrated leak rate tests is possible with minimal impact on public risk.

EPRI TR-104285 [Reference 2]

Extending the risk assessment impact beyond shutdown (the earlier EPRI TR-105189 study), the EPRI TR-104285 study is a quantitative evaluation of the impact of extending ILRT and LLRT test intervals on at-power public risk. This study combined IPE Level 2 models with NUREG-1150 Level 3 population dose models to perform the analysis. The study also used the approach of NUREG-1493 in calculating the increase in pre-existing leakage probability due to extending the ILRT and LLRT test intervals.

EPRI TR-104285 uses a simplified Containment Event Tree to subdivide representative core damage frequencies into eight classes of containment response to a core damage accident:

1. Containment intact and isolated
2. Containment isolation failures dependent upon the core damage accident
3. Type A (ILRT) related containment isolation failures

4. Type B (LLRT) related containment isolation failures
5. Type C (LLRT) related containment isolation failures
6. Other penetration related containment isolation failures
7. Containment failures due to core damage accident phenomena
8. Containment bypass

Consistent with the other containment leakage risk assessment studies, this study concluded:

"...the proposed CLRT (Containment Leak Rate Tests) frequency changes would have a minimal safety impact. The change in risk determined by the analyses is small in both absolute and relative terms. For example, for the PWR analyzed, the change is about 0.04 person-rem per year..."

NUREG-1150 [Reference 15] and NUREG/CR-4551 [Reference 7]

NUREG-1150 and the technical basis, NUREG/CR-4551, provide an ex-plant consequence analysis for a spectrum of accidents including a severe accident with the containment remaining intact (i.e., Tech Spec Leakage). This ex-plant consequence analysis is calculated for the 50-mile radial area surrounding Surry. The ex-plant calculation can be delineated to total person-rem for each identified Accident Progression Bin (APB) from NUREG/CR-4551. With the DCPP Level 2 model end-states assigned to one of the NUREG/CR-4551 APBs, it is considered adequate to represent DCPP. (The meteorology and site differences other than population are assumed not to play a significant role in this evaluation.)

NEI Interim Guidance for Performing Risk Impact Assessments In Support of One-Time Extensions for Containment Integrated Leakage Rate Test Surveillance Intervals [Reference 3, Reference 20]

The guidance provided in this document builds on the EPRI risk impact assessment methodology [Reference 2] and the NRC performance-based containment leakage test program [Reference 6], and considers approaches utilized in various submittals, including Indian Point 3 (and associated NRC SER) and Crystal River.

Calvert Cliffs Response to Request for Additional Information Concerning the License Amendment for a One-Time Integrated Leakage Rate Test Extension [Reference 5]

This submittal to the NRC describes a method for determining the change in likelihood, due to extending the ILRT, of detecting liner corrosion, and the corresponding change in risk. The methodology was developed for Calvert Cliffs in response to a request for additional information regarding how the potential leakage due to age-related degradation mechanisms was factored into the risk assessment for the ILRT one-time extension. The Calvert Cliffs analysis was performed for a concrete cylinder and dome and a concrete basemat, each with a steel liner.

EPRI Report No. 1009325, Revision 2-A, Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals [Reference 24]

This report provides a generally applicable assessment of the risk involved in extension of ILRT test intervals to permanent 15-year intervals. Appendix H of this document provides guidance for performing plant-specific supplemental risk impact assessments and builds on the previous EPRI risk impact assessment methodology [Reference 2] and the NRC performance-based containment leakage test program [Reference 6], and considers approaches utilized in various submittals, including Indian Point 3 (and associated NRC SER) and Crystal River.

The approach included in this guidance document is used in the DCPP assessment to determine the estimated increase in risk associated with the ILRT extension. This document includes the bases for the values assigned in determining the probability of leakage for the EPRI Class 3a and 3b scenarios in this analysis, as described in Section 5.2.

5.1.2 Plant Specific Inputs

The plant-specific information used to perform the DCPP ILRT Extension Risk Assessment includes the following:

- Level 1 Model results [Reference 17]
- Release category definitions used in the Level 2 Model [Reference 19]
- Dose within a 50-mile radius [Reference 19]
- ILRT results to demonstrate adequacy of the administrative and hardware issues [Reference 30]

DCPP Model

The Internal Events PRA Model that is used for DCPP is characteristic of the as-built plant. The current Level 1 model (DCPP PRA Model Version DC03) [Reference 17] is a large event tree, small fault tree model. The Internal Flood CDF is 7.52E-6/year for Unit 1 and 5.45E-6/year for Unit 2, and the LERF is 4.19E-7/year for Unit 1 and 3.43E-7 for Unit 2 [Reference 17]. The total internal events CDF, including internal flooding, is 1.89E-5/year for Unit 1 and 1.69E-5/year for Unit 2, and the total LERF is 2.26E-6/year for Unit 1 and 2.18E-6 for Unit 2 [Reference 17]. Table 5-1 and Table 5-2 provide a summary of the Internal Events CDF and LERF results, respectively.

The total Fire CDF is 4.83E-5/year for Unit 1 and 5.24E-5/year for Unit 2; the total Fire LERF is 2.45E-6/year for Unit 1 and 2.17E-6/year for Unit 2 [Reference 18]. Refer to Section 5.3.1 for further details on external events as they pertain to this analysis.

Table 5-1 – Internal Events CDF (DCPP PRA Model Version DC03)

Internal Events	Frequency (per year)	
LOCA	3.77E-06	
Loss of ASW or CCW	2.63E-06	
Transient	2.35E-06	
SGTR	1.32E-06	
Loss of 480V Switchgear Ventilation	3.88E-07	
Loss of one 125V DC Bus	4.33E-07	
LOOP	3.53E-07	
Other	1.37E-07	
Flood	7.52E-06 (Unit 1)	5.45E-06 (Unit 2)
Total Internal Events CDF	1.89E-05 (Unit 1)	1.69E-05 (Unit 2)

Table 5-2 – Internal Events LERF (DCPP PRA Model Version DC03)		
Internal Events	**Frequency (per year)**	
LOCA	2.76E-07	
Loss of ASW or CCW	5.70E-08	
Transient	9.38E-08	
SGTR	1.31E-06	
Loss of 480V Switchgear Ventilation	5.15E-08	
Loss of one 125V DC Bus	1.10E-08	
LOOP	2.76E-08	
Other	1.47E-08	
Flood	4.19E-07 (Unit 1)	3.43E-07 (Unit 2)
Total Internal Events LERF	2.26E-06 (Unit 1)	2.18E-06 (Unit 2)

Population Dose Calculations

The population dose was calculated for the DCPP SAMA in Table 4.1-2 of Reference 19, which reports six release categories: ST1 (large early), ST2 (small early), ST3 (late), ST4 (bypass w/ AFW), ST5 (ISLOCA), and ST6 (intact). Class 1 frequency corresponds to ST6. Since Classes 2 and 7 do not have a release category that precisely matches, they conservatively correspond to ST1. Class 8 consists of interfacing system loss of coolant accident (ISLOCA) and steam generator tube rupture (SGTR) frequency. The ISLOCA frequency corresponds to ST5. Attachment 5 of Reference 17 presents the top 200 cutsets in the LERF model. Of the un-isolated SGTR sequences (SGTRN), 95% of them are release class RC17 and have AFW available; Table 3.2-4 of Reference 19 states ST4 is representative of RC17. Therefore, ST4 is the most representative for SGTR frequency. Table 5-3 presents dose exposures calculated from methodology described in Reference 1 and data from Reference 19. Class 3a and 3b population dose values are calculated from the Class 1 population dose and represented as $10L_a$ and $100L_a$, respectively, as guidance in Reference 1 dictates.

Table 5-3 – Population Dose

Accident Class	Description	Release (person-rem)
1	Containment Remains Intact	3.68E+03
2	Containment Isolation Failures	9.83E+06
3a	Independent or Random Isolation Failures SMALL	3.68E+04[1]
3b	Independent or Random Isolation Failures LARGE	3.68E+05[2]
4	Isolation Failure in which pre-existing leakage is not dependent on sequence progression. Type B test Failures	n/a
5	Isolation Failure in which pre-existing leakage is not dependent on sequence progression. Type C test Failures	n/a
6	Isolation Failure that can be verified by IST/IS or surveillance	n/a
7	Containment Failure induced by severe accident	9.83E+06
8	Accidents in which containment is by-passed	8.90E+05[3]

1. $10 * L_a$
2. $100 * L_a$
3. The Class 8 dose value differs from the value presented in Reference 19 because the dose is weighted based on frequency of the two Class 8 contributors: ISLOCA and SGTR.

Release Category Definitions

Table 5-4 defines the accident classes used in the ILRT extension evaluation, which is consistent with the EPRI methodology [Reference 2]. These containment failure classifications are used in this analysis to determine the risk impact of extending the Containment Type A test interval, as described in Section 5.2 of this report.

Table 5-4 – EPRI Containment Failure Classification [Reference 2]

Class	Description
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 L_a, under Appendix J for that plant.
2	Containment isolation failures (as reported in the Individual Plant Examinations) including those accidents in which there is a failure to isolate the containment.
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.
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.
5	Independent (or random) isolation failures including 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 test and their potential failures.
6	Containment isolation failures including those leak paths covered in the plant test and maintenance requirements or verified per in-service inspection and testing (ISI/IST) program.
7	Accidents involving containment failure induced by severe accident phenomena. Changes in Appendix J testing requirements do not impact these accidents.
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 impact these accidents.

5.1.3 Impact of Extension on Detection of Component Failures that Lead to Leakage (Small and Large)

The ILRT can detect a number of component failures such as liner breach, failure of certain bellows arrangements, and failure of some sealing surfaces, which can lead to leakage. The proposed ILRT test interval extension may influence the conditional probability of detecting these types of failures. To ensure that this effect is properly addressed, the EPRI Class 3 accident class, as defined in Table 5-3, is divided into two sub-classes, Class 3a and Class 3b, representing small and large leakage failures respectively.

The probability of the EPRI Class 3a and Class 3b failures is determined consistent with the EPRI Guidance [Reference 24]. For Class 3a, the probability is based on the maximum likelihood estimate of failure (arithmetic average) from the available data (i.e., 2 "small" failures in 217 tests leads to "large" failures in 217 tests (i.e., 2 / 217 = 0.0092). For Class 3b, the probability is based on the Jeffreys non-informative prior (i.e., 0.5 / 218 = 0.0023).

In a follow-up letter [Reference 20] to their ILRT guidance document [Reference 3], NEI issued additional information concerning the potential that the calculated delta LERF values for several plants may fall above the "very small change" guidelines of the NRC Regulatory Guide 1.174 [Reference 4]. This additional NEI information includes a discussion of conservatisms in the quantitative guidance for ΔLERF. NEI describes ways to demonstrate that, using plant-specific calculations, the ΔLERF is smaller than that calculated by the simplified method.

The supplemental information states:
The methodology employed for determining LERF (Class 3b frequency) involves conservatively multiplying the CDF by the failure probability for this class (3b) of accident. This was done for simplicity and to maintain conservatism. However, some plant-specific accident classes leading to core damage are likely to include individual sequences that either may already (independently) cause a LERF or could never cause a LERF, and are thus not associated with a postulated large Type A containment leakage path (LERF). These contributors can be removed from Class 3b in the evaluation of LERF by multiplying the Class 3b probability by only that portion of CDF that may be impacted by Type A leakage.

The application of this additional guidance to the analysis for DCPP, as detailed in Section 5.2, involves subtracting the LERF from the CDF that is applied to Class 3b. To be consistent, the same change is made to the Class 3a CDF, even though these events are not considered LERF.

Consistent with the NEI Guidance [Reference 3], the change in the leak detection probability can be estimated by comparing the average time that a leak could exist without detection. For example, the average time that a leak could go undetected with a three-year test interval is 1.5 years (3 years / 2), and the average time that a leak could exist without detection for a ten-year interval is 5 years (10 years / 2). This change would lead to a non-detection probability that is a factor of 3.33 (5.0/1.5) higher for the probability of a leak that is detectable only by ILRT testing. Correspondingly, an extension of the ILRT interval to 15 years can be estimated to lead to a factor of 5 ((15/2)/1.5) increase in the non-detection probability of a leak.

It should be noted that using the methodology discussed above is very conservative compared to previous submittals (e.g., the IP3 request for a one-time ILRT extension that was approved by the NRC [Reference 9]) because it does not factor in the possibility that the failures could be detected by other tests (e.g., the Type B local leak rate tests that will still occur). Eliminating this possibility conservatively over-estimates the factor increases attributable to the ILRT extension.

5.2 Analysis

The application of the approach based on the guidance contained in EPRI Report No. 1009325, Revision 2-A, Appendix H [Reference 24], EPRI TR-104285 [Reference 2] and previous risk assessment submittals on this subject [References 5, 8, 21, 22, and 23] have led to the following results. The results are displayed according to the eight accident classes defined in the EPRI report, as described in Table 5-5.

The analysis performed examined DCPP-specific accident sequences in which the containment remains intact or the containment is impaired. Specifically, the breakdown of the severe accidents, contributing to risk, was considered in the following manner:

- Core damage sequences in which the containment remains intact initially and in the long term (EPRI TR-104285, Class 1 sequences [Reference 2]).
- Core damage sequences in which containment integrity is impaired due to random isolation failures of plant components other than those associated with Type B or Type C test components. For example, liner breach or bellow leakage (EPRI TR-104285, Class 3 sequences [Reference 2]).
- Accident sequences involving containment bypassed (EPRI TR-104285, Class 8 sequences [Reference 2]), large containment isolation failures (EPRI TR-104285, Class 2 sequences [Reference 2]), and small containment isolation "failure-to-seal" events (EPRI TR-104285, Class 4 and 5 sequences [Reference 2]) are accounted for in this

evaluation as part of the baseline risk profile. However, they are not affected by the ILRT frequency change.

- Class 4 and 5 sequences are impacted by changes in Type B and C test intervals; therefore, changes in the Type A test interval do not impact these sequences.

Table 5-5 – EPRI Accident Class Definitions

Accident Classes (Containment Release Type)	Description
1	No Containment Failure
2	Large Isolation Failures (Failure to Close)
3a	Small Isolation Failures (Liner Breach)
3b	Large Isolation Failures (Liner Breach)
4	Small Isolation Failures (Failure to Seal – Type B)
5	Small Isolation Failures (Failure to Seal – Type C)
6	Other Isolation Failures (e.g., Dependent Failures)
7	Failures Induced by Phenomena (Early and Late)
8	Bypass (Interfacing System LOCA)
CDF	All CET End States (Including Very Low and No Release)

The steps taken to perform this risk assessment evaluation are as follows:

Step 1 - Quantify the baseline risk in terms of frequency per reactor year for each of the accident classes presented in Table 5-5.

Step 2 - Develop plant-specific person-rem dose (population dose) per reactor year for each of the eight accident classes.

Step 3 - Evaluate risk impact of extending Type A test interval from 3 in 10 years to 1 in 15 years and 1 in 10 years to 1 in 15 years.

Step 4 - Determine the change in risk in terms of Large Early Release Frequency (LERF) in accordance with RG 1.174 [Reference 4].

Step 5 - Determine the impact on the Conditional Containment Failure Probability (CCFP).

5.2.1 Step 1 – Quantify the Baseline Risk in Terms of Frequency per Reactor Year

As previously described, the extension of the Type A interval does not influence those accident progressions that involve large containment isolation failures, Type B or Type C testing, or containment failure induced by severe accident phenomena.

For the assessment of ILRT impacts on the risk profile, the potential for pre-existing leaks is included in the model. (These events are represented by the Class 3 sequences in EPRI TR-104285 [Reference 2].) The question on containment integrity was modified to include the probability of a liner breach or bellows failure (due to excessive leakage) at the time of core damage. Two failure modes were considered for the Class 3 sequences. These are Class 3a (small breach) and Class 3b (large breach).

The frequencies for the severe accident classes defined in Table 5-5 were developed for DCPP by first determining the frequencies for Classes 1, 2, 6, 7, and 8. Table 5-6 presents the grouping of each release category in EPRI Classes based on the associated description. Table 5-7 presents the frequency and EPRI category for each sequence and the totals of each EPRI

classification. Table 5-8 provides a summary of the accident sequence frequencies that can lead to radionuclide release to the public and have been derived consistent with the definitions of accident classes defined in EPRI TR-104285 [Reference 2], the NEI Interim Guidance [Reference 3], and guidance provided in EPRI Report No. 1009325, Revision 2-A [Reference 24]. Adjustments were made to the Class 3b and hence Class 1 frequencies to account for the impact of undetected corrosion of the steel liner per the methodology described in Section 5.2.6. Note: calculations were performed with more digits than shown in this section. Therefore, minor differences may occur if the calculations in these sections are followed explicitly.

Class 3 Sequences. This group consists of all core damage accident progression bins for which a pre-existing leakage in the containment structure (e.g., containment liner) exists that can only be detected by performing a Type A ILRT. The probability of leakage detectable by a Type A ILRT is calculated to determine the impact of extending the testing interval. The Class 3 calculation is divided into two classes: Class 3a is defined as a small liner breach (L_a < leakage < $10L_a$), and Class 3b is defined as a large liner breach ($10L_a$ < leakage < $100L_a$).

Data reported in EPRI 1009325, Revision 2-A [Reference 24] states that two events could have been detected only during the performance of an ILRT and thus impact risk due to change in ILRT frequency. There were a total of 217 successful ILRTs during this data collection period. Therefore, the probability of leakage is determined for Class 3a as shown in the following equation:

$$P_{class3a} = \frac{2}{217} = 0.0092$$

Multiplying the CDF by the probability of a Class 3a leak yields the Class 3a frequency contribution in accordance with guidance provided in Reference 24. As described in Section 5.1.3, additional consideration is made to not apply failure probabilities on those cases that are already LERF scenarios. Therefore, LERF contributions from CDF are removed. The frequency of a Class 3a failure is calculated by the following equation:

$$Freq_{U1class3a} = P_{class3a} * (CDF_{U1} - LERF_{U1}) = \frac{2}{217} * (1.89\text{E-}5 - 2.26\text{E-}6) = 1.54\text{E-}7$$

$$Freq_{U2class3a} = P_{class3a} * (CDF_{U2} - LERF_{U2}) = \frac{2}{217} * (1.69\text{E-}5 - 2.18\text{E-}6) = 1.35\text{E-}7$$

In the database of 217 ILRTs, there are zero containment leakage events that could result in a large early release. Therefore, the Jeffreys non-informative prior is used to estimate a failure rate and is illustrated in the following equations:

$$\text{Jeffreys Failure Probability} = \frac{Number\ of\ Failures + 1/2}{Number\ of\ Tests + 1}$$

$$P_{class3b} = \frac{0 + 1/2}{217 + 1} = 0.0023$$

The frequency of a Class 3b failure is calculated by the following equation:

$$Freq_{U1class3b} = P_{class3b} * (CDF_{U1} - LERF_{U1}) = \frac{.5}{218} * (1.89\text{E-}5 - 2.26\text{E-}6) = 3.82\text{E-}8$$

$$Freq_{U2class3b} = P_{class3b} * (CDF_{U2} - LERF_{U2}) = \frac{.5}{218} * (1.69\text{E-}5 - 2.18\text{E-}6) = 3.36\text{E-}8$$

For this analysis, the associated containment leakage for Class 3a is $10L_a$ and for Class 3b is $100L_a$. These assignments are consistent with the guidance provided in Reference 24.

Class 1 Sequences. This group consists of all core damage accident progression bins for which the containment remains intact (modeled as Technical Specification Leakage). Since the PRA model does not contain a Level 2 model, Class 1 is calculated as CDF – LERF. This

overestimates the Intact frequency, which is conservative for this analysis because it leads to a higher calculated change in risk due to extending the ILRT frequency. The frequency per year is initially determined from the EPRI Accident Class 1 frequency listed in Table 5-7 and then subtracting the EPRI Class 3a and 3b frequency (to preserve total CDF), calculated below:

$$Freq_{class1} = Freq_{class1} - (Freq_{class3a} - Freq_{class3b})$$

Class 2 Sequences. This group consists of core damage accident progression bins with large containment isolation failures. This is determined from Section C.9.8.7 of Reference 17, which states that containment isolation failure contributes 8% of internal event LERF (1.84E-6). Therefore, the Class 2 contribution is 1.47E-7. The frequency per year for these sequences is obtained from the EPRI Accident Class 2 frequency listed in Table 5-7.

Class 4 Sequences. This group consists of all core damage accident progression bins for which containment isolation failure-to-seal of Type B test components occurs. Because these failures are detected by Type B tests which are unaffected by the Type A ILRT, this group is not evaluated any further in the analysis, consistent with approved methodology.

Class 5 Sequences. This group consists of all core damage accident progression bins for which a containment isolation failure-to-seal of Type C test components occurs. Because the failures are detected by Type C tests which are unaffected by the Type A ILRT, this group is not evaluated any further in this analysis, consistent with approved methodology.

Class 6 Sequences. These are sequences that involve core damage accident progression bins for which a failure-to-seal containment leakage due to failure to isolate the containment occurs. These sequences are dominated by misalignment of containment isolation valves following a test/maintenance evolution. All other failure modes are bounded by the Class 2 assumptions. This accident class is also not evaluated further.

Class 7 Sequences. This group consists of all core damage accident progression bins in which containment failure is induced by severe accident phenomena (e.g., overpressure). This frequency is calculated by subtracting the Class 1, 2, and 8 frequencies from the total CDF. For this analysis, the frequency is determined from the EPRI Accident Class 7 frequency listed in Table 5-7.

Class 8 Sequences. This group consists of all core damage accident progression bins in which ISLOCA or SGTR occur, which contribute 3.06E-8 and 1.32E-6, respectively. Frequencies are shown in Table 5-6. For this analysis, the total Class 8 frequency is listed in Table 5-7.

Table 5-6 – Release Category Frequencies

Containment End State	EPRI Category	Unit 1 Frequency (/yr)	Unit 2 Frequency (/yr)
Intact Containment	1	1.67E-05	1.47E-05
Large Isolation Failure	2	1.47E-07	1.47E-07
Failures Induced by Phenomena	7	7.61E-07	6.85E-07
ISLOCA	8	3.06E-08	3.06E-08
SGTR	8	1.32E-06	1.32E-06

Table 5-7 – Accident Class Frequencies

EPRI Category	Unit 1 Frequency (/yr)	Unit 2 Frequency (/yr)
Class 1	1.67E-05	1.47E-05
Class 2	1.47E-07	1.47E-07
Class 6	N/A – Included in Class 2	
Class 7	7.61E-07	6.85E-07
Class 8	1.35E-06	1.35E-06
Total (CDF)	1.89E-05	1.69E-05

Table 5-8 – Baseline Risk Profile

Class	Description	Unit 1 Frequency (/yr)	Unit 2 Frequency (/yr)
1	No containment failure	1.65E-05[2]	1.45E-05[2]
2	Large containment isolation failures	1.47E-07	1.47E-07
3a	Small isolation failures (liner breach)	1.54E-07	1.35E-07
3b	Large isolation failures (liner breach)	3.82E-08	3.36E-08
4	Small isolation failures - failure to seal (type B)	ε[1]	ε[1]
5	Small isolation failures - failure to seal (type C)	ε[1]	ε[1]
6	Containment isolation failures (dependent failure, personnel errors)	ε[1]	ε[1]
7	Severe accident phenomena induced failure (early and late)	7.61E-07	6.85E-07
8	Containment bypass	1.35E-06	1.35E-06
	Total	1.89E-05	1.69E-05

1. ε represents a probabilistically insignificant value or a Class that is unaffected by the Type A ILRT.
2. The Class 3a and 3b frequencies are subtracted from Class 1 to preserve total CDF.

5.2.2 Step 2 – Develop Plant-Specific Person-Rem Dose (Population Dose)

Plant-specific release analyses were performed to estimate the person-rem doses to the population within a 50-mile radius from the plant. The releases are based on DCPP-specific dose calculations summarized in Table 5-3. Table 5-3 provides a correlation of DCPP population dose to EPRI Accident Class. Table 5-10 provides population dose for each EPRI accident class.

The population dose for EPRI Accident Classes 3a and 3b were calculated based on the guidance provided in EPRI Report No. 1009325, Revision 2-A [Reference 24] as follows:

$$EPRI\ Class\ 3a\ Population\ Dose = 10 * 3.68E{+}3 = 3.68E{+}4$$

$$EPRI\ Class\ 3b\ Population\ Dose = 100 * 3.68E{+}3 = 3.68E{+}5$$

Table 5-9 – Mapping of Population Dose to EPRI Accident Class

EPRI Category	Unit 1 Frequency (/yr)	Unit 2 Frequency (/yr)	Dose (person-rem)
Class 1	1.67E-05	1.47E-05	3.68E+03
Class 2	1.47E-07	1.47E-07	9.83E+06
Class 6	N/A – Included in Class 2		
Class 7	7.61E-07	6.85E-07	9.83E+06
Class 8	1.35E-06	1.35E-06	8.90E+05[1]

1. The Class 8 dose value differs from the value presented in Reference 19 because the dose is weighted based on frequency of the two Class 8 contributors: ISLOCA and SGTR.

Table 5-10 – Baseline Population Doses

Class	Description	Population Dose (person-rem)
1	No containment failure	3.68E+03
2	Large containment isolation failures	9.83E+06
3a	Small isolation failures (liner breach)	3.68E+04[1]
3b	Large isolation failures (liner breach)	3.68E+05[2]
4	Small isolation failures - failure to seal (type B)	N/A
5	Small isolation failures - failure to seal (type C)	N/A
6	Containment isolation failures (dependent failure, personnel errors)	N/A
7	Severe accident phenomena induced failure (early and late)	9.83E+06
8	Containment bypass	8.90E+05[3]

1. $10{*}L_a$
2. $100{*}L_a$
3. The Class 8 dose value differs from the value presented in Reference 19 because the dose is weighted based on frequency of the two Class 8 contributors: ISLOCA and SGTR.

5.2.3 Step 3 – Evaluate Risk Impact of Extending Type A Test Interval from 10 to 15 Years

The next step is to evaluate the risk impact of extending the test interval from its current 10-year interval to a 15-year interval. To do this, an evaluation must first be made of the risk associated with the 10-year interval, since the base case applies to 3-year interval (i.e., a simplified representation of a 3-to-10 interval).

Risk Impact Due to 10-Year Test Interval

As previously stated, Type A tests impact only Class 3 sequences. For Class 3 sequences, the release magnitude is not impacted by the change in test interval (a small or large breach remains the same, even though the probability of not detecting the breach increases). Thus, only the frequency of Class 3a and Class 3b sequences is impacted. The risk contribution is changed based on the NEI guidance as described in Section 5.1.3 by a factor of 10/3 compared to the base case values. The Class 3a and 3b frequencies are calculated as follows:

$$Freq_{U1Class3a10yr} = \frac{10}{3} * \frac{2}{217} * (CDF - LERF) = \frac{10}{3} * \frac{2}{217} * 1.67\text{E-}5 = 5.12\text{E-}7$$

$$Freq_{U2Class3a10yr} = \frac{10}{3} * \frac{2}{217} * (CDF - LERF) = \frac{10}{3} * \frac{2}{217} * 1.47\text{E-}5 = 4.51\text{E-}7$$

$$Freq_{U1Class3b10yr} = \frac{10}{3} * \frac{.5}{218} * (CDF - LERF) = \frac{10}{3} * \frac{.5}{218} * 1.67\text{E-}5 = 1.27\text{E-}7$$

$$Freq_{U2Class3b10yr} = \frac{10}{3} * \frac{.5}{218} * (CDF - LERF) = \frac{10}{3} * \frac{.5}{218} * 1.47\text{E-}5 = 1.12\text{E-}7$$

The results of the calculation for a 10-year interval are presented in Table 5-11 for Unit 1 and Table 5-12 for Unit 2.

Table 5-11 – Unit 1 Risk Profile for Once in 10 Year ILRT

Class	Description	Frequency (/yr)	Contribution (%)	Population Dose (person-rem)	Population Dose Rate (person-rem/yr)
1	No containment failure[2]	1.60E-05	84.68%	3.68E+03	5.90E-02
2	Large containment isolation failures	1.47E-07	0.78%	9.83E+06	1.45E+00
3a	Small isolation failures (liner breach)	5.12E-07	2.71%	3.68E+04	1.88E-02
3b	Large isolation failures (liner breach)	1.27E-07	0.67%	3.68E+05	4.69E-02
4	Small isolation failures - failure to seal (type B)	ε[1]	ε[1]	ε[1]	ε[1]
5	Small isolation failures - failure to seal (type C)	ε[1]	ε[1]	ε[1]	ε[1]
6	Containment isolation failures (dependent failure, personnel errors)	ε[1]	ε[1]	ε[1]	ε[1]
7	Severe accident phenomena induced failure (early and late)	7.61E-07	4.02%	9.83E+06	7.48E+00
8	Containment bypass	1.35E-06	7.14%	8.90E+05	1.20E+00
	Total	1.89E-05			1.03E+01

1. ε represents a probabilistically insignificant value or a Class that is unaffected by the Type A ILRT.
2. The Class 1 frequency is reduced by the frequency of Class 3a and Class 3b in order to preserve total CDF.

Table 5-12 – Unit 2 Risk Profile for Once in 10 Year ILRT

Class	Description	Frequency (/yr)	Contribution (%)	Population Dose (person-rem)	Population Dose Rate (person-rem/yr)
1	No containment failure[2]	1.41E-05	83.70%	3.68E+03	5.19E-02
2	Large containment isolation failures	1.47E-07	0.87%	9.83E+06	1.45E+00
3a	Small isolation failures (liner breach)	4.51E-07	2.67%	3.68E+04	1.66E-02
3b	Large isolation failures (liner breach)	1.12E-07	0.67%	3.68E+05	4.13E-02
4	Small isolation failures - failure to seal (type B)	ε[1]	ε[1]	ε[1]	ε[1]
5	Small isolation failures - failure to seal (type C)	ε[1]	ε[1]	ε[1]	ε[1]
6	Containment isolation failures (dependent failure, personnel errors)	ε[1]	ε[1]	ε[1]	ε[1]
7	Severe accident phenomena induced failure (early and late)	6.85E-07	4.07%	9.83E+06	6.74E+00
8	Containment bypass	1.35E-06	8.02%	8.90E+05	1.20E+00
	Total	1.69E-05			9.49E+00

1. ε represents a probabilistically insignificant value or a Class that is unaffected by the Type A ILRT.
2. The Class 1 frequency is reduced by the frequency of Class 3a and Class 3b in order to preserve total CDF.

<u>Risk Impact Due to 15-Year Test Interval</u>

The risk contribution for a 15-year interval is calculated in a manner similar to the 10-year interval. The difference is in the increase in probability of leakage in Classes 3a and 3b. For this case, the value used in the analysis is a factor of 5 compared to the 3-year interval value, as described in Section 5.1.3. The Class 3a and 3b frequencies are calculated as follows:

$$Freq_{U1Class3a15yr} = \frac{15}{3} * \frac{2}{217} * (CDF - LERF) = 5 * \frac{2}{217} * 1.67\text{E-}5 = 7.68\text{E-}7$$

$$Freq_{U2Class3a15yr} = \frac{15}{3} * \frac{2}{217} * (CDF - LERF) = 5 * \frac{2}{217} * 1.47\text{E-}5 = 6.76\text{E-}7$$

$$Freq_{U1Class3b15yr} = \frac{15}{3} * \frac{.5}{218} * (CDF - LERF) = 5 * \frac{.5}{218} * 1.67\text{E-}5 = 1.91\text{E-}7$$

$$Freq_{U2Class3b15yr} = \frac{15}{3} * \frac{.5}{218} * (CDF - LERF) = 5 * \frac{.5}{218} * 1.47\text{E-}5 = 1.68\text{E-}7$$

The results of the calculation for a 15-year interval are presented in Table 5-13 for Unit 1 and Table 5-14 for Unit 2.

Table 5-13 – Unit 1 Risk Profile for Once in 15 Year ILRT

Class	Description	Frequency (/yr)	Contribution (%)	Population Dose (person-rem)	Population Dose Rate (person-rem/yr)
1	No containment failure[2]	1.57E-05	82.99%	3.68E+03	5.78E-02
2	Large containment isolation failures	1.47E-07	0.78%	9.83E+06	1.45E+00
3a	Small isolation failures (liner breach)	7.68E-07	4.06%	3.68E+04	2.83E-02
3b	Large isolation failures (liner breach)	1.91E-07	1.01%	3.68E+05	7.03E-02
4	Small isolation failures - failure to seal (type B)	ε[1]	ε[1]	ε[1]	ε[1]
5	Small isolation failures - failure to seal (type C)	ε[1]	ε[1]	ε[1]	ε[1]
6	Containment isolation failures (dependent failure, personnel errors)	ε[1]	ε[1]	ε[1]	ε[1]
7	Severe accident phenomena induced failure (early and late)	7.61E-07	4.02%	9.83E+06	7.48E+00
8	Containment bypass	1.35E-06	7.14%	8.90E+05	1.20E+00
	Total	1.89E-05			1.03E+01

1. ε represents a probabilistically insignificant value or a Class that is unaffected by the Type A ILRT.
2. The Class 1 frequency is reduced by the frequency of Class 3a and Class 3b in order to preserve total CDF.

Table 5-14 – Unit 2 Risk Profile for Once in 15 Year ILRT

Class	Description	Frequency (/yr)	Contribution (%)	Population Dose (person-rem)	Population Dose Rate (person-rem/yr)
1	No containment failure[2]	1.38E-05	82.04%	3.68E+03	5.09E-02
2	Large containment isolation failures	1.47E-07	0.87%	9.83E+06	1.45E+00
3a	Small isolation failures (liner breach)	6.76E-07	4.01%	3.68E+04	2.49E-02
3b	Large isolation failures (liner breach)	1.68E-07	1.00%	3.68E+05	6.19E-02
4	Small isolation failures - failure to seal (type B)	ε[1]	ε[1]	ε[1]	ε[1]
5	Small isolation failures - failure to seal (type C)	ε[1]	ε[1]	ε[1]	ε[1]
6	Containment isolation failures (dependent failure, personnel errors)	ε[1]	ε[1]	ε[1]	ε[1]
7	Severe accident phenomena induced failure (early and late)	6.85E-07	4.07%	9.83E+06	6.74E+00
8	Containment bypass	1.35E-06	8.02%	8.90E+05	1.20E+00
	Total	1.69E-05			9.52E+00

1. ε represents a probabilistically insignificant value or a Class that is unaffected by the Type A ILRT.
2. The Class 1 frequency is reduced by the frequency of Class 3a and Class 3b in order to preserve total CDF.

5.2.4 Step 4 – Determine the Change in Risk in Terms of LERF

The risk increase 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 an intact containment could, in fact, result in a larger release due to the increase in probability of failure to detect a pre-existing leak. With strict adherence to the EPRI guidance, 100% of the Class 3b contribution would be considered LERF.

Regulatory Guide 1.174 [Reference 4] provides guidance for determining the risk impact of plant-specific changes to the licensing basis. RG 1.174 [Reference 4] defines very small changes in risk as resulting in increases of CDF less than 10^{-6}/year and increases in LERF less than 10^{-7}/year, and small changes in LERF as less than 10^{-6}/year. Since containment overpressure is not required in support of ECCS performance to mitigate design basis accidents at DCPP, the ILRT extension does not impact CDF. Therefore, the relevant risk-impact metric is LERF.

For DCPP, 100% of the frequency of Class 3b sequences can be used as a very conservative first-order estimate to approximate the potential increase in LERF from the ILRT interval extension (consistent with the EPRI guidance methodology). Based on a 10-year test interval from Table 5-11 and Table 5-12, the Class 3b frequency is 1.27E-07/year for Unit 1 and 1.12E-07/year for Unit 2; based on a 15-year test interval from Table 5-13 and Table 5-14, the Class 3b frequency is 1.91E-07/year for Unit 1 and 1.68E-07/year for Unit 2. Thus, the increase in the overall probability of LERF due to Class 3b sequences that is due to increasing the ILRT test interval from 3 to 15 years is 1.53E-07/year for Unit 1 and 1.35E-07/year for Unit 2. Similarly, the increase due to increasing the interval from 10 to 15 years is 6.37E-08/year for Unit 1 and 5.61E-08/year for Unit 2. As can be seen, even with the conservatisms included in the evaluation (per the EPRI methodology), the estimated change in LERF is within the criteria for a small change when comparing the 15-year results to the current 10-year requirement and the original 3-year requirement. Table 5-15 summarizes these results.

Table 5-15 – Impact on LERF due to Extended Type A Testing Intervals

ILRT Inspection Interval	Unit 1: 3 Years (baseline)	Unit 1: 10 Years	Unit 1: 15 Years	Unit 2: 3 Years (baseline)	Unit 2: 10 Years	Unit 2: 15 Years
Class 3b (Type A LERF)	3.82E-08	1.27E-07	1.91E-07	3.36E-08	1.12E-07	1.68E-07
ΔLERF (3 year baseline)		8.92E-08	1.53E-07		7.85E-08	1.35E-07
ΔLERF (10 year baseline)			6.37E-08			5.61E-08

The increase in the overall probability of LERF due to Class 3b sequences is greater than 10^{-7}. As stated in RG 1.174 [Reference 4], "When the calculated increase in LERF is in the range of 10^{-7} per reactor year to 10^{-6} per reactor year, applications will be considered only if it can be reasonably shown that the total LERF is less than 10^{-5} per reactor year." Baseline LERF (excluding external events) is 2.26E-06/year for Unit 1 and 2.18E-06/year for Unit 2. Therefore, there is significant margin for both the ΔLERF and baseline LERF to the upper limits of Region II in RG 1.174 [Reference 4].

5.2.5 Step 5 – Determine the Impact on the Conditional Containment Failure Probability

Another parameter that the NRC guidance in RG 1.174 [Reference 4] states can provide input into the decision-making process is the change in the conditional containment failure probability

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

$$CCFP = 1 - \frac{f(ncf)}{CDF}$$

where *f*(ncf) is the frequency of those sequences that do not result in containment failure; this frequency is determined by summing the Class 1 and Class 3a results [Reference 24]. Table 5-16 shows the steps and results of this calculation. The difference in CCFP between the 3-year test interval and 15-year test interval is 0.808% for Unit 1 and 0.799% for Unit 2.

Table 5-16 – Impact on CCFP due to Extended Type A Testing Intervals

ILRT Inspection Interval	Unit 1: 3 Years (baseline)	Unit 1: 10 Years	Unit 1: 15 Years	Unit 2: 3 Years (baseline)	Unit 2: 10 Years	Unit 2: 15 Years
f(ncf) (/yr)	1.66E-05	1.65E-05	1.65E-05	1.46E-05	1.46E-05	1.45E-05
f(ncf)/CDF	87.9%	87.4%	87.1%	86.8%	86.4%	86.0%
CCFP	12.14%	12.61%	12.95%	13.16%	13.62%	13.95%
ΔCCFP (3 year baseline)		0.471%	0.808%		0.466%	0.799%
ΔCCFP (10 year baseline)			0.337%			0.333%

As stated in Section 2.0, a change in the CCFP of up to 1.5% is assumed to be small. The increase in the CCFP from the 3 in 10 year interval to 1 in 15 year interval is 0.808% for Unit 1 and 0.799% for Unit 2. Therefore, this increase is judged to be very small.

5.2.6 Impact of Extension on Detection of Steel Liner Corrosion that Leads to Leakage

An estimate of the likelihood and risk implications of corrosion-induced leakage of the steel liners occurring and going undetected during the extended test interval is evaluated using a methodology similar to the Calvert Cliffs liner corrosion analysis [Reference 5]. The Calvert Cliffs analysis was performed for a concrete cylinder and dome and a concrete basemat, each with a steel liner.

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

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

<u>Assumptions</u>

- Consistent with the Calvert Cliffs analysis, a half failure is assumed for basemat concealed liner corrosion due to the lack of identified failures (See Table 5-17, Step 1).
- The two corrosion events used to estimate the liner flaw probability in the Calvert Cliffs previous analysis are assumed to still be applicable.
- Consistent with the Calvert Cliffs analysis, the estimated historical flaw probability is also

limited to 5.5 years to reflect the years since September 1996 when 10 CFR 50.55a started requiring visual inspection. Additional success data was not used to limit the aging impact of this corrosion issue, even though inspections were being performed prior to this date (and have been performed since the time frame of the Calvert Cliffs analysis) (See Table 5-4, Step 1).

- Consistent with the Calvert Cliffs analysis, the steel liner flaw likelihood is assumed to double every five years. This is based solely on judgment and is included in this analysis to address the increased likelihood of corrosion as the steel liner ages (See Table 5-17, Steps 2 and 3). Sensitivity studies are included that address doubling this rate every ten years and every two years.
- In the Calvert Cliffs analysis, the likelihood of the containment atmosphere reaching the outside atmosphere, given that a liner flaw exists, was estimated as 1.1% for the cylinder and dome, and 0.11% (10% of the cylinder failure probability) for the basemat. These values were determined from an assessment of the probability versus containment pressure. For DCPP, the containment design pressure is 47 psig [Reference 27]. Probabilities of 1% for the cylinder and dome, and 0.1% for the basemat are used in this analysis, and sensitivity studies are included in Section 5.3.2 (See Table 5-17, Step 4).
- Consistent with the Calvert Cliffs analysis, the likelihood of leakage escape (due to crack formation) in the basemat region is considered to be less likely than the containment cylinder and dome region (See Table 5-17, Step 4).
- Consistent with the Calvert Cliffs analysis, a 5% visual inspection detection failure likelihood given the flaw is visible and a total detection failure likelihood of 10% is used. To date, all liner corrosion events have been detected through visual inspection (See Table 5-17, Step 5).
- Consistent with the Calvert Cliffs analysis, all non-detectable containment failures are assumed to result in early releases. This approach avoids a detailed analysis of containment failure timing and operator recovery actions.

Table 5-17 – Steel Liner Corrosion Base Case

Step	Description	Containment Cylinder and Dome (85%)		Containment Basemat (15%)	
1	Historical liner flaw likelihood Failure data: containment location specific Success data: based on 70 steel-lined containments and 5.5 years since the 10CFR 50.55a requirements of periodic visual inspections of containment surfaces	Events: 2 (Brunswick 2 and North Anna 2) 2 / (70 x 5.5) = 5.19E-03		Events: 0 Assume a half failure 0.5 / (70 x 5.5) = 1.30E-03	
2	Aged adjusted liner flaw likelihood During the 15-year interval, assume failure rate doubles every five years (14.9% increase per year). The average for the 5th to 10th year set to the historical failure rate.	Year	Failure rate	Year	Failure rate
		1	2.05E-03	1	5.13E-04
		average 5-10	5.19E-03	average 5-10	1.30E-03
		15	1.43E-02	15	3.57E-03
		15 year average = 6.44E-03		15 year average = 1.61E-03	

Table 5-17 – Steel Liner Corrosion Base Case

Step	Description	Containment Cylinder and Dome (85%)	Containment Basemat (15%)
3	Increase in flaw likelihood between 3 and 15 years Uses aged adjusted liner flaw likelihood (Step 2), assuming failure rate doubles every five years.	0.73% (1 to 3 years) 4.18% (1 to 10 years) 9.66% (1 to 15 years)	0.18% (1 to 3 years) 1.04% (1 to 10 years) 2.41% (1 to 15 years)
4	Likelihood of breach in containment given liner flaw	1%	0.1%
5	Visual inspection detection failure likelihood	10% 5% failure to identify visual flaws plus 5% likelihood that the flaw is not visible (not through-cylinder but could be detected by ILRT). All events have been detected through visual inspection. 5% visible failure detection is a conservative assumption.	100% Cannot be visually inspected
6	Likelihood of non-detected containment leakage (Steps 3 x 4 x 5)	0.00073% (3 years) 0.73% x 1% x 10% 0.00418% (10 years) 4.18% x 1% x 10% 0.00966% (15 years) 9.66% x 1% x 10%	0.000180% (3 years) 0.18% x 0.1% x 100% 0.00104% (10 years) 1.04% x 0.1% x 100% 0.00241% (15 years) 2.41% x 0.1% x 100%

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

Table 5-18 – Total Likelihood on Non-Detected Containment Leakage Due to Corrosion for DCPP

Description
At 3 years: 0.00073% + 0.000180% = 0.00091%
At 10 years: 0.00418% + 0.00104% = 0.00522%
At 15 years: 0.00966% + 0.00241% = 0.01207%

The above factors are applied to those core damage accidents that are not already independently LERF or that could never result in LERF.

The two corrosion events that were initiated from the non-visible (backside) portion of the containment liner used to estimate the liner flaw probability in the Calvert Cliffs analysis are assumed to be applicable to this containment analysis. These events, one at North Anna Unit 2 (September 1999) caused by timber embedded in the concrete immediately behind the containment liner, and one at Brunswick Unit 2 (April 1999) caused by a cloth work glove embedded in the concrete next to the liner, were initiated from the nonvisible (backside) portion of the containment liner. A search of the NRC website LER database identified two additional events have occurred since the Calvert Cliffs analysis was performed. In January 2000, a 3/16-inch circular through-liner hole was found at Cook Nuclear Plant Unit 2 caused by a wooden brush handle embedded immediately behind the containment liner. The other event occurred in April 2009, where a through-liner hole approximately 3/8-inch by 1-inch in size was identified in

the Beaver Valley Power Station Unit 1 (BVPS-1) containment liner caused by pitting originating from the concrete side due to a piece of wood that was left behind during the original construction that came in contact with the steel liner. Two other containment liner through-wall hole events occurred at Turkey Point Units 3 and 4 in October 2010 and November 2006, respectively. However, these events originated from the visible side caused by the failure of the coating system, which was not designed for periodic immersion service, and are not considered to be applicable to this analysis. More recently, in October 2013, some through-wall containment liner holes were identified at BVPS-1, with a combined total area of approximately 0.395 square inches. The cause of these through-wall liner holes was attributed to corrosion originating from the outside concrete surface due to the presence of rayon fiber foreign material that was left behind during the original construction and was contacting the steel liner [Reference 28]. For risk evaluation purposes, these five total corrosion events occurring in 66 operating plants with steel containment liners over a 17.1 year period from September 1996 to October 4, 2013 (i.e., 5/(66*17.1) = 4.43E-03) are bounded by the estimated historical flaw probability based on the two events in the 5.5 year period of the Calvert Cliffs analysis (i.e., 2/(70*5.5) = 5.19E-03) incorporated in the EPRI guidance.

5.3 Sensitivities

5.3.1 Potential Impact from External Events Contribution

An assessment of the impact of external events is performed. The primary purpose for this investigation is the determination of the total LERF following an increase in the ILRT testing interval from 3 in 10 years to 1 in 15 years.

Diablo Canyon has received License Amendments No. 225 and 227, dated April 14, 2016, [Reference ML16035A441] for implementation of NFPA 805 on Units 1 and 2, respectively. Diablo Canyon has implemented required changes to the Operating Licenses and Technical Specifications and is in the process of implementing the program and installing modifications as committed to in the License Amendment Request, Safety Evaluation, and License Amendments. Thus, it is anticipated that all of the Fire PRA related modifications will be completed prior to the next scheduled Type A tests for Units 1 and 2 in the first quarter of 2019 and 2018, respectively [Reference 33]. Therefore, the NFPA 805 post-modification Fire PRA model is deemed applicable and was used for this calculation.

The Fire PRA model DC03M was used to obtain the fire CDF and LERF values [Reference 18]. To reduce conservatism in the model, the methodology of subtracting existing LERF from CDF is also applied to the Fire PRA model. The following shows the calculation for Class 3b:

$$Freq_{U1class3b} = P_{class3b} * (CDF - LERF) = \frac{0.5}{218} * (4.83E\text{-}5 - 2.45E\text{-}6) = 1.05E\text{-}7$$

$$Freq_{U2class3b} = P_{class3b} * (CDF - LERF) = \frac{0.5}{218} * (5.24E\text{-}5 - 2.17E\text{-}6) = 1.15E\text{-}7$$

$$Freq_{U1class3b10yr} = \frac{10}{3} * P_{class3b} * (CDF - LERF) = \frac{10}{3} * \frac{0.5}{218} * (4.83E\text{-}5 - 2.45E\text{-}6) = 3.50\text{E-}7$$

$$Freq_{U2class3b10yr} = \frac{10}{3} * P_{class3b} * (CDF - LERF) = \frac{10}{3} * \frac{0.5}{218} * (5.24E\text{-}5 - 2.17E\text{-}6) = 3.84\text{E-}7$$

$$Freq_{U1class3b15yr} = \frac{15}{3} * P_{class3b} * (CDF - LERF) = 5 * \frac{0.5}{218} * (4.83E\text{-}5 - 2.45E\text{-}6) = 5.26\text{E-}7$$

$$Freq_{U2class3b15yr} = \frac{15}{3} * P_{class3b} * (CDF - LERF) = 5 * \frac{0.5}{218} * (5.24E\text{-}5 - 2.17E\text{-}6) = 5.76\text{E-}7$$

The Seismic PRA results estimate a CDF of 2.66E-5/year and a LERF of 3.29E-6/year [Reference 17]. The Seismic PRA model is not unit-specific. Subtracting seismic LERF from CDF, the Class 3b frequency can be calculated by the following formulas:

$$Freq_{class3b} = P_{class3b} * (CDF - LERF) = \frac{0.5}{218} * (2.66\text{E-}5 - 3.29\text{E-}6) = 5.35\text{E-}8$$

$$Freq_{class3b10yr} = \frac{10}{3} * P_{class3b} * (CDF - LERF) = \frac{10}{3} * \frac{0.5}{218} * (2.66\text{E-}5 - 3.29\text{E-}6) = 1.78\text{E-}7$$

$$Freq_{class3b15yr} = \frac{15}{3} * P_{class3b} * (CDF - LERF) = \frac{15}{3} * \frac{0.5}{218} * (2.66\text{E-}5 - 3.29\text{E-}6) = 2.67\text{E-}7$$

The DCPP IPEEE determined that each of the "other" external events evaluated contributed less than 1.0E-06 per year to core damage and was screened out as a result [Reference 32]. Therefore, the "other" external events are also screened for this application.

The fire and seismic contributions to Class 3b frequencies are then combined to obtain the total external event contribution to Class 3b frequencies. The change in LERF is calculated for the 1 in 10 year and 1 in 15 year cases and the change defined for the external events in Table 5-19 for Unit 1 and Table 5-20 for Unit 2.

Table 5-19 – Unit 1 DCPP External Event Impact on ILRT LERF Calculation

Hazard	EPRI Accident Class 3b Frequency			LERF Increase (from 3 per 10 years to 1 per 15 years)
	3 per 10 year	1 per 10 year	1 per 15 years	
External Events	1.59E-07	5.29E-07	7.93E-07	6.34E-07
Internal Events	3.82E-08	1.27E-07	1.91E-07	1.53E-07
Combined	1.97E-07	6.56E-07	9.84E-07	7.87E-07

Table 5-20 – Unit 2 DCPP External Event Impact on ILRT LERF Calculation

Hazard	EPRI Accident Class 3b Frequency			LERF Increase (from 3 per 10 years to 1 per 15 years)
	3 per 10 year	1 per 10 year	1 per 15 years	
External Events	1.69E-07	5.62E-07	8.43E-07	6.75E-07
Internal Events	3.36E-08	1.12E-07	1.68E-07	1.35E-07
Combined	2.02E-07	6.74E-07	1.01E-06	8.09E-07

The internal event results are also provided to allow a composite value to be defined. When both the internal and external event contributions are combined, the total change in LERF of 7.87E-7 for Unit 1 and 8.09E-7 for Unit 2 meets the guidance for small change in risk, as it exceeds 1.0E-7/yr and remains less than 1.0E-6 change in LERF. For this change in LERF to be acceptable, total LERF must be less than 1.0E-5. The total LERF value is calculated below:

$$LERF_{U1} = LERF_{U1internal} + LERF_{seismic} + LERF_{U1fire} + LERF_{U2class3Bincrease}$$
$$= 2.26\text{E-}6/yr + 3.29\text{E-}6/yr + 2.45\text{E-}6/yr + 7.87\text{E-}7/yr = 8.78\text{E-}6/yr$$

$$LERF_{U2} = LERF_{U2internal} + LERF_{seismic} + LERF_{U2fire} + LERF_{U2class3Bincrease}$$
$$= 2.18\text{E-}6/yr + 3.29\text{E-}6/yr + 2.17\text{E-}6/yr + 8.09\text{E-}7/yr = 8.45\text{E-}6/yr$$

Although the total change in LERF is somewhat close to the Regulatory Guide 1.174 limit [Reference 4] when external event risk is included, several conservative assumptions were made in this ILRT analysis, as discussed in Sections 4.0, 5.1.3, 5.2.1, and 5.2.4; therefore the total change in LERF is considered conservative for this application. As specified in Regulatory Guide 1.174 [Reference 4], since the total LERF is less than 1.0E-5, it is acceptable for the ΔLERF to be between 1.0E-7 and 1.0E-6.

5.3.2 Potential Impact from Steel Liner Corrosion Likelihood

A quantitative assessment of the contribution of steel liner corrosion likelihood impact was performed for the risk impact assessment for extended ILRT intervals. The impact on the Class 3b frequency due to increases in the ILRT surveillance interval was calculated for steel liner corrosion likelihood using the relationships described in Section 5.2.6. The EPRI Category 3b frequencies for the 3 per 10-year, 10-year, and 15-year ILRT intervals were quantified using the internal events CDF. The change in the LERF, change in CCFP, and change in Annual Dose Rate due to extending the ILRT interval from 3 in 10 years to 1 in 10 years, or to 1 in 15 years are provided in Table 5-21 – Table 5-26. The steel liner corrosion likelihood was increased by a factor of 1000, 10000, and 100000. Except for extreme factors of 10000 and 100000, the corrosion likelihood is relatively insensitive to the results.

Table 5-21 – Steel Liner Corrosion Sensitivity Case: Unit 1 3B Contribution

	3b Frequency (3-per-10 year ILRT)	3b Frequency (1-per-10 year ILRT)	3b Frequency (1-per-15 year ILRT)	LERF Increase (3-per-10 to 1-per-10)	LERF Increase (3-per-10 to 1-per-15)	LERF Increase (1-per-10 to 1-per-15)
Internal Event 3B Contribution	3.82E-08	1.27E-07	1.91E-07	8.92E-08	1.53E-07	6.37E-08
Corrosion Likelihood X 1000	3.86E-08	1.34E-07	2.14E-07	9.55E-08	1.76E-07	8.01E-08
Corrosion Likelihood X 10000	4.17E-08	1.94E-07	4.22E-07	1.52E-07	3.80E-07	2.28E-07
Corrosion Likelihood X 100000	7.30E-08	7.92E-07	2.50E-06	7.19E-07	2.42E-06	1.70E-06

Table 5-22 – Steel Liner Corrosion Sensitivity Case: Unit 2 3B Contribution

	3b Frequency (3-per-10 year ILRT)	3b Frequency (1-per-10 year ILRT)	3b Frequency (1-per-15 year ILRT)	LERF Increase (3-per-10 to 1-per-10)	LERF Increase (3-per-10 to 1-per-15)	LERF Increase (1-per-10 to 1-per-15)
Internal Event 3B Contribution	3.36E-08	1.12E-07	1.68E-07	7.85E-08	1.35E-07	5.61E-08
Corrosion Likelihood X 1000	3.39E-08	1.18E-07	1.89E-07	8.40E-08	1.55E-07	7.05E-08
Corrosion Likelihood X 10000	3.67E-08	1.71E-07	3.71E-07	1.34E-07	3.35E-07	2.01E-07
Corrosion Likelihood X 100000	6.43E-08	6.97E-07	2.20E-06	6.33E-07	2.13E-06	1.50E-06

Table 5-23 – Steel Liner Corrosion Sensitivity: Unit 1 CCFP

	CCFP (3-per-10 year ILRT)	CCFP (1-per-10 year ILRT)	CCFP (1-per-15 year ILRT)	CCFP Increase (3-per-10 to 1-per-10)	CCFP Increase (3-per-10 to 1-per-15)	CCFP Increase (1-per-10 to 1-per-15)
Baseline CCFP	1.21E-01	1.26E-01	1.29E-01	4.71E-03	8.08E-03	3.37E-03
Corrosion Likelihood X 1000	1.21E-01	1.26E-01	1.30E-01	4.76E-03	8.15E-03	3.40E-03
Corrosion Likelihood X 10000	1.22E-01	1.27E-01	1.30E-01	5.14E-03	8.81E-03	3.67E-03
Corrosion Likelihood X 100000	1.23E-01	1.32E-01	1.39E-01	9.00E-03	1.54E-02	6.43E-03

Table 5-24 – Steel Liner Corrosion Sensitivity: Unit 2 CCFP

	CCFP (3-per-10 year ILRT)	CCFP (1-per-10 year ILRT)	CCFP (1-per-15 year ILRT)	CCFP Increase (3-per-10 to 1-per-10)	CCFP Increase (3-per-10 to 1-per-15)	CCFP Increase (1-per-10 to 1-per-15)
Baseline CCFP	1.32E-01	1.36E-01	1.40E-01	4.66E-03	7.99E-03	3.33E-03
Corrosion Likelihood X 1000	1.32E-01	1.36E-01	1.40E-01	4.70E-03	8.06E-03	3.36E-03
Corrosion Likelihood X 10000	1.32E-01	1.37E-01	1.40E-01	5.08E-03	8.71E-03	3.63E-03
Corrosion Likelihood X 100000	1.33E-01	1.42E-01	1.49E-01	8.90E-03	1.53E-02	6.36E-03

Table 5-25 – Steel Liner Corrosion Sensitivity: Unit 1 Dose Rate

	Dose Rate (3-per-10 year ILRT)	Dose Rate (1-per-10 year ILRT)	Dose Rate (1-per-15 year ILRT)	Dose Rate Increase (3-per-10 to 1-per-10)	Dose Rate Increase (3-per-10 to 1-per-15)	Dose Rate Increase (1-per-10 to 1-per-15)
Dose Rate	1.41E-02	4.69E-02	7.03E-02	3.28E-02	5.63E-02	2.34E-02
Corrosion Likelihood X 1000	1.42E-02	4.93E-02	7.88E-02	3.51E-02	6.46E-02	2.95E-02
Corrosion Likelihood X 10000	1.53E-02	7.13E-02	1.55E-01	5.60E-02	1.40E-01	8.38E-02
Corrosion Likelihood X 100000	2.69E-02	2.92E-01	9.19E-01	2.65E-01	8.92E-01	6.27E-01

Table 5-26 – Steel Liner Corrosion Sensitivity: Unit 2 Dose Rate

	Dose Rate (3-per-10 year ILRT)	Dose Rate (1-per-10 year ILRT)	Dose Rate (1-per-15 year ILRT)	Dose Rate Increase (3-per-10 to 1-per-10)	Dose Rate Increase (3-per-10 to 1-per-15)	Dose Rate Increase (1-per-10 to 1-per-15)
Dose Rate	1.24E-02	4.13E-02	6.19E-02	2.89E-02	4.95E-02	2.06E-02
Corrosion Likelihood X 1000	1.25E-02	4.34E-02	6.94E-02	3.09E-02	5.69E-02	2.59E-02
Corrosion Likelihood X 10000	1.35E-02	6.28E-02	1.37E-01	4.93E-02	1.23E-01	7.38E-02
Corrosion Likelihood X 100000	2.36E-02	2.57E-01	8.09E-01	2.33E-01	7.85E-01	5.52E-01

5.3.3 Expert Elicitation Sensitivity

Another sensitivity case on the impacts of assumptions regarding pre-existing containment defect or flaw probabilities of occurrence and magnitude, or size of the flaw, is performed as described in Reference 24. In this sensitivity case, an expert elicitation was conducted to develop probabilities for pre-existing containment defects that would be detected by the ILRT only based on the historical testing data.

Using the expert knowledge, this information was extrapolated into a probability-versus-magnitude relationship for pre-existing containment defects [Reference 24]. The failure mechanism analysis also used the historical ILRT data augmented with expert judgment to develop the results. Details of the expert elicitation process and results are contained in Reference 24. The expert elicitation process has the advantage of considering the available data for small leakage events, which have occurred in the data, and extrapolate those events and probabilities of occurrence to the potential for large magnitude leakage events.

The expert elicitation results are used to develop sensitivity cases for the risk impact assessment. Employing the results requires the application of the ILRT interval methodology using the expert elicitation to change the probability of pre-existing leakage in the containment.

The baseline assessment uses the Jeffreys non-informative prior and the expert elicitation sensitivity study uses the results of the expert elicitation. In addition, given the relationship between leakage magnitude and probability, larger leakage that is more representative of large early release frequency, can be reflected. For the purposes of this sensitivity, the same leakage magnitudes that are used in the basic methodology (i.e., 10 L_a for small and 100 L_a for large) are used here. Table 5-27 presents the magnitudes and probabilities associated with the Jeffreys non-informative prior and the expert elicitation used in the base methodology and this sensitivity case.

Table 5-27 – MNGP Summary of ILRT Extension Using Expert Elicitation Values (from Reference 24)

Leakage Size (L_a)	Expert Elicitation Mean Probability of Occurrence	Percent Reduction
10	3.88E-03	86%
100	2.47E-04	91%

Taking the baseline analysis and using the values provided in Table 5-10 – Table 5-14 for the expert elicitation sensitivity yields the results in Table 5-28 and Table 5-29.

Table 5-28 – Unit 1 DCPP Summary of ILRT Extension Using Expert Elicitation Values

Accident Class	ILRT Interval							
	3 per 10 Years				1 per 10 Years		1 per 15 Years	
	Base Frequency	Adjusted Base Frequency	Dose (person-rem)	Dose Rate (person-rem/yr)	Frequency	Dose Rate (person-rem/yr)	Frequency	Dose Rate (person-rem/yr)
1	1.67E-05	1.66E-05	3.68E+03	6.11E-02	1.64E-05	6.05E-02	1.63E-05	6.00E-02
2	1.47E-07	1.47E-07	9.83E+06	1.45E+00	1.47E-07	1.45E+00	1.47E-07	1.45E+00
3a	N/A	6.46E-08	3.68E+04	2.38E-03	2.15E-07	7.93E-03	3.23E-07	1.19E-02
3b	N/A	4.12E-09	3.68E+05	1.51E-03	1.37E-08	5.05E-03	2.06E-08	7.57E-03
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	7.61E-07	7.61E-07	9.83E+06	7.48E+00	7.61E-07	7.48E+00	7.61E-07	7.48E+00
8	1.35E-06	1.35E-06	8.90E+05	1.20E+00	1.35E-06	1.20E+00	1.35E-06	1.20E+00
Totals	1.89E-05	1.89E-05	N/A	1.02E+01	1.89E-05	1.02E+01	1.89E-05	1.02E+01
ΔLERF (3 per 10 yrs base)	N/A				9.60E-09		1.65E-08	
ΔLERF (1 per 10 yrs base)	N/A				N/A		6.86E-09	
CCFP	11.96%				12.01%		12.05%	

Table 5-29 – Unit 2 DCPP Summary of ILRT Extension Using Expert Elicitation Values

Accident Class	ILRT Interval							
	3 per 10 Years				1 per 10 Years		1 per 15 Years	
	Base Frequency	Adjusted Base Frequency	Dose (person-rem)	Dose Rate (person-rem/yr)	Frequency	Dose Rate (person-rem/yr)	Frequency	Dose Rate (person-rem/yr)
1	1.47E-05	1.46E-05	3.68E+03	5.38E-02	1.45E-05	5.32E-02	1.44E-05	5.29E-02
2	1.47E-07	1.47E-07	9.83E+06	1.45E+00	1.47E-07	1.45E+00	1.47E-07	1.45E+00
3a	N/A	5.69E-08	3.68E+04	2.09E-03	1.90E-07	6.98E-03	2.85E-07	1.05E-02
3b	N/A	3.62E-09	3.68E+05	1.33E-03	1.21E-08	4.44E-03	1.81E-08	6.67E-03
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	6.85E-07	6.85E-07	9.83E+06	6.74E+00	6.85E-07	6.74E+00	6.85E-07	6.74E+00
8	1.35E-06	1.35E-06	8.90E+05	1.20E+00	1.35E-06	1.20E+00	1.35E-06	1.20E+00
Totals	1.69E-05	1.69E-05	N/A	9.44E+00	1.69E-05	9.45E+00	1.69E-05	9.45E+00
ΔLERF (3 per 10 yrs base)	N/A				8.45E-09		1.45E-08	
ΔLERF (1 per 10 yrs base)	N/A				N/A		6.04E-09	
CCFP	12.98%				13.03%		13.06%	

The results illustrate how the expert elicitation reduces the overall change in LERF and the overall results are more favorable with regard to the change in risk.

6.0 RESULTS

The results from this ILRT extension risk assessment for DCPP are summarized in Table 6-1 for Unit 1 and Table 6-2 for Unit 2.

Table 6-1 – Unit 1 ILRT Extension Summary

Class	Dose (person-rem)	Base Case 3 in 10 Years		Extend to 1 in 10 Years		Extend to 1 in 15 Years	
		CDF/Year	Person-Rem/Year	CDF/Year	Person-Rem/Year	CDF/Year	Person-Rem/Year
1	3.68E+03	1.65E-05	6.06E-02	1.60E-05	5.90E-02	1.57E-05	5.78E-02
2	9.83E+06	1.47E-07	1.45E+00	1.47E-07	1.45E+00	1.47E-07	1.45E+00
3a	3.68E+04	1.54E-07	5.65E-03	5.12E-07	1.88E-02	7.68E-07	2.83E-02
3b	3.68E+05	3.82E-08	1.41E-02	1.27E-07	4.69E-02	1.91E-07	7.03E-02
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	9.83E+06	7.61E-07	7.48E+00	7.61E-07	7.48E+00	7.61E-07	7.48E+00
8	8.90E+05	1.35E-06	1.20E+00	1.35E-06	1.20E+00	1.35E-06	1.20E+00
Total		**1.89E-05**	**1.02E+01**	**1.89E-05**	**1.03E+01**	**1.89E-05**	**1.03E+01**
ILRT Dose Rate from 3a and 3b							
ΔTotal Dose Rate	From 3 Years	N/A		4.44E-02		7.60E-02	
	From 10 Years	N/A		N/A		3.17E-02	
%ΔDose Rate	From 3 Years	N/A		0.434%		0.745%	
	From 10 Years	N/A		N/A		0.309%	
3b Frequency (LERF)							
ΔLERF	From 3 Years	N/A		8.92E-08		1.53E-07	
	From 10 Years	N/A		N/A		6.37E-08	
CCFP %							
ΔCCFP%	From 3 Years	N/A		0.471%		0.808%	
	From 10 Years	N/A		N/A		0.337%	

Table 6-2 – Unit 2 ILRT Extension Summary

Class	Dose (person-rem)	Base Case 3 in 10 Years		Extend to 1 in 10 Years		Extend to 1 in 15 Years	
		CDF/Year	Person-Rem/Year	CDF/Year	Person-Rem/Year	CDF/Year	Person-Rem/Year
1	3.68E+03	1.45E-05	5.34E-02	1.41E-05	5.19E-02	1.38E-05	5.09E-02
2	9.83E+06	1.47E-07	1.45E+00	1.47E-07	1.45E+00	1.47E-07	1.45E+00
3a	3.68E+04	1.35E-07	4.97E-03	4.51E-07	1.66E-02	6.76E-07	2.49E-02
3b	3.68E+05	3.36E-08	1.24E-02	1.12E-07	4.13E-02	1.68E-07	6.19E-02
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	9.83E+06	6.85E-07	6.74E+00	6.85E-07	6.74E+00	6.85E-07	6.74E+00
8	8.90E+05	1.35E-06	1.20E+00	1.35E-06	1.20E+00	1.35E-06	1.20E+00
Total		**1.69E-05**	**9.46E+00**	**1.69E-05**	**9.49E+00**	**1.69E-05**	**9.52E+00**
ILRT Dose Rate from 3a and 3b							
ΔTotal Dose Rate	From 3 Years	N/A		3.90E-02		6.69E-02	
	From 10 Years	N/A		N/A		2.79E-02	
%ΔDose Rate	From 3 Years	N/A		0.413%		0.708%	
	From 10 Years	N/A		N/A		0.294%	
3b Frequency (LERF)							
ΔLERF	From 3 Years	N/A		7.85E-08		1.35E-07	
	From 10 Years	N/A		N/A		5.61E-08	
CCFP %							
ΔCCFP%	From 3 Years	N/A		0.466%		0.799%	
	From 10 Years	N/A		N/A		0.333%	

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results from Section 5.2 and the sensitivity calculations presented in Section 5.3, the following conclusions regarding the assessment of the plant risk are associated with extending the Type A ILRT test frequency to 15 years:

- Regulatory Guide 1.174 [Reference 4] provides guidance for determining the risk impact of plant-specific changes to the licensing basis. Regulatory Guide 1.174 defines small changes in risk as resulting in increases of CDF greater than 1.0E-6/year and less than 1.0E-5/year and increases in LERF greater than 1.0E-7/year and less than 1.0E-6/year. 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 interval from 3 in 10 years to 1 in 15 years is estimated as 1.53E-7/year for Unit 1 and 1.35E-7/year for Unit 2 using the EPRI guidance (this value increases negligibly if the risk impact of corrosion-induced leakage of the steel liners occurring and going undetected during the extended test interval is included), and baseline LERF is 2.26E-6/year for Unit 1 and 2.18E-6/year for Unit 2. As such, the estimated change in LERF is determined to be "small" using the acceptance guidelines of Regulatory Guide 1.174 [Reference 4]. When external event risk is included, the increase in LERF resulting from a change in the Type A ILRT test interval from 3 in 10 years to 1 in 15 years is estimated as 7.87E-7/year for Unit 1 and 8.09E-7/year for Unit 2 using the EPRI guidance, and baseline LERF is 8.78E-6/year for Unit 1 and 8.45E-6/year for Unit 2. As such, the estimated change in LERF is determined to be "small" using the acceptance guidelines of Regulatory Guide 1.174 [Reference 4].
- The effect resulting from changing the Type A test frequency to 1-per-15 years, measured as an increase to the total integrated plant risk for those accident sequences influenced by Type A testing, is 0.076 person-rem/year for Unit 1 and 0.067 person-rem/year for Unit 2. EPRI Report No. 1009325, Revision 2-A [Reference 24] states that a very small population dose is defined as an increase of ≤ 1.0 person-rem per year, or ≤ 1% of the total population dose, whichever is less restrictive for the risk impact assessment of the extended ILRT intervals. The results of this calculation meet these criteria. Moreover, the risk impact for the ILRT extension when compared to other severe accident risks is negligible.
- The increase in the conditional containment failure probability from the 3 in 10 year interval to 1 in 15 year interval is 0.808% for Unit 1 and 0.799% for Unit 2. EPRI Report No. 1009325, Revision 2-A [Reference 24] states that increases in CCFP of ≤ 1.5% is very small. Therefore, this increase is judged to be very small.

Therefore, increasing the ILRT interval to 15 years is considered to be insignificant since it represents a small change to the DCPP risk profile.

Previous Assessments

The NRC in NUREG-1493 [Reference 6] has previously concluded that:

- Reducing the frequency of Type A tests (ILRTs) from 3 per 10 years to 1 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 containment leakage paths that cannot be identified by Type B or Type 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 paths detected solely by Type A testing, increasing the interval between integrated leakage-rate tests is possible with minimal impact on public risk. The impact of relaxing the ILRT frequency beyond 1 in 20 years has not been evaluated. Beyond testing the performance of containment penetrations, ILRTs also test integrity of the containment structure.

The findings for DCPP confirm these general findings on a plant-specific basis considering the severe accidents evaluated for DCPP, the DCPP containment failure modes, and the local population surrounding DCPP.

A. ATTACHMENT 1

A.1. Internal Events PRA Quality Statement for Permanent 15-Year ILRT Extension

PG&E conducted an Internal Events Peer Review in December 2012. The full-scope Peer Review that included internal events and internal floods portions of the DCPP PRA was performed in accordance with RG 1.200, Rev. 2, and ASME/ANS RA-Sa-2009. The review provided Facts and Observations (F&Os) regarding the model and identified 94 supporting requirements within the internal events and internal floods portions of the model that did not meet Capability Category (CAT) II. All findings have been either resolved by additional analysis or evaluated in terms of their impact on the ILRT extension, and dispositioned as presented in Table A-1 Internal Events PRA Peer Review – Facts and Observations.

No changes have been made to the Internal Events or Internal Floods PRA models since the Peer Review that would constitute an upgrade.

Internal floods findings and their disposition are presented in Table A-2. Findings associated with internal floods are addressed but have no impact on the ILRT extension application.

PG&E conducted a Seismic PRA Peer Review in January 2013. The full-scope Peer Review that also included a review of seismic hazard and fragility analyses was performed in accordance with RG 1.200, Rev. 2, and ASME/ANS RA-Sa-2009.

A.2. Fire PRA Quality Statement for Permanent 15-Year ILRT Extension

The FPRA is adequate to support the ILRT extension analysis. The DCPP FPRA was reviewed in January 2008 as part of the pilot application of the NEI-07-12 Peer Review process. The 2008 Peer Review was conducted against the requirements of the ANS Standard "FPRA Methodology" ANSI/ANS-58.23-2007. At the time of this first Peer Review, certain technical elements of the FPRA had not been completed, and it was agreed that the second phase of the Peer Review would be performed when all the technical elements of the FPRA were completed. The second phase of the Peer Review was completed in December 2010. The 2010 Peer Review was conducted against the requirements of Section 4 of the ASME/ANS Combined PRA Standard.

The Peer Review noted a number of F&Os. The F&Os and the disposition of the F&Os are provided in Table A-3.

All FPRA related F&Os, except SF-A5-01 against SR SF-A5, have been addressed and dispositioned as closed. SF-A5-01 tracks the implementation (revision of the fire brigade training procedure) of a recommendation related to fire brigade training requirement dealing with seismically induced fires. See Attachment S, Table S-3, Item S-3.25 of Reference 33 for more details. This item has no impact on the ILRT extension analysis.

Per the 2010 Peer Review, the DCPP FPRA met Capability Category II or better in all SRs but two (SRs CF-A1 and FSS-D7). These two SRs are listed in Table A-3. These SRs have since been addressed and now considered as met at CC-II.

Table A-3 also listed the SRs from the 2008 Peer Review that did not meet CC-II or better quality requirements. However, as documented in Tables V-1 and V-2, these 2008 SRs have been re-reviewed during the 2010 Peer Review and all of the SRs were found met at CC-II or better.

No changes have been made to the FPRA model since the Peer Reviews that would constitute an upgrade.

Based on the Peer Reviews, Independent Third Party Reviews, and the resolution of F&Os, the DCPP FPRA model includes no deviations from NUREG/CR-6850 approaches, and contains no unreviewed analysis methods (UAMs).

A.3. Seismic PRA Quality Statement for Permanent 15-Year ILRT Extension

The seismic hazard and fragilities are currently being updated. The Seismic hazard update incorporates the most recent site-specific seismic data. The Peer Review team reviewed the methodologies used in the hazard and fragility analyses and found them to be acceptable. The current SPRA model provides a reasonable estimate of the seismic CDF and LERF for the purposes of the ILRT extension analysis.

Section 5 of the ASME/ANS Combined PRA Standard contains a total of 77 Supporting Requirements (SRs) under three technical elements. As a result of this review, a total of 60 F&Os were generated. These included five "Best Practices," 18 "Suggestions," and 37 "Findings." Table A-4 presents Seismic PRA Peer Review Findings and Observations and their effect on the ILRT extension analysis.

Table A-1 Internal Events PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
IE-A5	IE-A5-01, NOT MET, systematic review of each system	Closed	**Discussion:** PERFORM a systematic evaluation of each system, including support systems, to assess the possibility of an initiating event occurring due to a failure of the system. **Basis for Significance:** There is no evidence in the documentation (including Section C.1 of PLG-0637) that demonstrates that EVERY system in the plant was reviewed as a potential IE contributor. Discussion with DCPP PRA personnel confirmed this conclusion. **Possible Resolution:** Collect list of all plant systems and meet with plant personnel to address the gap.	Each system was screened for potential initiating events. If a system did not screen, the system was reviewed against the existing Initiating Events analysis to confirm that a bounding or representative initiating event is modeled in the DCPP Internal Events PRA. An interview of operations representative was conducted to confirm the system screening and to discuss low power or NPOs for each system. Table H.1.6-10 of PRA Calc H.1.6 Rev 8 documented the review.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
IE-A7	IE-A7-01, NOT MET, Associated SRs: IE-A8(CC-I), IE-A9(CC-I), events occurred other than at-power	Closed	**Discussion:** SR IE-A7: In the identification of the initiating events, INCORPORATE (a) events that have occurred at conditions other than at-power operation (i.e., during low-power or shutdown conditions), and for which it is determined that the event could also occur during at-power operation. (b) events resulting in a controlled shutdown that includes a scram prior to reaching low-power conditions, unless it is determined that an event is not applicable to at-power operation. SR IE-A8: INTERVIEW plant personnel (e.g., operations, maintenance, engineering, safety analysis) to determine if potential initiating events have been overlooked. SR IE-A9: REVIEW plant-specific and review industry operating experience for initiating event precursors, for identifying additional initiating events. Twice-Daily Shift Manager Turnover Reports, On-line/Off-line Daily Log, and Outage History were reviewed for potential initiating events. No new initiating events were discovered during the review of the turnover reports, daily logs, and outage history. Low and non-power operation events were discussed as part of the system screening performed to resolve F&O IE-A5. Significance to the FPRA and NFPA-805 LAR:	Twice-Daily Shift Manager Turnover Reports, On-line/Off-line Daily Log, and Outage History were reviewed for potential initiating events. No new initiating events were discovered during the review of the turnover reports, daily logs, and outage history. Low and non-power operation events were discussed as part of the system screening performed to resolve F&O IE-A5. The review was documented in Table H.1.6-10 of PRA Calc H.1.6 Rev 8.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-1 Internal Events PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			The only aspect of the F&O that result in a change to the internal events PRA is the discussion of the internal events low-power and non-power operations events review for initiating events. This has no impact on the FPRA, and only affects the documentation of the internal events PRA since there are no new initiating events and therefore no changes to the Internal Events PRA model. **Basis for Significance:** SR IE-A7: The DCPP PRA has not addressed either requirements (a) or (b) for SR IE-A7, i.e., neither (a) a review of events that have occurred at conditions other than at-power operation that could also occur during at-power operation and would lead to a unique IE nor (b) a review of events resulting in an unplanned controlled shutdown that includes a scram prior to reaching low-power conditions. Note that the SR calls for a review of historical events. SR IE-A8: no interviews were conducted with plant personnel to determine if potential initiating events have been overlooked. SR IE-A9: the plant-specific operating experience was not reviewed for initiating event precursors to identify additional initiating events		
IE-C5	IE-C5-01, NOT MET, IE Frequency based on a reactor year basis	Closed	**Discussion:** Calculate initiating event frequencies on a reactor-year basis. Include in the initiating event analysis the plant availability, such that the frequencies are weighted by the fraction of time the plant is at-power. **Basis for Significance:** IE frequencies are converted to events per calendar year by multiplying by the site critical hours per calendar year factor calculated from site operating experience. However, SR IE-C5 requires this factor to be calculated on a plant unit operating year basis. This distinguishes differences in the plant units' operating experience. **Possible Resolution:** Revise the conversion factors from a site to a plant specific basis.	As demonstrated in PRA Calc 13-12 Revision 0, the difference between the capacity factors of both Units 1 and 2 is less than 1%. Using the combined capacity fact instead of unit specific factors has insignificant impact on the final CDF/LERF results.	Since this has insignificant on the final CDF/LERF results, there is negligible impact on the ILRT Extension Risk Analysis.
IE-C10	IE-C10-01, MET, combination of one Structure, System or Component (SSC) failure with the unavailability of other SSCs.	Closed	**Discussion:** If fault-tree modeling is used for initiating events, CAPTURE within the initiating event fault tree models all relevant combinations of events involving the annual frequency of one component failure combined with the unavailability (or failure during the repair time of the first component) of other components.	IE fault trees were evaluated and documentation was added to Section 4.2.3 of Calc B.1 to address the IE fault tree documentation discussed above.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-1 Internal Events PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			Basis for Significance: Use of plant specific information in the Internal Events Fault Trees (IEFT) was not evident. There was no discussion in the IEFT. Use of plant specific information in the IEFT was not evident. There was no discussion in the IEFT documentation regarding the treatment of common cause events. There is no discussion of how the 24-hour and 365-day exposure intervals are factored into the model. There is no discussion of whether the success criteria used for the mitigating fault trees are applicable (or not) for the IEFT. The Common Cause Failure (CCF) treatment in the IEFT should be described in order to verify that the appropriate exposure intervals are applied based on equipment rotational practices. **Possible Resolution:** Evaluate and document the IEFT success criteria. Expand the IEFT documentation to address the all of above issues.		
IE-C14	IE-C14-01, NOT MET, Interfacing System Loss of Coolant Accident (ISLOCA) frequency	Closed	**Discussion:** In the ISLOCA frequency analysis, INCLUDE the following features of plant and procedures that influence the ISLOCA frequency: (a) configuration of potential pathways including numbers and types of valves and their relevant failure modes and the existence, size, and positioning of relief valves (b) provision of protective interlocks (c) relevant surveillance test (d) the capability of secondary system piping. **Basis for Significance:** There is no systematic review of all containment penetrations performed for or in the ISLOCA calculation. All penetrations that are screened out need to be justified, yet this process was not evident in the documentation. Review of relevant surveillance test procedures is needed to meet this SR. Other requirements specified in SR IE-C14 must also be evaluated and documented. **Possible Resolution:** Create a table of all containment penetrations and disposition their potential as an ISLOCA pathway. Impact of surveillance test procedures should be explicitly documented. Explanation of RISKMAN treatment of ISLOCA quantification should be documented. Document all requirements of the SR.	Table C.4.7-5 of Calc C.4.7 Revision 9 lists the containment penetrations and disposition regarding their potential as an ISLOCA pathway was developed. A set of screening criteria were developed consistent with the SR requirement. These criteria were used explicitly to screen each potential ISLOCA pathway. The unscreened ISLOCA flow paths are consistent with what modeled in RISKMAN. Also, impact of Surveillance test was added to the documentation.	This is resolved; no model change was necessary. There is no impact on the ILRT Extension Risk Analysis.

Table A-1 Internal Events PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
IE-C15	IE-C15-01, NOT MET, Associated SR: IE-C1 (MET), uncertainty associated with IEs.	Closed	**Discussion:** CHARACTERIZE the uncertainty in the initiating event frequencies and PROVIDE mean values for use in the quantification of the PRA results. **Basis for Significance:** No discussion of uncertainty parameters for IEFT was located in Calculation Files C.10 and H.1.6. This is required to meet SR IE-C15 and is necessary to document the process used to calculate the IE frequencies per SR IE-C1. **Possible Resolution:** Provide a discussion of uncertainties (preferably in Calculation H.1.6).	Parametric uncertainty for IE frequencies is given in H.1.6 as Range Factors (Error Factors) for LOCA IEs and alpha/beta values for gamma distributions.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
IE-D1	IE-D1-01, NOT MET, Associated SRs: IE-D2 (NOT MET), IE-D3 (NOT MET), AS-C1 (NOT MET), SY-C1 (NOT MET), DA-E1 (NOT MET), QU-F1 (NOT MET), LE-G1 (NOT MET), IFPP-B1 (NOT MET), IFSO-B1 (NOT MET), IFSN-A5 (MET), IFSN-B1 (NOT MET), IFQU-B1 (MET)	Closed	**Discussion:** The DCPP PRA documentation is not written in manner that facilitates PRA applications, upgrades, and peer review. In great part, this is probably due to the fact that this documentation heavily references the original DCPP PRA documents, especially PLG-0637. This makes it difficult to understand details of the model, difficult to confirm that the model addresses PRA requirements, and difficult to update and use it for PRA applications. This finding applies to elements IE, AS, SY, DA, QU, LE, IFPP, IFSO, IFSN, and IFQU. **Basis for Significance:** The DCPP PRA documentation is not written in manner that facilitates PRA applications, upgrades, and peer review. In great part, this is probably due to the fact that this documentation heavily references the original DCPP PRA documents, especially PLG-0637. This makes it difficult to understand details of the model, difficult to confirm that the model addresses PRA requirements, and difficult to update and use it for PRA applications. **Possible Resolution:** In the summary document, Calculation file B.1, describe each aspect of the model development, referencing supporting calculations. And, these supporting calculations should provide additional details of the analysis to the level of documentation to demonstrate that all SRs are met. This approach, in essence, suggests abandoning the heavy reliance on PLG-0637, which does not meet many requirements of the PRA Standard and creating a set of "living" PRA documents that fully meet these requirements. This would not only eliminate the need to "patch" deficiencies of the PLG-0637	References to PLG-0637 as the basis have been taken out and information has been included in the new calculation revisions for system notebooks, initiating event notebooks, event tree notebooks, and other PRA development documentation.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-1 Internal Events PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			documentation but also provide a means to much more easily document model updates – thereby facilitating use of the model and document in future risk applications.		
IE-D2	IE-D2-01, NOT MET, Associated SRs: IE-A3 (MET), IE-A10(MET), IE-B3(CC-II), IE-C2(MET), IE-C3(MET), IE-C4(MET), IE-C8 (MET), IE-C9 (MET), IE-C10 (MET), IE-C12 (MET), IE-D1 (NOT MET), documentation	Closed	**Discussion:** DOCUMENT the processes used to select, group, and screen the initiating events and to model and quantify the initiating event frequencies, including the inputs, methods, and results. For example, this documentation typically includes: (a) the functional categories considered and the specific initiating events included in each **Basis for Significance:** IE-A3: CALCULATION FILE B.1 should reference Tables H1.6-5, 6, 7, and 8 to demonstrate compliance with SR IE-A3. IE-A10: The DCPP PRA documentation does not describe the potential for the loss of IA as a dual Unit initiator. IE-B3: Table 4-3 of Calculation File B.1: indicates that the TOTAL Loss of Condensate Flow was subsumed into the Partial Loss of Feedwater initiator. This is inappropriate. DCPP PRA personnel agreed and indicated that this is an editorial error. This should be corrected. IE-C2: Table H.1.6-5 of Calculation File H.1.6 states that the Unit 1 IE data is updated through March 31, 2009; however, no "freeze date" is provided for the Unit 2 IE data. This date should be provided. IE-C3: Credited recovery actions should be documented. IE-C4: Calculation File H.1.6 does not provide details associated with generation of mean and uncertainty parameters associated with the generic data (from NUREG/CR-6928) nor does it provide any details on the Bayesian calculations. This information should be documented (preferably in Calculation H.1.6) in order to facilitate future updates. IE-C8, IE-C9, IE-C10, and IE-C11: There is insufficient documentation describing the construction of the IEFT. This includes a lack of documentation regarding the treatment of CCF, how the 24 hour and 365 day exposure	Re IE-A3: Section 4.2.1 of Calc B.1 Revision 1 references to Calc H.1.6, which discusses use of plant-specific experience. Re IE-A10: Section 6.2 of Calc B.1 Revision 1 describes the potential for the loss of Instrument Air system as a dual unit initiator. Re IE-B3: The Total Loss of Condensate Flow initiator was moved from PLMFW to TLMFW as documented in Table 4.4 of Calc B.1 Revision 1. Calc H.1.6 Revision 8 also reflects this change. Re IE-C2: In Attachment 2 of Calc H.1.6 Revision 8 clearly states "freeze date" for the Unit 2 IE data. Re IE-C3: Recovery actions credited in the system fault trees used for initiating events (e.g., Top Event AI for loss of the ASW or Top Event CX for loss of all CCW system) are documented in Success Criteria section of the system notebooks such as D.2.6 for the ASW system and D.2.7 for the CCW system. Re IE-C4: Tables H.1.6-2 and H.1.6-8 provide details of the distribution parameters associated with the generic data, DCPP experience, and Bayesian updated results. Re IE C-8, IE-C9, IE-C10, IE-C11: IE fault trees are discussed in detail in the	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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			intervals are factored into the model, the success criteria used for the IEFT, and the use of plant specific information in the assessment of recovery actions used in the IEFT. IE-C12: A detailed discussion comparing the DCPP PRA IE frequencies with generic data sources and explaining differences is not documented. This is required to demonstrate that SR IE-C12 is met. **Possible Resolution:** Revise documentation to address the above issues.	applicable system notebooks (i.e for Loss of CCW initiator, Calc D.2.7). CCFs are discussed in H.1. Recovery actions are discussed in C.8. Calc B.1 discusses the System Initiator Quantification Methodology in Section 7.2.4. Re IE-C12: Section H.1.6.7 of Calc H.1.6 Revision 8 discusses comparison of the DCPP plant specific IE frequencies with generic data.	
AS-B3	AS-B3-01, NOT MET, Associated SRs: AS- B3 (NOT MET), SY- A18 (MET), SY- A21 (MET), SY- A23 (MET), SY- B14 (MET), phenomenological conditions created by accident progressions	Closed	**Discussion:** This SR states, "For each accident sequence, IDENTIFY the phenomenological conditions created by the accident progression. Phenomenological impacts include generation of harsh environments affecting temperature, pressure, debris, water levels, humidity, etc. that could impact the success of the system or function under consideration..." **Basis for Significance:** Based on a review of accident sequence documents, there does not appear to be a review of phenomenological conditions created by each accident sequence. Environmental Qualification (EQ) Program documentation was provided, however, there may be non-safety-related components that are affected by an accident sequence that were not reviewed/included for the accident impact on the functionality of the component. **Possible Resolution:** Include a sequence level review of phenomenological conditions and include those that affect the success of systems/functions in the accident sequence analyses.	A new system notebook, I.1 Revision 0 was created to document the review of phenomenological conditions for all initiating events for their impacts on the success of the system or function. Based on this review, the following model changes were made. Credit was conservatively removed for the Instrument Air System (IA) for Main Steam- Line Break and Feedwater-Line Break (Outside of Containment) initiators in the PRA model as their impacts could not be verified. Credit was also removed for the operator action to make-up to the RWST in the event of an Interfacing System LOCA (ISLOCA) due to potentially high radiation conditions in areas that operators need to enter to perform necessary actions.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
AS-B7	AS-B7-01, MET, time-phased dependencies	Closed	**Discussion:** This SR requires the modeling of time-phased dependencies. **Basis for Significance:** Time-phased dependencies were found to be modeled in the accident sequences (e.g., AC power recovery and DC battery depletion). However, the documentation has inconsistencies that need to be resolved.	Current time phased recovery in Section G.4.1.1 of Calc G.4 uses correct battery depletion times. Section D.2.1.2.4.1 of Calc D.2.1.2 Revision 10 was revised to correct inconsistency between Calc G.4 and D.2.1.2.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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			One example of an inconsistency is that the battery depletion time in documents G.4 and D.2.1.2 are not the same (5.75 hours vs.12 hours). **Possible Resolution:** Ensure that PRA documentation reflects the actual times used in the model and that PRA documentation is consistent.		
AS-C2	AS-C2-01, NOT MET, Documenting processes used to develop accident sequences	Closed	**Discussion:** This SR requires the documentation of processes used to develop accident sequences. **Basis for Significance:** AS-A11-01 and AS-B7-01 identify issues related to the documentation of the accident sequence analyses. **Possible Resolution:** Improve the accident sequence documentation to accurately reflect what is modeled.	Documentation related finding associated with accident sequence documentation. Refer to disposition for F&Os AS-A11-01 and AS-B7-01.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.
SC-A1	SC-A1-01, NOT MET, Associated SR: SC-A2 (NOT MET), definition of core damage	Closed	**Discussion:** This SR states "USE the definition of "core damage" provided in Section 1-2 of this Standard. If core damage has been defined differently than in Section 1-2, (a) IDENTIFY any substantial differences from the Section 1-2 definition (b) PROVIDE the bases for the selected definition." **Basis for Significance:** Based on the information in E.16, Revision 0, two definitions of Core Damage are used in the DCPP Internal Events. The first definition, Peak Node temperature >1800°F is a valid success criterion, and meets the definition in Section 1-2 of the Standard. However, the second criterion of "the time until the water level is collapsed below the top of active fuel" is not a valid definition since the definition of Core Damage as written in Section 1-2 requires the consideration of uncover and heat-up, and this definition does not consider heat-up. Additionally, it is not valid to have two separate definitions for the same end state. **Possible Resolution:** Remove the second definition of Core Damage, and do all analyses and timings using the Peak Node temperatures >1800°F.	The definition of core damage dependent on collapsed water level was removed from the documentation. MAAP runs were updated using the core damage definition of > 1800°F peak fuel temperature. Prior to this update, core uncovery was used as the end point in the timing analysis for the HRA. The use of core uncovery vs. peak clad temperature of 1800°F results in a slightly conservative time available for the HFE. Converting the collapsed water level uncovery of fuel criteria to Peak Control Temperature (PCT) of 1800°F would not adversely affect the timing requirements.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
SC-A4	SC-A4-01, NOT MET, shared systems between Units	Closed	**Discussion:** This SR states "IDENTIFY mitigating systems that are shared between Units, and the manner in which the sharing is performed should both Units experience a common initiating event (e.g., LOOP)."	Calc B.1 was revised to include an evaluation of two shared system Diesel Fuel Oil (DFO) and Instrument Air (IA) systems in Section 6.2 of Revision 1.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			Basis for Significance: A review of the documentation did not reveal where shared systems were identified and discussed with respect to how they were credited in dual Unit scenarios. Discussion with DCPP personnel identified that there are not many shared systems at DCPP and they are not typically credited. However, the identification of which systems are shared between the Units, and how they are credited is not documented anywhere. For example, no discussion on the DG Fuel Oil transfer system is provided, although it is a known shared system. Therefore it is not possible to verify that a shared system is not inadvertently credited in the analyses during dual Unit scenarios. **Possible Resolution:** Document which systems in the PRA are shared systems at DCPP, and discuss how they are credited in the Internal Events PRA, including how they are credited during dual Unit initiators. Verify that the shared systems are modeled consistent with their availability during dual Unit initiators.		
SC-A5	SC-A5-01, NOT MET, mission time	Closed	**Discussion:** This SR states: SPECIFY an appropriate mission time for the modeled accident sequences. For sequences in which stable plant conditions have been achieved, USE a minimum mission time of 24 hours. Mission times for individual SSCs that function during the accident sequence may be less than 24 hours as long as an appropriate set of SSCs and operator actions are modeled to support the full sequence mission time. For example, if following a LOCA, low pressure injection is available for 1 hour, after which recirculation is required, the mission time for LPSI may be 1 hour and the mission time for recirculation may be 23 hours. For sequences in which stable plant conditions would not be achieved by 24 hours using the modeled plant equipment and human actions, PERFORM additional evaluation or modeling by using an appropriate technique. Examples of appropriate techniques include: (a) assigning an appropriate plant damage state for the sequence; (b) extending the mission time, and adjusting the affected analyses, to the point at which conditions can be shown to reach acceptable values; or (c) modeling additional system recovery or operator actions for the sequence, in accordance with requirements stated in the	PG&E reviewed the fire and internal events accident sequences, success criteria and associated thermo-hydraulic (TH) runs for various non-LOCA and LOCA sequences (MAAPs 13-04, 13-06, 13-07, 13-08) to verify that a stable plant condition could be achieved for a minimum mission time of 24 hours. The review included verification whether individual SSCs can support the minimum mission time of 24 hours as currently credited in the PRA models. The review concluded that for scenarios where a stable hot shutdown condition was desired, the Condensate Storage Tank (CST) inventory would be depleted in less than 24 hours unless additional secondary inventory was made available. The PRA model at the time of the internal events peer review did not contain the equipment or operator actions necessary to assess	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			Systems Analysis and Human Reliability sections of this Standard, to demonstrate that a successful outcome is achieved. **Basis for Significance:** Notebook E.16, Revision 0 states "A 24 hour mission time is assumed sufficient to obtain a stable plant condition, either hot standby or cold shutdown after an initiating event has occurred." This SR requires verification that a safe, stable endpoint is obtained, and specifies using a minimum mission time of 24 hours. No discussion could be found that verified that each accident sequence actually reached a safe stable state at 24 hours could be identified. **Possible Resolution:** Each accident sequence needs to be reviewed to ensure that the 24 hour mission time is valid to reach a safe stable state, and this review needs to be documented. For any accident sequence that is identified that does not reach a safe, stable state at 24 hours, the time to reach a safe, stable state needs to be identified, and the model updated accordingly. If RHR entry conditions are met prior to 24 hours, then entry into shut down cooling (use of RHR for long term heat removal) needs to be included in the accident sequence, or a valid reason for not modeling RHR needs to be provided.	whether a stable state was reached using Auxiliary Feedwater (AFW) cooling along. For the Internal Events model, long-term AFW cooling is credited only if the Closed Loop Residual Heat Removal (RHR) cooling is not available. In the Fire PRA, only long-term AFW cooling is credited; Closed Loop RHR cooling is not credited. For Small LOCA (SLOCA) sequences, a RCS leakage and injection by itself is not sufficient to cooldown and bring the RCS pressure to the RHR entry condition. These sequences require AFW cooling to reduce the RCP pressure and temperature prior to depletion of the Refueling Water Storage Tanks (RWST) and switch-over to the RHR Containment Recirculation. The results of the TH runs for various sizes of small LOCA show that the existing CST volume is sufficient to support such secondary cooling function. Therefore a supplemental secondary inventory supply within 24 hour mission time is not required to mitigate Internal Events or fire induced SLOCA sequences. For Medium and Large LOCA (MLOCA and LLOCA) sequences, the TH runs indicate that the RCS is rapidly depressurized and the additional cooling via the AFW is not necessary. Therefore a make-up to the CST within 24 hour mission time is not required to mitigate MLOCA or LLOCA sequences.	

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
				As discussed above, supplemental secondary inventory is required for non-LOCA scenarios in order to maintain a stable hot shutdown condition for a minimum of 24 hours. The Fire and Internal Events models are updated to incorporate additional inventory requirements by adding the equipment necessary to align alternate AFW water supply sources and an operator action based on the existing Operating Procedures. (AR PK 10-01 and OP D-1:V). For LOCA scenarios, Residual Heat Removal (RHR) is required and modeled within the FPRA to reach a stable end state. In order to ensure that a stable end state is reached in the fire analysis, the FPRA model was updated to include a required supplemental water supply to AFW for non-LOCA scenarios.	
SC-A5	SC-A5-02, NOT MET, mission time	Closed	**Discussion:** This SR states: SPECIFY an appropriate mission time for the modeled accident sequences. For sequences in which stable plant conditions have been achieved, USE a minimum mission time of 24 hours. Mission times for individual SSCs that function during the accident sequence may be less than 24 hours, as long as an appropriate set of SSCs and operator actions are modeled to support the full sequence mission time. For example, if following a LOCA, low pressure injection is available for 1 hour, after which recirculation is required, the mission time for LPSI may be 1 hour and the mission time for recirculation may be 23 hours. For sequences in which stable plant conditions would not be achieved by 24 hours using the modeled plant equipment and human actions, PERFORM additional evaluation or modeling by using an appropriate technique. Examples of appropriate techniques include:	Reviewed success criteria and verified 24 hours is acceptable Looked at MAAP runs. E.16 Rev 1 Documentation revised to include some text of this review: MAAP Calcs were reviewed (MAAP 13-06, 13-07, 13-08) and run past 24 hours to verify that a safe stable state was achieved. RHR entry conditions were also reviewed for the applicable accident sequences. For LOCA scenarios, Residual Heat Removal (RHR) is required and modeled within the FPRA to reach a stable end state. In order to ensure that a stable end state is reached in the fire	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			(a) assigning an appropriate plant damage state for the sequence; (b) extending the mission time, and adjusting the affected analyses, to the point at which conditions can be shown to reach acceptable values; or (c) modeling additional system recovery or operator actions for the sequence, in accordance with requirements stated in the Systems Analysis and Human Reliability sections of this Standard, to demonstrate that a successful outcome is achieved. **Basis for Significance:** Several accident sequences were identified where RHR entry conditions were met prior to 24 hours, but RHR was not required for success in the accident sequence. If RHR is not questioned, then the end state may not be stable since heat removal via the SGs will be diminished as decay heat lowers, and RHR will be required to maintain temperatures long term. **Possible Resolution:** Ensure that all accident sequences are modeled to the actual safe, stable end state. If RHR entry conditions are met prior to 24 hours, then entry into shut down cooling (use of RHR for long term heat removal) needs to be included in the accident sequence, or a valid reason for not modeling RHR needs to be provided.	analysis, the FPRA model was updated to include a required supplemental water supply to AFW for non-LOCA scenarios. A new Top Event "AWR" representing long term availability of the AFW supply water is modeled. Associated event trees (i.e., FIRELTREE and SLTREE) and their split fraction rules and event. Update: A new Top Event "AWR" representing long term availability of the AFW supply water is modeled. Associated event trees (i.e., LATETREE and SLTREE) and their split fraction rules and event tree structures were modified to incorporate the new top event. PRA Calcs C.4.2 and E.2 were updated to reflect the above changes.	
SC-B3	SC-B3-01, NOT MET, Associated SRs: SC- B1 (CC-II), IE-B4 (MET), IE-C1 (MET), IE-C13 (CC-I/II), LOCA break sizes	Closed	**Discussion:** SR SC-B3 states "When defining success criteria, USE thermal/hydraulic, structural, or other analyses/evaluations appropriate to the event being analyzed, and accounting for a level of detail consistent with the initiating event grouping (HLR-IE-B) and accident sequence modeling (HLR-AS-A and HLR-AS-B)." **Basis for Significance:** The current success criterion for LOCAs is based on plant capabilities and system responses. The specific break sizes associated with the transitions between the LOCA definitions have not been adequately justified. Based on PRA12-14, several MAAP analyses have been performed to verify the equipment needed to successfully respond to the break size (runs are done for 1, 2, 3, 5, 7, 12, and 16 breaks), but no runs could be found to validate the transition points between the break sizes. Per the requirement, thermal hydraulic evaluations are required at a level of detail to support	Additional MAAP runs were performed to define new LOCA break size (MAAP 13-03 Rev 0). SLOCA < 2.75" 2.75" < MLOCA < 6" LLOCA > 6" SLOCA and MLOCA frequencies were updated and documented in H.1.6 Rev 8. Calc E.16 Revision 1 (Success Criteria) incorporated these changes.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			the definitions/break sizes so that the appropriate initiating event frequencies can be determined. **Possible Resolution:** Perform additional thermal hydraulic analyses to determine the actual LOCA break sizes where the success criteria changes (e.g., break size above which Charging is not sufficient, break size where Containment Spray is first required, etc.). Once the new break sizes are determined, determine the correct Initiating Event frequency associated with the newly defined break ranges.		
SC-B3	SC-B3-02, NOT MET, Associated SR: SC-B1 (CC-II), verify Small Loss of Cooling Accident (SLOCA) size via MAAP	Closed	**Discussion:** This SR states "When defining success criteria, USE thermal/hydraulic, structural, or other analyses/evaluations appropriate to the event being analyzed, and accounting for a level of detail consistent with the initiating event grouping (HLR-IE-B) and accident sequence modeling (HLR-AS-A and HLR-AS-B)." **Basis for Significance:** In Calculation E16, Revision 0, (which is not referenced anywhere in the discussion of ISLOCAs in the body of the E16 Calculation), the MAAP analysis referenced for the success criteria validation is based on an 8 inch ISLOCA, and not on a 2 inch ISLOCA. The use of an 8 inch break size is inappropriate because the required equipment and timing associated with responding to a 2 inch break would be significantly different than the required equipment and timing associated with an 8 inch break. Additionally, the E16 Calculation implies that the RHR pumps are unavailable due to a lack of suction from the sump, but the ISLOCA Calculation (which is not referenced anywhere in the E16 Calculation), C.4.7 Revision 8, makes an assumption that the RHR pumps would be unavailable since they would be subjected to extreme pressures/temperatures. The assumption that the RHR pumps would be unavailable during all ISLOCA sequences is overly conservative compared to industry norms for modeling ISLOCAs, and compared to the modeling at similar power plants. This assumption should be re-evaluated to be more realistic and in-line with current industry practices.	E.16 updated (Revision 1) to include ISLOCA MAAP Calculation with a 2.75" break for success criteria. To be consistent with the updated SLOCA success criteria (previously a break size < 2.0", but now < 2.75"), the lower break size limit for ISLOCA of 2.75" was analyzed. According to MAAP case HR-OL-01b, the flow rate from a 2.75" break at 570 F immediately following a LOCA is approx. 4660 GPM (MAAP break flowrate of 166381 LB/HR with density of 5.9478 lb/gal). For a 2" break, case HR-OL-01a, the break flowrate is approx. 2470 GPM (MAAP break flowrate of 880045 LB/HR with density of 5.9478 lb/gal). Top Event SM was changed to reflect 2.75" break size and leak rate. Sections E.10.4.3 and E.10.5.3 of Calc E.10 Revision 10 reflects this change.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			Possible Resolution: Perform additional MAAP analyses of smaller ISLOCA sizes to verify that the success criteria specified is valid, and update as appropriate.		
SC-B4	SC-B4-01, MET, define Large Break Loss of Coolant Accidents (LBLOCAs)	Closed	**Discussion:** This SR states "USE analysis models and computer codes that have sufficient capability to model the conditions of interest in the determination of success criteria for CDF, and that provide results representative of the plant. A qualitative evaluation of a relevant application of codes, models, or analyses that has been used for a similar class of plant (e.g., Owner's Group generic studies) may be used. USE computer codes and models only within known limits of applicability." **Basis for Significance:** The MAAP code is used in support of all LOCA break sizes at DCPP. However, the MAAP code has known limitations with respect to its modeling of large LOCAs, and is not a valid code to use for determining success criteria for LBLOCAs. Although the limitations of the MAAP code are included in the MAAP 4 Users Guide, they are not summarized anywhere in the DCPP analyses, so it is not clear that the limitations of the code were considered when developing the DCPP success criteria. **Possible Resolution:** Define the success criteria for LBLOCAs based on the criteria in the FSAR or on a specific analysis using a computer code that is capable of evaluating LBLOCAs such as CENTS, RETRAN, or RELAP.	The success criteria from the design basis analysis is consistent with the MAAP based success criteria and a review of this non-MAAP based accident analysis shows that the current PRA model success Criteria is appropriate.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
SC-B4	SC-B4-02, MET, ATWT definition	Closed	**Discussion:** This SR states "USE analysis models and computer codes that have sufficient capability to model the conditions of interest in the determination of success criteria for CDF, and that provide results representative of the plant. A qualitative evaluation of a relevant application of codes, models, or analyses that has been used for a similar class of plant (e.g., Owner's Group generic studies) may be used. USE computer codes and models only within known limits of applicability." **Basis for Significance:** The discussion in E.16, Revision 0, associated with the Anticipated Transient Without Trip (ATWT) scenarios of concern and the success criteria for ATWT is not consistent. Table E.16.2 identifies 12 ATWT scenarios, but the success criteria developed does not clearly consider each of these ATWT scenarios. Section E.16.5.6 states that the	Conditions in Table E.16-3, and the MC top event of Attachment 4 of Calc E.16 (Revision1) were updated to be consistent with the current model, and Attachment 8. The basis for the change in Unfavorable MTC threshold from -7 to -5.5 is explained in the Rev 7 notes of E.11 which updates "the MTC issue based on new information for cycle 10, which begins on Unit 1 in March, 1999. The fuel constitution for cycle 10 is substantially different than cycle 9 with respect to the value being used for top event MC. The new MC value is .01, using a threshold of -5.5 pcm per	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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			success criteria for ATWT is developed for the following criteria and the success criteria is discussed in detail in Attachment 8: ATWT 1 - Turbine Trip Successful, Power Level > 80%, MTC < -7 pcm/F or Turbine Trip Successful, Power Level < 80%, MTC > -7 pcm/F ATWT 2 - Turbine Trip Successful, Power Level > 80%, MTC > -7 pcm/F ATWT 3 - Turbine Trip Successful, Power Level < 80%, MTC < -7 pcm/F ATWT 4 - Turbine Trip Fails But Attachment 8 is not based on these criteria. Attachment 8 evaluates: 1. Turbine trip within 30 seconds; 100% power; MTC< -5.5 pcm/°F. 2. Turbine trip within 30 seconds; 80% power; MTC > -5.5 pcm/°F. 3. Turbine trip within 30 seconds; 100% power; MTC > -5.5 pcm/°F. 4. Turbine trip within 1 minute; 80% power; MTC < -5.5 pcm/°F. 5. No turbine trip. 6. Main feedwater lost. 7. Turbine trip and reactor coolant pump coastdown. None. Core melt assumed if these events combined with a failure to trip. Calculation File C.4.6, Revision 9, states that the basis for the MTC of -7pcm/F could not be identified, but no definitive answer as to the basis for the -5.5 was provided either. The actual criteria for DCPP specific ATWT conditions needs to be defined, justified, and evaluated for system response required to mitigate the ATWT. **Possible Resolution:** Determine what the DCPP ATWT definition is (DCPP specific pcm/F values) and determine the actual system level success criteria required to mitigate the various ATWT accident sequences.	degree F instead of -7 pcm per degree F. This is consistent with new analysis and the cycle 10 fuel loading characteristics to ensure that RCS pressure does not exceed 3200 pounds. The system transient analysis, reactor and Westinghouse fuel engineers have been consulted and documentation has been provided from Westinghouse to PG&E concurrent with this change." – AR0445958	
SC-B5	SC-B5-01, MET, crediting PORVs for	Closed	**Discussion:** This SR states "USE analysis models and computer codes that have sufficient capability to model the	The impact of not crediting feed and bleed for small LOCA scenarios was	This is resolved. There is no impact

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	depressurization when AFW not available		conditions of interest in the determination of success criteria for CDF, and that provide results representative of the plant. A qualitative evaluation of a relevant application of codes, models, or analyses that has been used for a similar class of plant (e.g., Owner's Group generic studies) may be used. USE computer codes and models only within known limits of applicability." **Basis for Significance:** In Calculation File B.1, Revision 0, there is a documentation of a comparison of success criteria for DCPP to the success criteria at similar plants. One outlier was noted. This outlier is that the success criteria for a small LOCA without AFW available is assumed to result in core damage at DCPP, but the use of PORVs to depressurize and cooldown is credited at similar plants. The basis for not crediting the use or PORVs at DCPP for depressurization and cooldown is not documented, and discussions with plant PRA personnel did not identify any reason that the PORVs could not be credited at DCPP. Since the PORVs appear to be a valid option at DCPP, they should be credited in these accident sequences. **Possible Resolution:** Update the accident sequence progression for Small LOCAs and include credit for using the PORVs to depressurize and cooldown for those sequences where AFW is not available, or justify not crediting it. If the Emergency Operating Procedure (EOP) network uses the PORVs for this application, it should be credited in the PRA.	determined to be approximately 1E-8/yr CDF (Reference 36). Although the risk benefit for this credit is not significant, it could contribute some risk benefit in certain configurations, such as an AFW pump being inoperable. Therefore, the DCPP PRA model has been updated to ensure that small LOCA scenarios correctly credit the use of feed and bleed when appropriate. References: 1. PG&E PRA Calculation File PRA 13-13, Rev 0, "Small LOCA Feed and Bleed"	on the ILRT Extension Risk Analysis.
SC-C2	SC-C2-01, NOT MET, not clear process of developing the success criteria	Closed	**Discussion:** The process followed for developing the success criteria for each accident scenario is not clearly documented. For example, there are two definitions of core damage used, the basis for the timing of human actions is not clear (two criteria used - but nothing showing why both are acceptable), the limitations of the software used for the success criteria is not documented, etc. **Basis for Significance:** The overall process used to develop the DCPP success criteria, including identification of the supporting engineering bases, inputs, methods, and results is not clearly documented. Particular items noted include: There are two definitions of core damage used in the DCPP - and there should only be one. (See F&O SC-A1-01)	Removed the collapsed water level definition of Core Damage and now use Peak Node temperature of greater than 1800°F. The use of collapsed water level is conservative for HRA timing evaluation. In addition, the conservatism is limited due to the short amount of time between uncovery of active fuel and peak clad temperature of 1800°F. Limitations of computer codes addressed in SC-B4-01. Impact of	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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			The calculations used to support the success criteria for various accident sequences is not always clearly identified - for example, the basis for the ATWT success criteria is not clear, and the discussion in the E.16 Report uses two difference criteria for pcm/F. (See F&O SC-B4-02) The limitations associated with the computer codes used in support of the success criteria are not documented in the DCPP calculations or reports. The bases for establishing the time available for human actions is suspect since some of the HRAs are based on a core damage of 1800°F, while others are based on a core damage definition of "water below top of active fuel" - the use of 2 different definitions of core damage is incorrect, plus there is no discussion as to when/how it was determined which timing to use for which operator action - should base the time available for all operator actions on the core damage definition of 1800° F peak clad temperature. **Possible Resolution:** Update the documentation to specifically address the elements identified in the SC SR. At a minimum, the list provided in SC-C2 should be reviewed, and the applicable items listed in the SR should be clearly documented in the Success Criteria calculation/document.	ATWT success criteria addressed in SC-B4-02.	
SC-C3	SC-C3-01, NOT MET, Associated SRs: IE- D3 (NOT MET), SY- C3 (NOT MET), Documenting source of uncertainties	Closed	**Discussion:** This SR states: Document the sources of model uncertainty and related assumptions (as identified QU-E1 and QU-E2) associated with the development of success criteria. There is a similar requirement to document sources of uncertainty and assumptions for the other elements of the PRA as well. **Basis for Significance:** A review of many of the PRA elements identified that there was not summarization of the sources of uncertainty or assumptions associated with the individual PRA element. The documentation of these items is required by the standard, and these items should be used as the basis for determining which sensitivity studies need to be performed for the PRA.	PRA Calculation B.1 (Revision 1) and C.10 (Revision 5) documents the assumptions and uncertainties associated with each technical elements of different hazard groups. As suggested in this F&O, these documents have been updated by systematically reviewing PRA development documents (e.g., system notebooks, success criteria notebook, event-tree notebooks, etc.).	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			Possible Resolution: Go through each of the individual PRA element reports and calculations and identify and summarize the sources of uncertainty and the assumptions associated with the element being documented. These sources of uncertainty and assumptions should then be used as the basis for determining what sensitivity studies need to be performed for the DCPP PRA.		
SY-A4	SY-A4-01, NOT MET, walkdown and interview	Closed	**Discussion:** PERFORM plant walkdowns and interviews with knowledgeable plant personnel (e.g., engineering, plant operations, etc.) to confirm that the systems analysis correctly reflects the as-built, as-operated plant. **Basis for Significance:** Based on discussion with DCPP PRA personnel, neither plant walkdowns nor interviews with knowledgeable plant personnel were performed to confirm that the systems analysis correctly reflects the as-built, as- operated plant. This is required for CC-II/III. **Possible Resolution:** Perform walkdowns and interviews.	DCPP PRA models were prepared by industry and in-house experts in 1988. Per the PRA configuration control programs (i.e., TS1.NR3 and AWP E-028), DCPP PRA has been updated as needed to reflect the as-built and as-operated plant (e.g., review of the procedure changes, design changes, equipment reliability, etc.). The models and their technical elements have been continuously refined and/or corrected for errors through their uses in applications. Many different talk-throughs of accident scenarios have been performed since the original development of the PRA that confirm the accuracy of the accident response model. Attachment 1 to HRA Calculation G.2, "Human Action Analysis – Failure Likelihood and Range Factor Calculation, Revision 6 dated November 2012 document the operator and training personnel interviews that were conducted the fall of 2012 to review PRA initiators and consider whether any initiators or initiating event categories had been omitted. The similar operator interviews were documented in Attachment 3 of Calc H.1.6 Revision 8.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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				In addition, new MAAP runs (documented in PRA12-13 "MAAP HRA Cases") were performed and the human error probabilities (HEPs) were updated to reflect the new timing. It is not likely the current models including Internal Events and Fire still contain gross model errors or assumptions which result in significant deviation from the as- built/as-operated plant condition or configuration. Numerous walkdowns performed for the Fire and Seismic PRAs have been performed within the last 5 years and no evidence that the systems analysis differs from the as-built, as-operated plant was noted.	
SY-A16	SY-A16-01, NOT MET, Associated SR: HR- A1 (NOT MET), modeling of pre-initiators	Closed	**Discussion:** In the system model, INCLUDE Human Factors Engineering (HFEs) that cause the system or component to be unavailable when demanded. These events are referred to as pre-initiator human events. (See also Human Reliability Analysis, 2-2.5.) **Basis for Significance:** Review of the AFW system fault tree indicates that no pre-initiator HFEs are modeled. Given that the AFW is a standby system, at least one pre-initiator HFE (e.g., failure to restore pump after maintenance or testing) is expected to be in the model. Related SR HR-A1 and F&O HR-A1-01. **Possible Resolution:** Either model the pre-initiator and others like it in other standby systems and trains or justify and document why it is not needed.	Pre-initiators review was performed and pre- initiator HFEs were identified in G.1 Rev 2. All newly identified miscalibration and misposition HFEs were included in the PRA model.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
SY-A20	SY-A20-01, NOT MET, simultaneous unavailability of redundant SSCs	Closed	**Discussion:** INCLUDE events representing the simultaneous unavailability of redundant equipment when this is a result of planned activity (see DA-C14). **Basis for Significance:** Per discussion with DCPP PRA personnel, simultaneous unavailability of redundant safety-related equipment due to planned activity is excluded from	Simultaneous unavailability of redundant safety- related equipment due to planned activity is excluded from consideration. This is consistent with TS 3.0.3 restrictions for safety-related equipment.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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			consideration. This is consistent with Technical Specification (TS) 3.0.3 restrictions for safety-related equipment. This assumption is reasonable. However, this approach is not documented. In addition, this assumption is probably not appropriate for non-safety equipment, whose unavailability is not restricted by TS. An example of this is multiple IA compressors concurrently out of service. **Possible Resolution:** Either account for allowed simultaneous of redundant equipment or document justification of it is not modeled.	Examination of the 12-week rolling MOW matrix at DCPP did not identify any planned, repetitive activity which would cause coincident unavailability due to maintenance for redundant equipment (both intra-system and intersystem). Calculation or modeling of coincident maintenance unavailability was therefore unnecessary. The above justification was included in Section H.1.2 of PRA Calculation H.1 Revision 1.	
SY-A23	SY-A23-01, MET, consistent system model nomenclature	Closed	**Discussion:** DEVELOP system model nomenclature in a consistent manner to allow model manipulation and to represent the same designator when a component failure mode is used in multiple systems or trains. **Basis for Significance:** Based on discussion with DCPP PRA personnel, consistent system/component failure mode nomenclature is used in all system notebooks, except the AFW notebook. This occurred as a result of a modeling oversight. **Possible Resolution:** Correct condition for AFW and document system/component failure model nomenclature.	The AFW basic events were renamed to be consistent with system/component failure mode nomenclature used throughout the PRA model. The changes are documented in PRA Calc E.2 Rev 12.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
SY-B3	SY-B3-01, NOT MET, CCF groups	Closed	**Discussion:** ESTABLISH common cause failure groups by using a logical, systematic process that considers similarity in (a) service conditions (b) environment (c) design or manufacturer (d) maintenance JUSTIFY the basis for selecting common cause component groups. Candidates for common cause failures include, for example: (a) motor-operated valves (b) pumps (c) safety-relief valves	Common Cause failure of Safety Inject (SI) system components is modeled and common cause groups are defined within the model. The review comment is that the common cause groups are not documented in the system notebook. Documentation was revised for all systems to specifically list the common cause that is modeled.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			(d) air-operated valves (e) solenoid-operated valves (f) check valves (g) diesel generators (h) batteries (i) inverters and battery charger (j) circuit breakers **Basis for Significance:** No documentation was found for the Common Cause Failure (CCF) group definition for the SI top event. DCPP PRA staff indicated that this is a known gap. For other systems, CCF groups appear to generally be defined inside of RISKMAN files but not in the documentation. **Possible Resolution:** Close gaps in CCF group definitions and basis in all system notebooks.		
SY-B8	SY-B8-01, NOT MET, Associated SR: SY-B14 (MET), spatial and environmental hazards impacting multiple SSCs	Closed	**Discussion:** IDENTIFY spatial and environmental hazards that may impact multiple systems or redundant components in the same system, and ACCOUNT for them in the system fault tree or the accident sequence evaluation. **Basis for Significance:** No discussion of room heatup and dependence on HVAC could be found in the sampled system notebooks. No discussion of spatial and environmental dependencies could be found in the sampled system notebooks. After discussions with DCPP personnel, we identified additional documentation not provided earlier that was available to potentially address these gaps. However, the SNBs do not have this discussion nor references and therefore the PRA does not meet this SR. **Possible Resolution:** Provide a discussion of spatial and environmental dependencies in each system notebook. Incorporate any impacts from these considerations on SSCs in the system notebooks documentation as well in the models.	The IEPRA incorporated the results of room heat-up calculations and system success dependency on HVAC. The results of room heat-up calculations provide a basis for operator action timing or to demonstrate that a loss of cooling would not impact modeled SSCs. A SSC requiring cooling is considered failed if the cooling is not available due to failure of the HVAC SSC and if operators fail to establish alternate ventilation/cooling within the time estimated based on the room heat-up calculations. Documentation of the effects of room heatup is available and references plant specific room heatup calculations. These results are not reiterated within the individual system notebooks but system modeling is consistent with the room heatup calculations.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.
SY-B10	SY-B10-01, NOT MET,	Closed	**Discussion:** MODEL those systems that are required for initiation and actuation of a system. In the model quantification, INCLUDE the presence of the conditions needed for automatic	PG&E performed a systematic evaluation of modeling of permissives and interlocks in the Internal Events	This is resolved. There is no impact on the ILRT

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	modeling of permissive and interlocks		actuation (e.g., low vessel water level). INCLUDE permissive and lockout signals that are required to complete actuation logic. **Basis for Significance:** The treatment of permissive and interlocks could not be located in the system notebooks. **Possible Resolution:** Model permissive and interlocks and document in system notebooks.	PRA (IEPRA) and documented in PRA Calc 14-01, Rev 1. The evaluation includes identification and modeling of (1) those systems that are required for initiation and actuation of a system, (2) the conditions needed for automatic actuation (e.g., low vessel water level), and (3) control features (e.g., protection and control permissive, lock-out signals, and component interlocks that are required to complete actuation logic, as required in the Supporting Requirement (SR) of Section 2 of AMSE/ANS RA-SA-2009 Standard. Based on the results of the review, permissive and interlocks of the following SSCs are included in the Internal Events model; 8701/8702, 8982A/B, and 9003A/B, 8804A/B.	Extension Risk Analysis.
SY-B15	SY-B15-01, NOT MET, intersystem operator dependency	Closed	**Discussion:** INCLUDE operator interface dependencies across systems or trains, where applicable. **Basis for Significance:** A review of several system notebooks indicate that DCPP did include human actions that had the potential to impact multiple trains of a given system (miscalibration) and actions from one system that could impact the function of another system. **Possible Resolution:** Close gap.	To address this F&O, the DCPP procedures were reviewed to identify realignment and calibration activities for all systems and components including any dependencies between activities and components. This review was performed in order to be consistent with the ANS/ASME Standard supporting requirements and is documented in revision 2 of PRA calculation G.1. As a result of this review, additional pre-initiator HFEs were identified in standby systems and were quantified using the EPRI HRA Calculator THERP module. Although pre-initiator dependency across Trains was identified due to misposition and included in the DCPP HFEs, none of the HFEs involved miscalibration across systems or trains.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
SY-C2	SY-C2-01, NOT MET, Associated SRs: SY- A22 (CC-II), SY-B1 (MET), SY-B3 (NOT MET), SY-B6 (MET), SY-B7 (CC-II), SY-B9 (MET), SY-B11 (MET), documentation	Closed	**Discussion:** DOCUMENT the systems analysis in a manner that facilitates PRA applications, upgrades, and peer review. **Basis for Significance:** SY-A22: Based on discussion with DCPP PRA personnel, credit for system operability is taken only if design capabilities are not exceeded. This modeling assumption should be documented in the system notebooks. SY-B1: NUREG/CR-5485 for CCF is not referenced in the documentation related to modeling intra-system common cause failures. SY-B6: The need for the HVAC system support is not discussed in the SI system notebook. This and other system notebooks should be reviewed and, if appropriate, revised to describe HVAC dependencies. SY-B7: Success criteria and timing is not discussed in the system notebooks. Success criteria are provided but references are not provided. For example, a reference or basis for the assumed time for high pressure recirculation of 18 hours is not provided in the high pressure system notebook. Similarly, no discussion of the potential for and effects of room heat-up in system notebooks reviewed. This information should be documented in the system notebooks. SY-B9: References need to be added to the system notebooks to describe HVAC dependency. SY-B11: Gaps were found in the system notebooks regarding the discussion of available inventories of air, power, and cooling to support the mission time. **Possible Resolution:** Ensure that all system notebooks address the above issues and that the system models address these issues appropriately.	SY-A22: Calc File E.17 Rev 0 states the following: "No credit is taken for component or system operability for beyond design rated capabilities unless supported by appropriate testing, engineering analysis or operational data." SY-B1: NUREG/CR-5485 for CCF is now referenced in H.1 Rev 1 SY-B6/B9: Room Heat-ups and thermal fragilities are explained in E.16.5.8 of the Success Criteria Notebook. The original analysis for mission time ventilation requirements - Appendix A of PLG-0637 was added to E.16. This document shows that only the SSPS and the 480V switchgear are vulnerable to loss of ventilation during the mission time. All other systems which normally use ventilation systems do not need them to operate within the mission time. New revisions of these notebooks put the ventilation requirement more prominently in the main body under the heading, "Support Systems." Furthermore, these new revisions contain references to PLG-0637 (where the ventilation requirement is determined). SY-B7: *All system notebooks were reviewed for mission times and timing success criteria, and the following changes were made: *The Success Criteria section for E.4 "ECCS high pressure system" Rev10 has been completely rewritten with	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
				references to 6-hour and 18-hour mission times removed. No model change is required since a 24-hour mission time was previously used, and continues to be used. *D.2.1.2 "125V vital DC system" Rev10 has the following text added to the Success Criteria section: "A 2-hour mission time is considered sufficient because transfer to the startup power source or the diesel generators is automatic and nearly instantaneous; and in the case that human action is required to restore the 4kV busses, 21 minutes is the time it takes for operators to manually perform the transfer according to the analyses done for ZHEAC1 and ZHEAC2 found in the HRA Calculator Report (Reference 35)." *References were added to D.2.8 "AMSAC System" *Calc E.11 Revision 11 - Top Event RS Success Criteria was revised to remove timing criteria and state that the top event is not credited in the current model. *The success criteria in E.3.4.3 was revised for top events OB, OBS, and PO such that there is no explicit requirement for the PORVs to remain open for six hours. *Reference to G.4 Electric Power Recovery Model was added to D.2.1.5 Rev 12 Diesel Generator Systems and D.2.1.6 Rev 11 Diesel Transfer System to help justify the 6-hour mission time for non-seismic	

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				events in the Success Criteria Subsection. SY-B11: Section E.16.5.10 was added to Success Criteria Notebook Calc E.16 Revision 1 which includes discussion about available inventories of air, power, and cooling to support mission times.	
HR-A1	HR-A1-01, NOT MET, Associated SRs: HR- A2 (NOT MET), SY- A16 (NOT MET), pre-initiator HRAs	Closed	**Discussion:** Supporting requirements HR-A1 and A2 discuss the identification of pre-accident HRA based on whether the procedure or practice involves realignment (A1) or calibration (A2). Per the standard, these criteria should be performed before going to the screening method performed in Attachment 4. **Basis for Significance:** Some potential pre-accident HRAs could be screened too early. **Possible Resolution:** Review the procedures and practices against whether it involves realignment or calibration.	To address this F&O, DCPP procedures were reviewed to identify realignment and calibration activities. This review was performed in order to be consistent with the ANS/ASME Standard supporting requirements HR-A1 and HR-A2. This review is documented in revision 2 of PRA calculation G.1. As a result of this review, additional pre-initiator HFEs were identified for inclusion into the PRA model and were quantified using the EPRI HRA Calculator THERP module. These new HFEs were incorporated into the PRA model.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
HR-A3	HR-A3-01, MET, preinitiator HRAs	Closed	**Discussion:** Pre-initiator HRA screening criteria 3D could remove restoration errors prematurely. If a system or train is automatically actuated following an event, then a restoration error of manual valves in the flow path could be missed. Examples include mis-positioning of a valve in the standby CCW pump train if it receives an automatic start signal on low header pressure and misposition of a valve in SI pump train if the valve does not automatically open on an ESFAS signal. **Basis for Significance:** Mispositioned events could be missed in the modeling. **Possible Resolution:** Review the process for identifying pre-accident HRAs.	Screening criterion 3D was faulty in that it included system or component automatic actuation. As the F&O correctly points out, a system may be automatically actuated without changing the position of the component in question. To address this F&O, all of the screening criteria, including criterion 3D, were reviewed and revised as necessary to ensure that the criteria applied specifically to the component being operated/calibrated. The DCPP procedures were then reviewed against the new criteria to identify realignment and calibration activities. This review is	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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				documented in revision 2 of PRA calculation G.1.	
HR-C3	HR-C3-01, NOT MET, consideration of mis-calibration	Closed	**Discussion:** HR-C3 states "INCLUDE the impact of miscalibration as a mode of failure of initiation of standby systems." While the pre-accident HRA document discusses the reasons for not including common miscalibration, the PRA Standard requires inclusion of miscalibration events. **Basis for Significance:** The exclusion of the miscalibration contradicts to the requirement. **Possible Resolution:** Include the consideration of miscalibration.	To address this F&O, the DCPP procedures were reviewed to identify realignment and calibration activities. This review was performed in order to be consistent with the ANS/ASME Standard supporting requirements and is documented in revision 2 of PRA calculation G.1. As a result of this review, new pre-initiator mis-calibration HFEs were identified and were quantified using the EPRI HRA Calculator THERP module. These new HFEs were incorporated into the PRA model.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
HR-D3	HR-D3-01, CC-I, pre-initiator HFEs	Closed	**Discussion:** The detailed pre-accident HFEs in Section G.1.3.3 do not discuss the quality of procedures, administrative controls, or Man-Machine Interface (MMI) requirements in performing the assessments. **Basis for Significance:** The quality of procedures, administrative controls, and human-machine interface reviews are required to meet CC-II/III requirements in HR-D3. **Possible Resolution:** Address the issues identified in this F&O.	New sections (G.1.4.3.1.6, G.1.4.3.2.6, and G.1.4.3.3.6) dealing with procedure and human- machine interface quality has been added to G.1 Rev. 2.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
HR-E1	HR-E1-01, MET, Associated SR: SY-A17 (MET), crediting manual verification steps when auto failed	Closed	**Discussion:** This SR States: When identifying the key human response actions REVIEW: (a) the plant-specific emergency operating procedures, and other relevant procedures (e.g., AOPs, annunciator response procedures) in the context of the accident scenarios (b) system operation such that an understanding of how the system(s) functions and the human interfaces with the system is obtained. **Basis for Significance:** Currently, there are no operator actions associated with starting pumps or aligning valves even when the EOP network specifically states "Verify" pump started or "Verify" valve open/closed. In the event the automatic signal	The basis for significance is incorrect. The DCPP PRA does credit operator actions that manually start pumps and operate valves when the automatic signal fails. Data variable ZHEOS1 addresses the manual start of ESF pumps and the operation of ESF valves on failure of the SSPS signal. Additionally the DCPP PRA credits the manual start and/or alignment of standby equipment upon failure of the running train. Basic events CCOP2, aligning the backup CCW heat	No issues were identified. There is no impact on the ILRT Extension Risk Analysis.

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			fails to start the pump or align the valve, credit should be taken for the Operator backing up the automatic signal. **Possible Resolution:** Review the EOP/AOP Procedure network and identify those pumps/valves whose desired function is "Verified" by the Operators, and add an Operator action to perform the action given failure of the automatic signal.	exchanger on failure of the running CCW heat exchanger and CVHE1, transferring to the unselected control room ventilation sub train, are two examples. A review was performed to verify that no manual recovery for failure of an automatic signal that could be credited was missed. In order to avoid unnecessary complexity in the PRA model, the scope of the review was limited to risk significant basic events. The risk significant basic events were reviewed in conjunction with the emergency operating procedures (EOPs) to determine if any additional manual recoveries of automatic signal failures could be found. No additional operator actions were identified that could mitigate the failure of an automatic signal for risk significant components. Therefore, no change to the DCPP PRA model is required.	
HR-E3	HR-E3-01, CC-I, consistent interpretation of procedures	Closed	**Discussion:** This SR States: TALK THROUGH (i.e., review in detail) with plant operations and training personnel the procedures and sequence of events to confirm that interpretation of the procedures is consistent with plant observations and training procedures. **Basis for Significance:** Attachment 1 of Calculation G.2, Revision 6, summarizes the talk through performed with Operations and Training personnel. However, there is no discussion on how the specific scenarios discussed were selected, the questions posed to the Operators, the entire sequence of procedures followed in the response to the accident sequence, etc. Additionally, all that is contained in Attachment 1 is a summary of the PRA interpretation of the talk-through, but the actual Operator interview sheets are not included.	Operator interviews were re-performed and documented in the G.2 Rev 7 HRA database for each applicable operator action. Many different talk-through of accident scenarios have been performed since original development of the PRA that confirm the accuracy of the accident response model. Attachment 1 to Calculation G.2 identifies the scenario types that were discussed with four separate operators and with training, including the procedure path that would be followed. The interviews focused on the key scenarios such as LOCA, loss of AFW, and SGTR that are known to	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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			Without having the basis for why the scenarios discussed were selected, it is not possible to ensure that the most risk-significant, or important Operator actions were discussed. Additionally, without the Operator Interview sheets it is not possible to verify what the operators/trainers said, and that the responses were taken in context. **Possible Resolution:** Provide the basis for the accident sequences discussed, and ensure that the list includes all risk significant operator actions. Find the actual Operator Interview sheets, and include them with the report. For any risk significant operator actions that Operator Interview sheets cannot be found, perform an additional Operator interview, including documentation of the interview, to ensure that the interpretation of the procedures is correct.	be risk-significant. It is common when conducting operator interviews to consolidate scenarios to maximize the benefit of the limited time available with the operators. In addition, routine procedure reviews are performed in order to ensure that procedure changes have not changed the as-built plant response.	
HR-E4	HR-E4-01, CC-I, confirming response models via simulator observations or talk-through	Closed	**Discussion:** This SR States: USE simulator observations or talk-through with operators to confirm the response models for scenarios modeled. **Basis for Significance:** Attachment 1 of Calculation G.2, Revision 6, summarizes the talk through performed with Operations and Training personnel. However, there is no discussion associated with confirming that the response models (i.e., MAAP runs) used to support the PRA are realistic. Additionally, no documentation of the use of simulator observations to confirm the response models can be found. **Possible Resolution:** Category I does not require using simulator observations or talk-through with operators to confirm the response models. However, to get to a Category II/III, a confirmation of the response models, either using simulator observations of operator talk-through, is required.	Simulator observations were performed on 3/27/2014 for response models and a statement is inserted in Section 5 of Calc G.2 Revision 7.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
HR-G5	HR-G5-01, CC-II, Associated SRs: HR- E3 (CC-I), HR-E4 (CC-I), verification of the time estimates in HRA via observation of	Closed	**Discussion:** The required time to complete actions used in the HRA Calculator for is documented in Calculation File G.1 HFE datasheets. These datasheets generally indicate that this time is based on operator interviews. This meets SR Category II. However, because for other HFEs, not basis for the required time is provided. F&O HR-B5-01 documents this deficiency. **Basis for Significance:** The basis for the required time to complete actions used in the HRA Calculator for is not	Operator interviews were re-performed and documented in Section 5, Attachment 1 and HRA database of Calc G.2 Rev 7 for each applicable operator action. Response times were verified via interviews.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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	simulators or walk-through		documented in Calculation File G.1 or in the HRA Calculator file. In order to fully meet SR HR-G5 to Category II, these times should be based on either walk-throughs, talk-through, or simulator observations. **Possible Resolution:** Perform the required walkthroughs, talk-through, or simulator observations and revise the time estimates, if necessary. Document these in the HRA Calculator and Calculation File G2.		
HR-G6	HR-G6-01, MET, combining identical HFEs	Closed	**Discussion:** Section 7.2 of Calculation File G2 documents several checks performed to check the reasonableness of the HEPs of the post initiator HFEs relative to each other. This is considered adequate for the SR to be met. A review of the final set of HFEs indicates that two appear to be essentially identical; these have the same HEPs: ZHFEO4 and ZHFEO5. These two should be combined into one HFE, since the use of both could adversely affect the HRA dependence analysis and the impact of the state of knowledge correlation in the quantified results. This is documented in F&O HR-G6-01. **Basis for Significance:** A review of the final set of HFEs indicates that two HFEs appear to be essentially identical; these have the same HEPs: ZHFEO4 and ZHFEO5. These two should be combined into one HFE, since the use of both could adversely affect the HRA dependence analysis and the impact of the state of knowledge correlation in the quantified results. **Possible Resolution:** Combine HFEs ZHFEO4 and ZHFEO into a single HFE.	Correction: The HFEs referred in this F&O should be read as ZHEF04 and ZHEF05 ZHEFO5 is the HEP for 1 normal power source unavailable. ZHEFO4 is the HEP for both normal power sources unavailable. ZHEFO5 is the HEP for operator action to align a backup power supply to the Diesel Fuel Oil Pump when one of the normal power sources is unavailable. ZHEFO4 is similar except used in cases where both normal power sources are unavailable. These HFEs are similar but not identical The two HEPs never appear in the same cutsets because of the mutually exclusive house event impacts used in the top event split fractions. Because they do not appear in the same cutsets, the dependency between two HFEs is immaterial. The current model is adequate and no model changes are needed. In order to address the reviewer's concern, some documentation changes were made to clarify the diesel fuel oil	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
				modeling. Table 7.1 of Calc G.2 Revision 7 and Section D.2.1.6.5.5 of Calc D.2.1.6 Revision 11 were updated to include better descriptions of the HEPs. Riskman data descriptions were also updated to avoid confusion.	
HR-G7	HR-G7-01, NOT MET, HFE dependencies	Closed	**Discussion:** Section C.9.8 (Human Error Probability (HEP) Dependency Study) and Attachment 7 of Calculation C.9 document the DCPP PRA post initiator HFE dependency analysis. This document discusses a review of dependence between actions, but does not list a set of operator actions that were evaluated or how the dependence between actions is dependent. **Basis for Significance:** DCPP personnel discussed the process used to identify and evaluate HRA dependencies; however, the process does not seem to provide a thorough means for identifying and accounting for dependent human actions. **Possible Resolution:** Evaluate the dependency of HFEs according to the requirements of the SR.	A detailed Internal Events model HRA dependency was performed and documented in PRA Calc G.3, Revision 0. Changes to the Internal Events model were identified and incorporated to DC03.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
HR-H2	HR-H2-01, MET, staffing level assumed in HRA	Closed	**Discussion:** This SR States: CREDIT operator recovery actions only if, on a plant-specific basis, the following occur: (a) a procedure is available and operator training has included the action as part of crew's training, or justification for the omission for one or both is provided (b) "cues" (e.g., alarms) that alert the operator to the recovery action provided procedure, training, or skill of the craft exist (c) attention is given to the relevant performance shaping factors provided in HR-G3 (d) there is sufficient manpower to perform the action. **Basis for Significance:** Calculation G.2, Revision 6, discusses the "normal" staffing levels at the plant and implies that these are the staffing levels used in the analysis. A review of the HRA calculator files shows that the staffing levels listed in the HRA calculator include electricians, Instrument & Controls (I&C), Health Physics (HP), and Chemistry personnel in addition to the Operations staff. Based on discussions with DCPP personnel, the non-Operations personnel are not on-site 24 hours, 7 days	All HFEs were re-reviewed. The minor change to non-Operations staffing levels does not impact existing HFEs.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			a week, but are available via call-in – so they should not be credited for shorter term responses. Additionally, minimum Operations staffing levels should be used when evaluating the post-initiator recovery actions. **Possible Resolution:** Identify what the minimum Operations staffing levels are, and ensure that the HRA failure/success probabilities are based on these manpower levels. Additionally, ensure that non-Operations personnel are not credited as being available immediately – but account for the time that will be required to call them in.		
DA-C1	DA-C1-01, NOT MET, use of the latest industry documentation for SSC failure rate, CCF, and offsite power recovery	Closed	**Discussion:** This SR requires the use of recognized sources for generic data for component failure rates, common cause failures, and off-site power recovery. **Basis for Significance:** It is evident from the data analysis (Calculation File H.1) that the latest generic data (NUREG/CR-6928) is used for component failure rates and probabilities; however, it is not evident that recognized sources are utilized for common cause failures and off-site power recovery. **Possible Resolution:** Ensure that the latest industry documentation is utilized for the listed generic data and reference them in the DCPP data package.	The DCPP PRA Data Update calculation (PRA Calc H.1, Revision 1) included a reference to NUREG/CR-5485 for CCF methodology and NRC's "CCF Parameter Estimations, 2010 Update" for the updated CCF factors. The Electric Power Recovery Model calculation (G.4 Revision 9) included a reference to INEEL/EXT-04-02326 for the AC power recovery probability data.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
DA-C4	DA-C4-01, NOT MET, Associated SR: DC-C3 (NOT MET), basis for identification of an event as a failure	Closed	**Discussion:** This SR states, "When evaluating maintenance or other relevant records to extract plant-specific component failure event data, DEVELOP a clear basis for the identification of events as failures. DISTINGUISH between those degraded states for which a failure, as modeled in the PRA, would have occurred during the mission and those for which a failure would not have occurred (e.g., slow pick-up to rated speed). INCLUDE all failures that would have resulted in a failure to perform the mission as defined in the PRA." **Basis for Significance:** There was no evidence found in the data documentation that a clear basis for the identification of events as failures was developed. Also, no evidence was found that degraded states were distinguished as being PRA	Calc H.1 Rev 1 (Section H.1.5.2 and H.1.5.3) documents detailed basis for component failure identification. Also, Calc B.1 Rev 1 Section 9.2.2 contains a summary of this. Added the below text to H.1.5.3 and included a table for screened out failures in Table H.1-7: The remaining records were reviewed by the PRA group to eliminate entries that were not considered valid for the purposes of this calculation. This includes degraded states for which a failure would not have occurred during	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			applicable or not. **Possible Resolution:** Document the evidence and the basis for the identification of events as failures.	the PRA mission time and retaining those that would have occurred.	
DA-C5	DA-C5-01, NOT MET, documenting evaluation of failure events	Closed	**Discussion:** No discussion is documented on how failure events were re-reviewed for inclusion. In reviewing the data provided in the Integrated Relational Data System (IRDS) spreadsheet, only one case was found where the same component was failed twice on consecutive days. **Basis for Significance:** Without documentation, it cannot be determined if these were both counted as failures. This SR is covered under the Maintenance Rule methodology. **Possible Resolution:** Expand documentation to reference this methodology. Calculation File H.1 - Documents methodology for review of plant failure events occurring close in time as one or multiple events.	The failure events of the "2009 Failure Events" spreadsheet of the "H1 Comp Failure Tables Rev 1.xls" workbook were reviewed and it was found that there were two separate failure events for the S-44/E-44 super component on consecutive days (11/26/2005; 11/27/2005). One of the events was screened out from further analysis, leaving one event to represent both. H.1 was updated to include the methodology used in removing these types of repeat failures.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
DA-C6	DA-C6-01, MET, removing post-maintenance from demand counts	Closed	**Discussion:** In Data Notebook H.1, Component Operating Experience section, it states that "the failure rate determination requires the total number of demands (for demand failure variables) or the total operating hours (for fail-to-run (operate) variables) for the prescribed updating period. These calculations are based on the number of components, number of surveillance tests and maintenance events, and operating hours of the reactor and other systems." In addition, multi tables in H.1 provided maintenance and test demands, durations and other plant specific information based various plant data sources. However, certain post- maintenance tests were included; these should not be accounted for as per SR. **Basis for Significance:** Per SR requirement, it should not account for post-maintenance tests as stated in the SR. **Possible Resolution:** Remove post-maintenance from demand counting.	Data analysis was reviewed and PMT demands were removed from the count. One Data variable (ZTPATS, Turbine Driven AFW Pump Failure to Start) was updated and new variable was included in the current FPRA model. A change in the failed-to-start probability of the Turbine Driven AFW (TDAFW) impacts both the Internal Events and Fire model. This change was included as part of the routine data update performed in 2014.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
DA-C10	DA-C10-01, NOT MET, No document	Closed	**Discussion:** Per review and discussion with DCPP personnel, no document to prove this SR was met. **Basis for Significance:** It needs to demonstrate this SR was met as specified in the SR.	Documentation was added to Section H.1.5.1 of Calc H.1 Revision 1: Credit is taken for successful demands from surveillance tests by mapping the ZT-variables to applicable surveillance test procedures and reviewing the test	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			Possible Resolution: Perform the items required for this SR and document them.	procedures themselves. Tables of the Unit 1 and Unit 2 demands are shown in the "Tables_ALL_With_Summary_2013_Update.xlsm" spreadsheet. This also contains comments on the failure mode for these surveillance tests. Component failure modes are not broken down into sub-elements or causes.	
DA-C14	DA-C14-01, NOT MET, Associated SR: SY-A20 (NOT MET), planned	Closed	**Discussion:** It does not appear that a search for instances of coincident maintenance was performed since there is no reference to it in Data Notebook H.1. **Basis for Significance:** Need to assess routine activities for multiple component unavailable or document that Maintenance Rule practices do not allow for routine instances of multiple trains or equipment being unavailable. **Possible Resolution:** Perform this review or document that coincident maintenance on redundant trains is not performed. Validate by review of data.	Examined the 12-week rolling MOW matrix at DCPP and did not identify any planned, repetitive activity which would cause coincident unavailability due to maintenance for redundant equipment (both intra-system and intersystem). Calculation or modeling of coincident maintenance unavailability was therefore unnecessary. The above statement was added in Section H.1.2 of Calc H.1 Revision 1.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.
DA-C16	DA-C16-01, MET, disposition of plant specific LOOP events	Closed	**Discussion:** No documentation for explaining the disposition of plant specific LOOP events could be identified in the Initiating Events document provided to the reviewers. **Basis for Significance:** Such documentation is necessary to meet the SR requirement. **Possible Resolution:** Close gaps in documenting the dispositioning of PS LOOP events in development of basis for IE frequency.	Section H.1.6.4 of Calc H.1.6 Revision 8 documents the treatment of DCPP specific LOOP event. Specifically, one LOPPC Diablo Canyon event on 5/15/2000 removed from generic data and classified as a plant specific LNVEL event (See Attachment 2 of H.1.6 for Unit 1).	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
DA-D4	DA-D4-01, CC-II/III, Associated SR: DA-E1 (NOT MET), tests and check of data updates	Closed	**Discussion:** No documentation found in Data Calculation for following related to the Bayesian Update- tests to ensure that the updating is accomplished correctly and that the generic parameter estimates are consistent with the plant-specific application include the following: (a) confirmation that the Bayesian updating does not produce a posterior distribution with a single bin histogram (b) examination of the cause of any unusual (e.g., multimodal) posterior distribution shapes	The Bayesian updating is done using the Riskman Data Module. Throughout the process, Riskman shows the analyst a plot of the prior distribution, and a plot of the prior distribution together with the posterior distribution. Riskman also shows various stats for these distributions such as the mean, median, and range factor. This process helps the	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			(c) examination of inconsistencies between the prior distribution and the plant-specific evidence to confirm that they are appropriate (d) confirmation that the Bayesian updating algorithm provides meaningful results over the range of values being considered (e) confirmation of the reasonableness of the posterior distribution mean value **Basis for Significance:** Finding F&O is because that much of the SR requirement is not present. **Possible Resolution:** Provide documentation for the performances of these tests and checks as recommended in the Standard.	analyst determine if the update and the distributions are valid and make sense. The Bayesian update checks for all failure rates and all initiating events were added as an attachment to the Data Update file (H.1). The Bayesian updates for flooding frequencies and maintenance events were also checked using the same criteria, but the screen shots from those Bayesian updates were not included here. All distributions, including priors and posteriors, with their plots and statistics are stored in the Riskman files.	
DA-D6	DA-D6-01, CC-III, documenting method and references in data calculation	Closed	**Discussion:** Update use of references in Data calculation. **Basis for Significance:** Per conversation with DCPP staff, NUREG/CR-5485 was used for CCF methodology; however this is not listed as a reference or in discussions in the calculation. **Possible Resolution:** Update Data calculation clearly discussing the methodology used and correct references.	A reference to NUREG/CR-5485 was added in Section H.1.1 of Calc H.1 Revision 1.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.
DA-D8	DA-D8-01, NOT MET, Documenting evaluation of design changes on impact on data	Closed	**Discussion:** No documentation of analysis done on impact on data of design changes (such as recirculation sump screen Design Change Notices (DCNs), or new charging pump DCNs) could be found in the data calculation. **Basis for Significance:** Assessing the data is part of the SR requirement. **Possible Resolution:** Include documentation of analysis performed to evaluate impact on data for DCNs incorporated in the PRA model in the Data calculation.	Evaluation of DCN impacts are made as part of the design change process and documented during the design change process using a task via associated design change tracking SAPN. For example, the conclusion of the assessment performed for the new charging pump concluded that the pump should be added to the model. On a routine basis as part of model maintenance, all design changes since the last model update are re-reviewed again for impacts on the model.	No issues were identified. There is no impact on the ILRT Extension Risk Analysis.
DA-E2	DA-E2-01, NOT MET, Associated SR: DA-D5 (CC-III),	Closed	**Discussion:** Documents provided to peer review team do not facilitate review. Additional questions and uncontrolled backup materials such as spreadsheets had to be obtained to get a traceable basis for the Data Calculation.	In general, all PRA documentation is updated to include all information in a single calculation file without external	This was a documentation issue and is resolved. There is no impact

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	documentation		**Basis for Significance:** The peer review team felt the lacking of documentation as required by the SR is significant. **Possible Resolution:** Improve the documentation as required by SR and consider every detail of the requirements stated in the SR.	attachments or spreadsheets, including data calculation files. System and component boundaries are described in the system calculations. The model used in the actual PRA model is listed in the C.9 (Quantification of CDF and LERF). This is done only in this C.9 as not all calculations are required to be updated or revised for each model release. Sources for data is listed in H.1 Title of H.1 includes time period used for data. Uncertainty is in PRA Calc C.10.	on the ILRT Extension Risk Analysis.
QU-C2	QU-C2-01, NOT MET, HFE dependency	Closed	**Discussion:** Based on discussion with DCPP personnel, the human action dependencies are not evaluated with a minimum default value to prevent underestimating risk. **Basis for Significance:** The issue identified in this F&O either needs to be performed or justified with alternative means to ensure proper consideration of risk contributions. **Possible Resolution:** It needs to justify adequate risk contributions are considered.	A detailed Internal Events model HRA dependency was performed and documented in PRA Calc G.3, Revision 0. Changes to the Internal Events model were identified and incorporated to DC03.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
QU-D4	QU-D4-01, CC-I, comparison to other similar plants	Closed	**Discussion:** The Category II requirements for this SR, "COMPARE results to those from similar plants and IDENTIFY causes for significant differences. For example, Why is LOCA a large contributor for one plant and not another?" **Basis for Significance:** DCPP has performed and documented a comparison to other similar plants for the CDF results. However, in order to meet this requirement to Category II, a further level of comparison is required. **Possible Resolution:** Justification and/or actions are needed to assess the difference, especially significant differences of modeling assumptions and treatment with similar plant.	Resolved and documented in Section C.9.8.6 of Calculation C.9 Revision 13 by performing a more in-depth comparison with other Westinghouse 4-loop plants.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.
QU-F2	QU-F2-01, NOT MET,	Closed	**Discussion:** This SR provides several details of items expected to be seen in the quantification documentation.	The results of quantification and risk insights of the base model (i.e., Model	This was a documentation issue and is resolved.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	Associated SR: QU- F1 (NOT MET), documentation		**Basis for Significance:** Items listed in this SR were not located in the documentation (e.g., item b). Also, issues identified in other QU SRs point out details that should be documented in the quantification package. **Possible Resolution:** Improve the documentation for the quantification calculation.	of Record) are documented in Calc C.9 Revision 13 and C.10 Revision 5.	There is no impact on the ILRT Extension Risk Analysis.
QU-F6	QU-F6-01, NOT MET, documenting definition of significant	Closed	**Discussion:** This SR states, "DOCUMENT the quantitative definition used for significant basic event, significant cutset, significant accident sequence. If other than the definition used in Part 2, JUSTIFY the alternative." **Basis for Significance:** Although the quantitative definition for significant accident sequence is given in the DCPP documentation, there was no definition for significant basic event located. **Possible Resolution:** Provide the necessary definitions in DCPP documentation.	The following statement was added to Section C.9.7 of Calc C.9 Revision 13: "Significant sequences are defined as being the top 95% contributors to a specific hazard group and having an individual contribution of 1% to that hazard group." Basic Event importance (RAW) to CDF and LERF are shown in Attachments 16 and 17 of C.9, respectively. Significant Basic Events are those defined as having a RAW importance greater than 2.0.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.
LE-C2	LE-C2-01, NOT MET, modeling of operator actions following the onset of core damage	Closed	**Discussion:** This SR states: INCLUDE realistic treatment of feasible operator actions following the onset of core damage consistent with applicable procedures, e.g., EOPs/SAMGs, proceduralized actions, or Technical Support Center guidance. **Basis for Significance:** The current LERF analysis states that there are no post-core damage operator actions available or credited. However, a review of plant procedures identified that there are several SAMG procedures available that do include post-core damage actions that need to be reviewed and credited as applicable. **Possible Resolution:** Review the SAMG procedures, and any other available post-core damage procedures, and credit the available actions as appropriate.	As documented in PRA Calc 14-02 Revision 0, all SAMG procedures were reviewed. No additional human actions would be worthwhile to credit in the PRA due to credit already being taken as part of core damage mitigation and due to high uncertainty and non-prescriptive actions in the procedures.	It is stated that the addition of operator actions would not be worthwhile to add; however, additional actions could be credited in the FPRA that would reduce LERF. Treatment is conservative for overall LERF. While reduction in LERF would lead to an increase in Class 3b, the change is expected to be small, and there is significant margin for ΔLERF to the upper

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
					level of RG 1.174 Region II (see Section 5.2.4). Therefore, the ILRT analysis is not adversely affected.
LE-D7	LE-D7-01, CC-II, realistic containment isolation analysis	Closed	**Discussion:** This SR states: PERFORM containment isolation analysis in a realistic manner. INCLUDE consideration of both the failure of containment isolation systems to perform properly and the status of safety systems that do not have automatic isolation provisions. **Basis for Significance:** For the containment isolation, there is no documentation readily available that shows a traceable basis for the list of Configuration Identification (CI) valves that are present in the model and the systematic disposition of all of the containment penetrations that are not in the model. **Possible Resolution:** Provide a systematic evaluation of all containment penetrations to arrive at the list of valves that are present in the CI model.	As documented in Calc E.8 Revision 8, a systematic evaluation of containment penetrations was performed and documented in a separate spreadsheet. A set of screening criteria were developed consistent with the requirement of this SR, and consistent with large early release definition. Each containment penetration is dispositioned explicitly using this set of screening criteria. FCV-253/254 was moved to top event CP top due to 2" break size being used as boundary for large release. Also, identified that 8100/8112 and 8149A/B and 8149C and 8152 that were scoped into CP.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
LE-E2	LE-E2-02, MET, definition of LERF with 3" Opening	Closed	**Discussion:** This SR states: USE realistic parameter estimates to characterize accident progression phenomena. **Basis for Significance:** Calculation N.2, Revision 0 states "Using the Westinghouse Owners Group Definition for Large Early Release Frequency (LERF) in WCAP-16378 a containment leak rate analysis would show that an equivalent pipe break diameter that would result in a large release is about 3." However, no actual calculation verifying this expected break size can be located. **Possible Resolution:** Perform and document a calculation verifying that the 3 inch break size is accurate for the DCPP LERF related containment leak rate.	PG&E has an existing calculation for 2 and 4 inch containment bypass sizes. Using the same methodology as this existing calculation, a 3 inch size was evaluated and determined to be an acceptable size for LERF purposes. However, DCPP has decided to conservatively use 2" for containment bypass size. As documented in Resolution section of F&O LE-D7-01, containment isolation analysis was re-performed based on greater than 2" definition of the large release path in Calc E.8 Revision 8.	Using a small containment isolation size is not conservative for ΔLERF but is conservative for total LERF. While reduction in LERF would lead to an increase in Class 3b, the change is expected to be small, and there is significant margin for ΔLERF to the upper level of RG 1.174 Region II (see

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
					Section 5.2.4). There is no impact on the ILRT Extension Risk Analysis.
LE-F2	LE-F2-01, MET, review of LERF sequences for reasonableness	Closed	**Discussion:** This SR states: REVIEW contributors for reasonableness (e.g., to assure excessive conservatism have not skewed the results, level of plant-specificity is appropriate for significant contributors, etc.) **Basis for Significance:** The LERF contributors were re-reviewed for reasonableness, but the quantification report (C.9, Revision 11) discussion does not reflect the latest LERF quantification cutsets. Additionally, there is an assumption in the N.2, Revision 0 notebook that states "It is assumed that the conditional core damage probability for different seal LOCA sizes is the same. This assumption may not be correct but is adopted in the absence of information at a more detailed level from the Level 1 PRA." The Level 1 RCP Seal LOCA model is now developed to a detailed enough level to get the actual Conditional Core Damage Probabilities (CCDPs), so this assumption needs to be removed and the actual composition of HANNS and HANNI PDS (fraction of sequences which are seal LOCAs) needs to be used. **Possible Resolution:** Update Section C.9.9.1.B of the C.9 report to reflect the current LERF cutsets and insights. Revise the N.2 calculation and RCP Seal LOCA PDS split fractions to ensure that the actual RCP Seal LOCA CCDPs are used to reflect the correct split fractions.	This F&O has no impact on the ILRT Extension Risk Analysis. The F&O is related to documentation of the baseline LERF results, and identified outdated results and assumptions. The seal LOCA split fractions were confirmed to not have changed since the Level 2 analysis was performed, so there are no model updates required to address this issue. Reviewing and documenting the most current results and assumptions for LERF would not impact the calculations of risk changes for the ILRT Extension Risk Analysis.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.
LE-G3	LE-G3-01, NOT MET, documenting LERF calculation	Closed	**Discussion:** This SR states: DOCUMENT the relative contribution of contributors (i.e., plant damage states, accident progression sequences, phenomena, containment challenges, containment failure modes) to LERF. **Basis for Significance:** Although the LERF model has been quantified and the cutsets are available to determine the relative contribution of contributors, this information is not documented in the LERF calculation, and the information in the quantification calculation does not reflect the latest results, and does not include all the types of contributions discussed in this SR.	C.9 Rev 13 has contributions (along with discussion) to LERF as well as CDF.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			Possible Resolution: Update the quantification calculation (C.9) or the LERF calculation (N.2) with the information required by this SR.		
LE-G5	LE-G5-01, NOT MET, limitations in the LERF analysis	Closed	**Discussion:** This SR states: IDENTIFY limitations in the LERF analysis that would impact applications. **Basis for Significance:** The limitations in the various portions of the analyses that would impact applications are not identified or discussed. **Possible Resolution:** Identify and discuss the limitations of the various analyses that would impact applications.	The DCPP PRA model includes a complete Level 2 detailed analysis. There are currently no general limitations in the LERF analysis that would impact applications. Any special case limitations impacting an application are specifically identified on a case-by-case basis.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-2 Internal Flooding PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
IFSO-A6	IFSO-A6-01, MET, spray protection	Closed	**Discussion:** The walkdown reports include spray sources near the equipment and states that the equipment is spray protected. However, the documentation does not discuss what is credited as spray protection and what the limitations of that protection are. For instance, is there a source that could spray on the equipment where the spray protection would not be effective? **Basis for Significance:** Without documenting how spray protection is credited, the plant may change or remove it without the PRA analysts understanding that the internal floods analysis is negatively affected. **Possible Resolution:** Where spray protection is credited, include the source and limitations of the spray protection.	Attachment E.1 Revision 1 of Section 7 of the Internal Flooding PRA Calculation F.4 Revision 1 documents the spray target component screening process. For spray susceptible mitigating equipment where there is a spray source in the area, whether the equipment is protected is determined and documented in Table E.1-1, based on insight gained in the internal flooding PRAs performed in the industry, field walkdown, and/or DCPP plant database regarding equipment environment qualifications. For components not screened in Table E.1.1, a field walkdown is performed to collect information for quantitatively modeling the spray scenarios. These are documented in sections E.1.2 and E.1.3 for Unit 1 and 2, respectively. The newly identified spray scenarios are included in Appendix E of Section 7, Revision 1 of the Internal Flooding PRA Report.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.
IFSN-A3	IFSN-A3-01, NOT MET, auto and/or operator responses	Closed	**Discussion:** Reviewed associated notebooks and attachments, no evidence for each flood area and for each source the applicable and relevant either auto and/or operator responses was identified if it has the probability to terminate or contain a flood propagation. **Basis for Significance:** Such proper identification is not just to meet this SR but it also would enable to properly meet other SRs and model development and risk insights. **Possible Resolution:** Identify per SR requirements.	For infinite flood sources, and large flood sources, auto and/or operator responses to terminate or contain a flood are considered. For infinite flood sources, considerations were provided in resolution to IFSN-A10-01. For example, to terminate flood due to the Circulating Water pipe break, credit was taken for the automatic pump trip feature based on float switch mounted on the condenser pit walls. For large flood sources such as fire water pipe break with water source from raw water storage reservoir, HFEs were developed for operator actions to terminate the flood. See Appendix G of Section 9, Revision 1 of the Internal Flooding PRA Report, and Section 10,	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
				Revision 1 of the Internal Flooding PRA Report for development of these HFEs. For other flood sources, scenario modeling including modeling of plant response is developed on a flood area and/or scenario specific basis. For example, for flood sources with limited source inventory (e.g., chilled water pipe breaks), termination of flooding would occur if the source system is depleted.	
IFSN-A8	IFSN-A8-01, MET, drain line and back flow paths	Closed	**Discussion:** This SR requires the identification of drain lines paths and back flow through drain lines involving failed check valves, pipe and cable penetrations, etc., as stated in the SR. Currently it is stated that drains were no credited. This does not eliminate the need for the identification. To meet this SR it needs to review drain drawings to identify the path or credit past drain line studies explicitly. Cable trays, etc. **Basis for Significance:** Did not identify as required by the standard SR. These conditions could be screened out later, but need to be identified first as specified by this SR. **Possible Resolution:** Identify accordingly.	Section 7.3, Revision 1 of the Internal Flooding PRA Report documents the identification of propagation pathways at DCPP. Due to the open layout design and numerous openings in different elevations of the Auxiliary Building and Turbine Buildings (e.g., open stairways and grate-covered floor openings), floods originating in one level is expected to propagate freely to the basement of the building. There is a subsection in section 7.3 discussing drainage system; backflow of water is not a significant issue in the Auxiliary Building because of the physical layout of the building. There are large open areas outside the pump rooms, and the pump rooms are elevated above the pipe tunnel, where water would collect. There is also a subsection in section 7.3 discussing unsealed cable tray/conduit and pipe penetrations. For the cases in which pipe penetrations are not sealed, other significantly larger propagation pathways are present; one example is Containment Penetration Area El 115', the gap along the containment wall is a much larger propagation pathway than pipe penetrations through the floor. As a response to this F&O, in water level	No issues were identified. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
				rise timing estimation for nominal flood originated at Fuel Handling Building El. 100' (the corridor area 31, the AFW pump room 3-Q-1, or 3-Q-2), drain flow through floor drains and then drain lines to the Auxiliary Building sump is estimated, as documented in Section 7, Revision 1 of the Internal Flooding PRA Report.	
IFSN-A9	IFSN-A9-01, NOT MET, flood depth and propagation	Closed	**Discussion:** No calculations were provided to the review team that shows the flooding rates and the time to equipment damage. The calculations are needed to determine propagation beyond the initial flood area. **Basis for Significance:** Calculations for flood areas with a large capacity are needed to show that the flood does not propagate without some action to mitigate the flood. **Possible Resolution:** Perform flood calculations to show flooding depth and propagation to other areas. If older calculations exist that show the flooding depth and propagation, review and revise these to meet the current PSA standard requirements.	Flood calculations were performed for selected areas where bounding assumptions were too severe and more detailed analysis was required, including flood areas with limited drainage paths and large flood source capacities. The calculations consider flood rates, flood propagation through door gaps, opening between rooms and floor drains. The flooding depth (level rise) timing is evaluated in these calculations, as documented in Appendix E of Section 7, Revision 1 of the Internal Flooding PRA Report.	No issues were identified. There is no impact on the ILRT Extension Risk Analysis.
IFSN-A10	IFSN-A10-01, MET, size of flood sources	Closed	**Discussion:** Table 4-1 lists the flood source capacities for each water source, but subsequent evaluations of the flooding scenarios do not mention the impact of emptying that source on the flood depth in the areas or the subsequent propagation of infinite water sources to various other areas without operator action to isolate the flood. **Basis for Significance:** The size of the flood source is not really considered beyond the initial scoping of the flood sources. **Possible Resolution:** To determine the true impact of flooding, include the size of the flood source and what could be flooded if infinite sources, such as circulating water and ASW are not isolated.	The size of infinite flood sources, Circulating Water, Auxiliary Saltwater and Firewater from the raw water reservoir, were included in the flood scenario development along with the flood area, source, flood rate, SSC damage and operator actions. System design and plant flood mitigation features were considered for these infinite sources, which are documented in Section 7.3 of Revision 1 of Section 7 of the Internal Flooding PRA Report. For the Circulating Water Turbine Building flood the automatic pump trip feature based on the float switches mounted on the condenser pit walls is credited and modeled. For the ASW flood in the CCW heat exchanger room	No issues were identified. There is no impact on the ILRT Extension Risk Analysis.

Table A-2 Internal Flooding PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
				it is concluded that it is not credible to postulate a flood propagation scenario that would cause damage to the emergency diesel generators and offsite power based on the limited flood rate, the ASW pumps tripping terminates the flood and numerous control room alarms. Operator actions to isolate the raw water reservoir are credited and modeled for flood scenarios in the Auxiliary, Fuel Handling and Turbine Buildings. If these credited operator actions and automatic trip functions are failed additional SSCs are assumed to be damaged.	
IFSN-A11	IFSN-A11-01, NOT MET, multi-Units effect	Closed	**Discussion:** The impact of large flooding sources in areas that could impact both Units has not been considered. For instance, Circulating Water and ASW are considered infinite sources since they take suction from the ocean. The Turbine Building is a large open area that contains the turbines for both Units. However, a possible duel Unit scram due to a very large flood in these areas was not considered. Similarly, the Intake structure contains SSCs for both Units that could also result in a dual Unit scram due to a pipe break in a large source such as ASW. **Basis for Significance:** The impacts of floods effecting multi-Units must be considered. **Possible Resolution:** Update the flood analysis to consider large floods impacting multi-Units.	For the Turbine Building flood scenarios, ASW and Circulating Water piping failure is assumed to cause a dual unit trip. ASW and Circulating Water pipe breaks in the intake structure causing dual unit trip are not considered credible scenarios (see Appendix E of Section 7, Revision 1 of the Internal Flooding PRA Report.). In response to this F&O, pipe failures in Auxiliary Building flood areas that are shared between the two units are included in the flood initiator frequency count for both units (as documented in Appendix G of Section 9, Revision 1 of the Internal Flooding PRA Report).	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
IFSN-A12	IFSN-A12-01, MET, screening of flood scenarios	Closed	**Discussion:** Based on the discussion of building features, it appears that flooding scenarios are screened or assumed not to propagate based on drains, curbs and barriers between rooms. This screening implicitly assumes that the leak is smaller than the drain capacity and/or that the operators take action to reduce or stop the flow before water backs up into the room and fails additional equipment or propagates beyond the room. Table E-1 in the flooding document discusses screening of numerous flooding scenarios for propagation. The propagation screenings do not look at accumulation on the	The scenarios in Appendix E of Section 7, Revision 1 of the Internal Flooding PRA Report were reviewed. Additional propagation scenarios previously screened in Revision 0 were identified and scoped in with flood source capacity and propagation paths considered in characterization and quantification of the flood scenarios. In addition, select human failure events	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-2 Internal Flooding PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			area where the water is going and whether equipment in that area would be impacted due to flood or whether the flood could propagate beyond the second flood area to another area and damage equipment. **Basis for Significance:** Many flooding scenarios are qualitatively screened by making undocumented assumptions and suppositions and thus prematurely screening these flooding scenarios. The propagation does not appear to consider source capacity and spread beyond the second area. Large flooding sources can propagate to several rooms	(HFE) were developed to model the flood isolation for large flood sources such as Firewater from the raw water reservoir. Failure of these HFEs result in additional PRA equipment damage beyond the original source flood area, such as both RHR pumps being damaged whenever the 54' pipe tunnel in the Auxiliary Building is flooded beyond its capacity volume.	
IFPP-A5	IFPP-A5-01, MET, walkdown documents	Closed	**Discussion:** Walkdown documentation in Section 5 of the Internal floods report has a lot of blank fields associated with the flooding sources in the areas. The equipment list is generally complete but appears to be a download of the Appendix R Safe Shutdown Equipment list. Therefore, it is difficult to determine if all flooding sources in a zone have been identified and is difficult to know what sources have been included or not. **Basis for Significance:** Hard for a reviewer or regulator to determine that all flood scenarios have been properly dispositioned. **Possible Resolution:** Improve the documentation to address the concerns identified in the F&O.	Walkdowns were performed in response to IFSO-A6-01 for spray screening and modelling, and to IFSNA12-01 for propagation scenarios. For the few instances where additional pipings are identified, the Section 5 walkdown table is updated. The process of identifying equipment list is discussed in detail in Section 3.3 Rev 0 and Rev 1. It involves using multiple information sources as a starting point, such as IPE internal flooding, current fire PRA, and current internal events PRA. A comprehensive review of the initially compiled list of components was performed to identify those equipment which can be damaged by flooding effects and whose damage would affect the accident initiation and/or mitigating functions.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
PP-C2	PP-C2-01 (2008), NOT MET, exclusion of areas	Closed	No explicit justification for the exclusion of locations within the licensee controlled area is provided in the FPRA documentation. Because the global boundary encompasses all of the Fire Hazards Analysis (FHA) areas, and adds certain areas not included in the FHA, this is unlikely to be a problem. SR PP-C2 calls explicitly for providing this documentation. Since it has not been done, this SR is not met. (Note: This F&O was generated during the January 2008 review).	Attachment 3 was added to PRA Calc F.3.1 to identify all of the permanent buildings on the site and to address the potential fire effects in order to justify their inclusion or exclusion from the Global Plant Analysis Boundary. Further discussion is provided in Section 4 of F.3.1. During the 2010 peer review, the PP SR, PP-C2 was reviewed and judged to be met.	This was a documentation issue and is resolved. There is no impact on the ILRT Extension Risk Analysis.
ES-B1	ES-B1-02 (2008), CC I, need to verify the basis of excluding low importance SSC valid	Closed	The intent of ES-B1 per Discussion 2 is that it is iterative. The analysis does not demonstrate that excluded components are revisited to determine if the system/component should be added due to importance of risk. Reference Section 7.7.1.c and Section 3.2 for systems and components considered. Discussion 2 of ES-B1 reviews the importance of using an iterative approach to validate the assumptions made in the initial review of components to include. Even though systems such as Main Feed / Condensate are not important to the internal events model, they may be important to specific fire areas once initial results are reviewed. Reference Section 7.7.1.c and Section 3.2 for systems and components considered. Add step to process to review the assumptions and determine if systems /components originally excluded due to significance should be added. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by additional analysis. The risk significance of excluded systems and equipment has been documented in the uncertainty and sensitivity analysis to justify the final set of SSCs credited in the fire PRA. With this F&O resolved, along with additional F&Os ES-B1-03 (2008) and ES-B1-01 (2010), SR ES-B1 is judged to be met at Capability Category II based on the verification of low risk importance of excluded SSCs. The 2010 peer review identified a similar finding (see ES-B1-01 (2010) below), but concluded that SR ES- B1 is met at Capability Category II.	The exclusion of systems from the Fire PRA is conservative for the ILRT application. The other part of this F&O is related to documentation. Therefore, there is no adverse impact on the ILRT Extension Risk Analysis.
ES-B1	ES-B1-03 (2008), CC I, not including a recovery action for potentially significant scenario, specifically the drain-down of the RWST	Closed	The component selection considers spurious operations including MSOs that could affect system operation. The result of this review is the failure of associated components without consideration for recovery. For example, spurious operations of equipment that could cause a loss of Refueling Water Tank (RWST) inventory results in a loss of the RWST for the purposes of injection and subsequent recirculation. This results in a loss of primary inventory control function and heat	This F&O has been resolved by additional analysis and model updates. A sensitivity analysis was performed and documented to evaluate the risk significance of EOP and post-fire recovery actions. Important actions have been added to the fire PRA model. With this F&O resolved, along with additional F&Os ES-B1-02 (2008) and ES-B1-01 (2010), SR ES-B1 is judged to be met at Capability Category II. The 2010 peer review	This is closed. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			removal (feed and bleed). This is showing as being conservative and significantly affecting results. From discussion #2: Ultimately the selected equipment and the resulting FPRA plant response model must be sufficiently complete that the objectives with respect to level of detail, realism, and accuracy as stated in Table 1-1 of this standard are met consistent with the intended capability category. Evaluate significance of not including recovery actions and equipment and include where appropriate. (Note: This F&O was generated during the January 2008 review).	concluded that SR ES-B1 is met at Capability Category II.	
ES-B1	ES-B1-01 (2010), CC II, need to verify the basis of excluding low importance SSC valid	Closed	Calculation F.3.2 does not explicitly include a step to review the assumptions used to exclude components or systems that were excluded to verify that these components can remain excluded based on risk significance. The DCPP response indicates that the uncertainty of excluded components and systems is addressed in F.3.15. A review of Calculation F.3.15 does not indicate any discussion of the uncertainty of the exclusion of components or systems based on risk significance under Section 3.3.2 of the calculation. Basis for Significance: The iteration to validate that the assumption to exclude components or systems needs to be performed to ensure that the model is not excessively conservative to meet a Capability Category II. Possible Resolution: Perform a sensitivity analysis of components or systems that were excluded during the ES task to confirm that they are not risk significant. (Note: This F&O was generated during the December 2010 review).	This F&O has been resolved by additional analysis. The risk significance of excluded systems and equipment has been documented in the uncertainty and sensitivity analysis to justify the final set of SSCs credited in the fire PRA. With this F&O resolved, along with additional F&Os ES-B1-03 (2008) and ES-B1-01 (2010), SR ES-B1 is judged to be met at Capability Category II based on the verification of low risk importance of excluded SSCs. The 2010 peer review identified a similar finding (see ES-B1-01 (2010) below), but concluded that SR ES- B1 is met at Capability Category II.	The exclusion of systems from the Fire PRA is conservative for the ILRT application. The other part of this F&O is related to documentation. Therefore, there is no adverse impact on the ILRT Extension Risk Analysis.
ES-B2	ES-B2-01 (2010), documentation inconsistencies and errors in MSO documentation.	Closed	MSO review does not appear to evaluate and disposition the effects of multiple spurious operations on calculations to support the success criteria in the FPRA. This includes system success criteria such as multiple flow diversion paths and timing associated with manual actions. CC-II needs to consider the effect on two spurious operations	This F&O has been resolved by additional reviews and model updates. The qualitative screening criteria used to evaluate the impact of MSOs on the function success criteria was supplemented by additional reviews to confirm there were no situations in which the	This F&O has been resolved by additional reviews and model updates. There is no impact on the

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			per train and the effect on the system success criteria. Multiple spurious operations may affect the success criteria for the train in either required system performance functions and/or supporting manual actions. Not performing this review could have impact on system success and HRA. Review multiple operational effects on calculations that support system and train success. (Note: This F&O was generated during the January 2008 review).	effects of coincident MSOs would impact system success criteria. As a result, MSO of pressurizer power- operated relief valves (PORVs) was considered as requiring mitigation as a medium-break instead of a small-break LOCA. The 2010 peer review concluded that SR ES-B2 is met at Capability Category III.	ILRT Extension Risk Analysis.
CS-A2	CS-A2-03 (2008), CC III, incomplete circuit analysis for the bypass of MOV torque and limit switches.	Closed	A review of Appendix R circuits has not been completed to find potential circuit failures that could lead to the bypass of MOV torque and limit switches. Where damage to MOV is possible, credit for manual actions to credit operation of the valves need to be removed. Credit for valve operation could be taken when valve positioning may not be available due to physical valve damage. Review existing circuit analysis for MOVs where shorts could bypass the torque and limit switch and determine if valve damage could occur. If so, validate that manual actions to recover the valve position are not credited in the FPRA. (Note: This F&O was generated during the January 2008 review).	DCPP Action Request A0414724 addressed this issue in November 2000 in response to NRC IE Notice 92-18. During the 2010 peer review, SR CS-A2 was judged to be met at CC-II but a new F&O CS-A2-01 was added. Refer to F&O CS-A2-01 (2010) for details.	This is closed. There is no impact on the ILRT Extension Risk Analysis.
CS-A2	CS-A2-01 (2010), CC II, expand NRC IN 92-18 to MOVs required to support the manual actions in the FPRA.	Closed	F&O: In response to NRC IE Notice 92-18, a review of safety-related MOVs was performed in Evaluation AR A0414724. A review should be conducted to confirm that MOVs from the internal events PRA that are credited in the FPRA, but are not included in the above evaluation are added to that evaluation. If not, then credit for manual operation of the affected MOVs should be removed from the FPRA. Basis for Significance: This action is required to meet the SR. The evaluation AR A0414724 only addressed MOVs that are credited for Appendix R Safe Shutdown. Any new MOVs credited from the internal events PRA for the FPRA have not necessarily been evaluated for mechanical damage resulting from a stalled condition, and may not be capable of manual operation.	This F&O has been resolved by additional analyses. Action request (AR) A0414724 documented the review of MOVs credited in the Appendix R analysis to address NRC Information Notice 92-19. Additional review of the fire PRA identified additional MOVs not in the scope of AR A04J 472d. These MOVs have been evaluated for this failure mode to ensure that manual operation of the MOV is not improperly credited, and the documentation has been revised to reflect the additional evaluations. With this F&O resolved, SR CS-A2 is judged to be met at Capability Category II. (The	This is closed. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			Possible Resolution: See text of F&O above. (Note: This F&O was generated during the December 2010 review).	2010 peer review concluded that SR CS-A2 is met at Capability Category II.)	
CS-A7	CS-A7-01 (2008), NOT MET, 3-Phae hot short	Closed	Components added associated with ISLOCA Sequences in Table 7-4 of the Component Selection Calculation did not appear to have 3-Phase Hot Short Analysis in the circuit analysis. This includes CVCS valves 8112 and 8100, and RHR valves 8701 and 8702. Requirement not met for major ISLOCA pathways. Add in to the analysis the cable impact and analysis for valves mentioned above, and ensure the impact is modeled in the PRA. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by a model update. Cables associated with isolation valves where spurious actuation due to three-phase hot shorts could result in an ISLOCA have been verified in the model, and additional cables for valves identified have been added. NUREG/CR-7150 guidance recommends screening of 3-phase proper polarity hot shorts; therefore, the current Fire PRA model is conservative for the ILRT extension application. The 2010 peer review concluded that SR CS-A7 is met.	The current Fire PRA model is conservative for the ILRT extension application. Therefore, there is no adverse impact on the ILRT Extension Risk Analysis.
CS-A10	CS-A10-01 (2008), NOT MET, potential high CDF impact of the assumptions of guaranteed failure of non-traced SSCs.	Closed	The Assumptions for Guaranteed failure (GF) in the Impact Matrix for the 50 or so components not traced has resulted in conservatism in the CCDP for the FPRA results. The present CCDP for a baseline PRA run is a factor of 40 higher than the internal events, which may in part be due to assumptions on the GF issue. This results in a significantly too high CDF for Fire for all scenarios, and may be one of the main contributors to the overall high CDF initially estimated. A review of Calc 134Draft.doc and the Impact matrix was performed. In general, all components identified in the component selection process were traced, and the tracing results are in the impact matrix. However, many of the components that were listed as credited under Component Selection were actually not traced and assumed failed, as identified as a Guaranteed Failure in the Matrix. A review of the FDS1 results was performed, with the lowest FDS1 CCDP of 5.3E-05. This is about a factor of 40 higher than the reactor trip CCDP (1.4E-06). What this indicates is that between the assumptions in the equipment selection task IA, MFW, Containment Spray not credited) and the components not traced in the Cable	This F&O has been resolved by additional analysis. The risk significance of excluded systems and equipment has been documented in the uncertainty and sensitivity analysis to justify the final set of SSCs credited in the fire PRA. With this F&O resolved, along with additional F&Os ES-B1-03 (2008) and ES-B1-01 (2010), SR ES-B1 is judged to be met at Capability Category II based on the verification of low risk importance of excluded SSCs. The 2010 peer review concluded that SR CS-A10 is met at Capability Category III.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			Selection, the CCDP for the FPRA is a factor of 40 too high. Review the FDS1 results for several scenarios, and determine the assumptions that are most affecting the results. Based on this review, perform cable routing and circuit analysis needed to remove the assumptions, and re-run the FDS1 results. Once a baseline FDS1 result is similar to the internal events PRA CCDP (with the HEP set back to the original internal events PRA results), then the remaining assumed component failures can likely remain. This may need to be looked at again for multiple initiating events and for higher CCDP events where the assumed failures can become important for certain scenarios. (Note: This F&O was generated during the January 2008 review).		
CS-A11	CS-A11-01 (2008), NOT MET, lack of documenting the basis for assumed cable routing, Associated SRs: CSC3, FSS-E4.	Closed	In discussions with the PRA staff, there were several components, where Appendix R basis was used to determine the cable routing, without specific cable/circuit review and routing. This includes Cable Room, Battery room, and 480 VAC switchgear room dampers (which results in a loss of Heating Ventilation and Air Conditioning (HVAC)). This event is important in the PRA, as evidence by the baseline results analysis provided by DCPP, which shows this to be the number 1 scenario due to an increased HEP event for non-recovery of loss of HVAC. Due to the failure to document the use of the Appendix R basis for the cable routing, a finding was developed to add this documentation to the PRA. Without the documentation, it is not possible to determine where the cable tracing results come from for these components. Additionally, these components are always assumed failed for fires in areas where the component cables are assumed to be located. Add the documentation for components not specifically traced into the PRA, and the basis for the resulting routing. This can then be input into the uncertainty results discussion, including the fire modeling (FSS) uncertainty.	This F&O has been resolved by a documentation update. The cables associated with the 480 V switchgear HVAC and damper were analyzed and traced. The remaining assumed cable routing were reviewed and the documentation updated to document the basis for the routing assumptions The 2010 peer review concluded that SRs CS-A11 and CS-C3 are not applicable.	This was resolved by a documentation update. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			(Note: This F&O was generated during the January 2008 review).		
PRM-A4	PRM-A4-01 (2008), NOT MET, incomplete Uncertainty and Sensitivity analysis.	Closed	Uncertainty and Sensitivity and Analysis (Task 15) have not been performed yet. This item could not be verified. Once the FPRA model becomes stable, perform Task 15 to account for uncertainties and sensitivities. (Note: This F&O was generated during the January 2008 review).	Note: This SR in 2007 Standard has been deleted from 2009 Standard. PRA Calc F.3.15 has been prepared documenting the Uncertainty and Sensitivity Analysis.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
PRM-B13	PRM-B13-01 (2008), NOT MET, incomplete quantification of LERF model, Associated SRs: PRM-B14.	Closed	DCPP has not reviewed accident progression beyond core damage considering fire failures. It is recommended that DCPP perform this review and document it. In reviewing the draft report, DCPP contested this finding and said that they had performed a screening review the containment penetrations to identify potential sources of fire-induced containment isolation failures. DCPP provided a copy of Calculation F.3.3.1, Rev. 0, dated June 6, 2006, documenting this review. A subsequent review of this document indicated that DCPP had performed a thorough review of all containment penetrations using a documented set of screening criteria. As a result of this review, DCPP retained 59 penetrations for further evaluation as potential sources for containment isolation failure. However, at the time of the review, as discussed in Table 4-13, the quantification was still in process and there was not enough information or documentation to determine the extent to which fire-induced containment isolation failures had been incorporated into the model and addressed in the final quantification. This finding stands until DCPP has completed the quantification and documented the results and the final model. However, based on the additional information provided, it seems likely that DCPP will meet this requirement when they have completed the quantification. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved a model update. The LERF model for fires has been completed and documented. The 2010 peer review team concluded that SR PRM-B14 is met.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
PRM-B15	PRM-B15-01 (2010), MET, lack of	Closed	F&O: F.3.2 states that "The possibility of multiple open pathways (<3") should also be considered." A review of the remaining small isolation pathways shows that the likelihood of combined events leading to a pathway >3" is	Revision 1 to Calculation F.3.2.1 has been changed such that Section 4 and Attachment 1 now include the dispositioning of non-screened containment penetrations based on	This is resolved. There is no impact on the ILRT

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	documenting low probability of multiple open pathways leading to greater than 3" opening, Associated SRs: PRM-C1		very low and could likely be screened. However, this is not documented. Basis for Significance: All new fire-related LERF pathways that were identified in F.3.2.1 have not been formally dispositioned and documented. Possible Resolution: The PRM documentation should be updated to disposition all potential LERF pathways applicable to the FPRA that were identified in F.3.2.1. (Note: This F&O was generated during the December 2010 review).	the size of equivalent opening given multiple pathways.	Extension Risk Analysis.
PRM-C1	PRM-C1-02 (2010), MET, modeling of new low leakage RCP seals.	Closed	F&O: F.3.5, Section 6.4.2.1 (Step 4) states: "It is assumed in the model that the installation of the high temperature RCP seals has the benefit excluding the possibility of an RCP Seal LOCA on loss of cooling to the seals." This was verified in the rules (Appendix I) which have split fraction SE0 (with a value of 0.0), as the first rule in SE, set to be default as success (i.e., SE0 = 1). However, neither the Flowserve N-9000 nor the new Westinghouse shutdown seal (SDS) are guaranteed to not develop a Seal LOCA in the event of loss of seal injection and thermal barrier cooling. Both seal types require an operator action to trip the RCPs (not modeled in DCPP FPRA) and both seals have a nominal failure rate (e.g., on the order of 1E-3) even when the RCPs are successfully tripped (not modeled in DCPP FPRA). Basis for Significance: RCP seal LOCA can be a significant contributor to fire CDF in PWRs, even with newer seals (either N-9000 or Westinghouse SDS). Assuming that no operator action is required and that the seal cannot fail (i.e., failure probability = 0.0) may significantly affect the results and/or insights of the FPRA. Possible Resolution: Add modeling for RCP seal failure, including the need for operator action to trip the RCPs. WCAP-16175 provides guidance and values for RCP seal failure rates for N-9000 seals. If Westinghouse SDS seals are expected to be installed, Westinghouse should	This F&O has been resolved by a model update. The RCP seal model was modified based on the vendor guidance documents to include both human error and random failure modes.	The new RCP seal modelling is based on the RCP seals to be installed. The Fire PRA model results presented in this report are based on this model, which provides reasonable estimates of Fire PRA CDF and LERF for this application. Therefore, there is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			be able to provide approximate failure rates and required operator timing. (Note: This F&O was generated during the December 2010 review).		
PRM-D1	PRM-D1-01 (2008), NOT MET, the PRM report is in draft form	Closed	Documentation for the Plant Response model has portions in draft and other portions not complete. This is due to the current status of the project with the plant response model undergoing updates. Once the model becomes stable, update F.3.5 with how the model was developed and updated the PRA model documentation as necessary to account for model changes used to account for FPRA evaluation capability. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by completion of the plant response model documentation. The 2010 peer review concluded SR PRM-C1 is met.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-A5	FSS-A5-01 (2008), NOT MET, incomplete development of detailed fire scenarios	Closed	For many compartments, target sets associated with high risk compartments and ignition sources has not been completed. A review of fire compartment 3BB-100 was performed to evaluate the adequacy of the scenario selection method. This is not in line with the intent of this requirement as provided in Discussions #1 and 2. High risk compartments not evaluated in a level of depth sufficient to understand the results.	This F&O has been resolved by a model update. Since the initial peer review in 2008, the fire PRA scenarios have been completed and documented. The 2010 peer review identified an industry best practice for this element. The 2010 peer review concluded SR FSS-A5 is met at Capability Category III.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-A6	FSS-A6-01 (2008), NOT MET, incomplete the fire modeling of the Main Control Room (MCR)	Closed	The main control room analysis is not complete. This item could not be verified. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by completion of the MCR analysis. The fire modeling of the MCR has been performed and documented. The 2010 peer review concluded SR FSS-A6 is met at Capability Category I/II.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-B1	FSS-B1-01 (2008), NOT MET, MCR abandonment analysis, Associated SRs: FSS-B2.	Closed	Scenarios that require MCR abandonment/reliance on ex-control room operator actions have not been developed. MCR abandonment criteria is identified in Main Control Room Fire Risk Analysis but not justified based on review of draft Main Control Room Fire Risk Analysis. MCR abandonment criteria identified but justification not provided as required in the SR. Complete fire scenario development and evaluation MCR scenarios and scenarios that require either MCR	This F&O has been resolved by a model and documentation update. The control room abandonment criteria are consistent with NUREG/CR-6850, and this is documented with the RAI 03 model. The RAI 03 model includes the risk contribution of MCR abandonment in the Fire PRA CDF and LERF.	This is resolved since the RAI 03 model, which incorporated the revised MCR abandonment model, is used in the external events sensitivity.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			abandonment or ex-control room operator manual actions. (Note: This F&O was generated during the January 2008 review).	With this F&O resolved, FSS-B1 is judged to be met.	Therefore, there is no impact on the ILRT Extension Risk Analysis.
FSS-C2	FSS-C2-01 (2008), CC I, lack of time dependent heat release rate	Closed	For Capability Categories II & III, a time-dependent assessment of heat release rate is called for scenarios important to risk. In the compartments for which scenario development was examined, heat release rates for most components (e.g., cabinets) were constant with time. Time-dependent heat release rates were assessed in at least some cases for target cables. The scenarios examined are important contributors to risk. To achieve Capability Category II or III, time dependent assessment of the heat release rates is required. More detailed assessment of the heat release rates may contribute to reducing the assessed frequencies for these scenarios and compartments. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved with a model update. Time dependent HRRs have been developed and implemented using the t^2 fire growth, peak, and decay per NUREG/CR-6850. The 2010 peer review concluded SR FSS-A6 is met at Capability Category II/III.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-C5	FSS-C5-01 (2008), CC I/II, justification for the use of damage criteria of qualified cable for non-qualified cable.	Closed	A technical basis is needed to justify the use of damage temperatures for qualified cable when a limited amount of non-qualified cable is installed in the plant. Use of damage temperatures for qualified cables may be non-conservative for targets that include nonqualified cables. Pursue identification of nonqualified cable routes or develop severity factors that may be applied to targets that may include nonqualified cables.	The F&O has been resolved with a model update. The fire modeling of all fire areas containing thermoplastic cables (or cables of unknown material which are assumed to be thermoplastic) were updated, and now considers appropriate damage criteria for unqualified cables.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-C5	FSS-C5-01 (2010), CC I/II, treatment of thermoplastic cables	Closed	NOTE: This finding was identified in 2008 review and re-identified in 2010 review. F&O: DCPP fire modeling reports indicate that the damage/ignition temperature at DCPP is based on thermoset cabling which was concluded from performance of PRA calculation F.3.6.1, which established that all raceways and conduit at DCPP contain thermoset cabling. This review identified less than 1% (350 cables) of plant cables as being thermoplastic and 5.19% (2,229 cables) of cables were constructed of unknown materials based on this it was	The F&O has been resolved with a model update. The fire modeling of all fire areas containing thermoplastic cables (or cables of unknown material which are assumed to be thermoplastic) were updated, and now considers appropriate damage criteria for unqualified cables.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			concluded that thermoset damage criteria should be applied to all fire modeling targets and self-ignited cable fires need not be considered. While this information clearly demonstrates that most cables at DCPP are qualified a very small percentage is non-qualified and those cables could damage/ignite at lower non-qualified cable damage temperatures. Basis for Significance: A very limited set of non-qualified cables exist in the plant which should be evaluated using lower damage/ignition temperatures. If these cables are present in a fire scenario for which fire modeling was performed use of damage criteria for qualified cable may be non-conservative. Possible Resolution: Identify the routing of cables with un-qualified or unknown cable construction. Screen such cables which are located in areas where no fire modeling was performed or the cables are routed in conduits. In cases where such cables are routed in cable trays in risk-significant areas reevaluate the treatment of targets where these cables are routed. (Note: This F&O was generated during the December 2010 review).		
FSS-C8	FSS-C8-01 (2008), NOT MET, treatment of fire wrap	Closed	Fire Wrap is not discussed in the fire area analysis performed for the PRA, and the technical justification for credited wrap is not provided as required by FSS-C8. Provide a description of when fire wrap is credited, a list of fire areas and components where it is credited and reference to the technical justification for the fire wrap qualifications in the FPRA. Additionally, provide documentation of the wrap effectiveness, including the maintenance of the wrap (no mechanical damage) and the review of the wrap against direct flame impingement from a high hazard ignition source. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved with a model update and documentation update. Credited fire wrap in each fire area and fire scenario is documented in the risk modeling workbook. The 2010 peer review concluded SR FSS-C8 is met.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-D3	FSS-D3-01 (2008), CC I, fire modeling is not completed for all	Closed	Fire modeling is not complete. Spreadsheets have been completed for eight areas and one CFAST model is completed based on submittal to Peer Review.	This F&O has been resolved by completion of fire modeling and documentation.	This is resolved. There is no impact on the ILRT

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	screened areas		Complete Fire Modeling Task and documentation to satisfy this SR. (Note: This F&O was generated during the January 2008 review).	The 2010 peer review concluded SR FSS-D3 is met at Capability Category III.	Extension Risk Analysis.
FSS-D7	FSS-D7-01 (2010), CC I, use of plant specific data for suppression and detection systems	Closed	F&O: To meet Capability Category II, it should be demonstrated that the system has not experienced outlier behavior relative to system unavailability. A review of data and results of Calculation M-1079 indicates that the plant smoke detector unavailability is similar to the generic unavailability. There does not appear to be a similar review performed for the heat detectors or the fire suppression systems. Basis for Significance: The analysis currently meets Capability Category I. This finding discusses the gap that needs to be addressed to meet Capability Category II for this Supporting Requirement. Possible Resolution: Perform a review of plant-specific maintenance and testing data for fire suppression and other fire detection systems in order to characterize the unavailability of these systems to confirm that here are no outliers. (Note 1: This F&O was generated during the December 2010 review). (Note 2: After the issue of the draft peer review report, PG&E requested that the peer review team revisit this F&O. The review team caucused and decided that the F&O will stay as originally written. The PG&E's request and the review team's conclusions are documented in Appendix C).	This F&O has been resolved by additional review with no model change required. A review of plant-specific maintenance and testing data for fire suppression and detection systems was performed and results documented. It was concluded that these systems have not experienced outlier behavior compared to the generic data applied in the fire PRA. With this F&O resolved, SR FSS-D7 is judged to be met at Capability Category II.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-D8	FSS-D8-01 (2008), MET, suitability of detection and suppression systems	Closed	The effectiveness of the fire detection and suppression systems is included in the fire modeling spreadsheets; however evidence of an evaluation of the suitability of detection and suppression systems and specific features that may impact these systems was not identified. This information is contained to some degree in the FHA but specific discussion in the fire modeling calculations should be included. SR requires specific discussion of suitability of detection and suppression systems and	This F&O has been resolved by a documentation update. The effectiveness of the automatic detection and suppression systems has been evaluated during walkdowns and inspections, and has been included in revised documentation.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			specific analysis unit features that may impact these systems. Include write-up in fire modeling calculations to discuss these attributes. (Note: This F&O was generated during the January 2008 review).		
FSS-D9	FSS-D9-01 (2008), CC I, incomplete smoke damage analysis	Closed	Qualitative analysis of the smoke analysis is included in individual fire modeling spreadsheets; although the approach used is good, this activity is not yet complete. Smoke analysis has been performed for smoke transport through bus ducts. This analysis needs to be completed for all affected compartments. Complete smoke damage analysis for all affected compartments. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by completion of the smoke damage analysis; no model change was required. The smoke damage analysis was completed with no new risk-significant scenarios identified. Smoke damage was evaluated based on the guidance in Appendix T of NUREG/CR-6850. The 2010 peer review concluded that SR FSS-D9 is met at Capability Category II/III.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-D10	FSS-D10-01 (2008), NOT MET, confirmatory walkdown of detection and suppression system not done	Closed	Confirmatory walkdowns have not been performed to verify that as-built plant conditions or detection, suppression, etc. have been characterized appropriately for each analyzed fire scenario. The site has high confidence in the accuracy of drawings and initial walkdowns used to establish fire scenario parameters are accurate; however the information gathered has not been validated. Perform confirmatory walkdowns to validate fire model inputs. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by a documentation update. Confirmatory walkdowns have been performed for fire scenarios per the fire modeling procedure and documented in the fire modeling workbooks. The 2010 peer review concluded that SR FSS-D10 is met at Capability Category II/III.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-D11	FSS-D11-01 (2008), NOT MET, confirmatory walkdown of fire source and targets not done	Closed	Confirmatory walkdowns have not been performed to confirm that the combinations of fire sources and target sets appropriately represent the as-built plant conditions. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by a documentation update. Confirmatory walkdowns have been performed for fire scenarios per the fire modeling procedure as documented in the fire modeling workbooks. The 2010 peer review concluded that SR FSS-D11 is met with a new finding - refer to F&O FSS-011-01 (below).	This is closed. There is no impact on the ILRT Extension Risk Analysis.
FSS-D11	FSS-D11-01 (2010), MET, crediting the incipient detection	Closed	F&O: Fire modeling for some of the electrical cabinets (i.e., Cabinets PK109, RAR, RFWM, RG, RNASB/RNARA/RNARB, RNO1, RNP1, RNP2, &	DCPP committed to install the incipient detection system in SSPS room and Cable Spreading Rooms of both Units (SAPN	DCPP committed to install the incipient detection

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	system for some of electrical cabinets in the Cable Spreading Room		RTFW) located in Fire Compartment 7A include credit for incipient detection which is not yet installed. Basis for Significance: Incipient detection has not been installed accordingly credit for this system does not reflect current plant conditions. Crediting this detection may mask risk associated with these cabinets. Possible Resolution: The incipient detection system should be installed as planned or the scenarios that credit this system should be revised to eliminate credit for incipient detection. (Note: This F&O was generated during the December 2010 review).	50365080). It is anticipated that all of the Fire PRA related modifications will be completed prior to the next scheduled Type A tests for Units 1 and 2 in the first quarter of 2019 and 2018, respectively (see Section 5.3.1 for details). The fire areas for the detection system were selected based on risk insights from the FPRA model being developed as part of NFPA 805. The modeling methodology of crediting and incorporating the incipient detection system (in-cabinet) in the FPRA model followed FAQ 08-0046 and is documented in Rev 3 of the Fire Modeling Procedure (EPM-DPFP-001), Section 8.4.2. At DCPP the incipient detection system will be installed only in the SSPS and CSR rooms, which are not continuously occupied. It is not used in an area-wide application or in the Main Control Room.	system in SSPS room and Cable Spreading Rooms of both Units (SAPN 50365080). Therefore, this is closed, and there is no impact on the ILRT Extension Risk Analysis.
FSS-E1	FSS-E1-01 (2010), MET, validating type of detection system (smoke or heat) credited in the Cable Spreading room	Closed	F&O: During conduct of the peer review walkdown in compartment 7A it was noted that both heat and smoke detection is provided in the area. This compartment is protected with a CO2 fire suppression system which is credited for the FPRA. The documentation contained in the fire modeling report does not address whether this system is cross-zoned or not. Typically such a system would require activation of one heat or two smoke detectors to activate the CO2 system. The fire modeling was predicated on activation of a single heat detector which is likely accurate for this system however the system function should be validated and accurate modeling of system response should be documented. Basis for Significance: Fire modeling parameter needs to be validated. Possible Resolution: Validate fire detection and suppression system operation and ensure proper modeling.	The suggestion F&O has been resolved with a model update. See F&O FSS-CS-01 (2008) above.	This is closed. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			(Note: This F&O was generated during the December 2010 review).		
FSS-E2	FSS-E2-01 (2010), MET, use of generic unavailability for the suppression system	Closed	F&O: The basis for the establishment of a fire suppression system unavailability factor of 0.01 is not clear. Documentation included in Section 5.8 of the fire modeling reports indicates that this value was adopted based on a lack of plant-specific information and that this value equates to 80 hours of exposure per year. The report indicates that the value is based on an estimate of maintenance activities however no additional detail is provided. Basis for Significance: The rationale used to justify the use of this unavailability factor is not provided. Possible Resolution: The write-up provided as rationale for this unavailability factor should be expanded to discuss why the 0.01 value is representative or bounding of DCPP fire suppression system unavailability. (Note 1: This F&O was generated during the December 2010 review). (Note 2: After the issue of the draft peer review report, PG&E requested that the peer review team revisit this F&O. The review team caucused and decided that the F&O will stay as originally written.).	This F&O has been resolved by additional review with no model change required. A review of plant-specific maintenance and testing data for fire suppression and detection systems was performed and results documented. It was concluded that these systems have not experienced outlier behavior compared to the generic data applied in the fire PRA. With this F&O resolved, SR FSS-E2 is judged to be met at Capability Category II.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-E3	FSS-E3-01 (2008), NOT MET, fire modeling uncertainty	Closed	The Fire Modeling and accident sequence analysis does not include a characterization of uncertainty, either qualitative or quantitative. Provide a quantitative characterization of uncertainty factors in the fire modeling and sequence analysis, for significant fire scenarios, per FSS-E3. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by a documentation update. The uncertainty associated with fire modeling has been identified and characterized in the documentation. The 2010 peer review concluded that SR FSS-E3 is met at Capability Category III.	This is resolved and the uncertainty analysis does not affect Fire PRA values used in the ILRT Extension Risk Analysis. Therefore, there is no impact on the ILRT Extension Risk Analysis.
FSS-F1	FSS-F1-01 (2008), NOT MET, exposed structure steel	Closed	Exposed Structural Steel Analysis/Review has not been performed.	This F&O has been resolved by a documentation update. The exposed	This is resolved. There is no impact on the ILRT

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	analysis not done		Perform Exposed Structural Steel Analysis per FSS-F1 to F3. (Note: This F&O was generated during the January 2008 review).	structural steel analysis has been completed and documented. The 2010 peer review concluded that SR FSS-FI is met at Capability Category I/II.	Extension Risk Analysis.
FSS-G1	FSS-G1-01 (2008), NOT MET, multi-compartment analysis was done.	Closed	Multi-Compartment Analysis has not be performed. Complete Analysis for Multi-Compartment Scenarios for FSS-G1 to G6. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by a documentation update. The multi-compartment analysis has been completed and documented. The 2010 peer review concluded that SR FSS-G1 is met.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-H1	FSS-H1-01 (2008), NOT MET, lack of documentation of the detailed fire modeling, Associated F&Os: SR H2 through H10.	Closed	Documents reviewed are in-progress and at various levels of completion. Fire modeling is currently in-process; the detailed fire modeling analyses have not been fully documented. Documentation of uncertainty analysis, multi-compartment analysis and fire scenario confirmatory walkdowns is required. Complete analysis and accompanying documentation. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by completing the analysis and documentation. Fire modeling has been completed and documented in detailed fire modeling workbooks. See F&O FSS-E3-01 (2008) (above) for completion of the uncertainty analysis. See F&O FSS-G1-01 (2008) (above) for completion of the multi-compartment analysis. The 2010 peer review concluded that SR FSS-H1 is met.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-H4	FSS-H4-01 (2008), MET, incomplete detailed fire modeling and documentation of fire modeling inputs.	Closed	The input values for each modeling tool used is documented in the corresponding attachment to Calc. File No. 3.11a; however because the detailed fire modeling task has not been completed satisfaction of this SR is not complete. Complete Fire Modeling Task and documentation to satisfy this SR. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by completing the analysis and documentation. Fire modeling has been completed and documented in detailed fire modeling workbooks.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
FSS-H5	FSS-H5-01 (2008), CC I, incomplete detailed fire modeling and parametric uncertainty	Closed	The fire modeling output results for each analyzed fire scenarios are documented in the respective Calculation File No. 3.11a attachments; however the completed analyses and documentation are not finalized. No evidence of uncertainty evaluations was identified. Fire modeling results are documented for completed	This F&O has been resolved by completing the analysis and documentation. Fire modeling has been completed and documented in detailed fire modeling	This is closed. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			analyses/scenarios; documentation of remaining scenarios must be performed. Parameter uncertainty evaluations should be conducted to achieve CC-II. Complete and document results for remaining scenarios including parameter uncertainty evaluations. (Note: This F&O was generated during the January 2008 review).	workbooks. The results of the parameter uncertainty was performed and documented. The 2010 peer review concluded that SR FSS-H5 is met at Capability Category II, with a new finding; see FSS-H5-01 (2010) below.	
FSS-H5	FSS-H5-01 (2010), CC II, lack of documenting the cause of the target damage, Associated SRs: FSS-D9	Closed	F&O: The documentation in the Risk Modeling Workbooks (Attachment 2 of the Detailed Fire Modeling Reports) does not clearly identify the cause of the target damage (i.e., heat effects, smoke). Section 5.8 of the report does discuss the impact of smoke damage, and discussions with the analyst indicate that smoke damage is a consideration and can be the cause of target damage. However, the analysis results do not differentiate, and so it cannot be easily determined if target damage is due to smoke. Basis for Significance: Needed to meet the SR. Possible Resolution: Document fire modeling output results for each analyzed fire scenario in a manner that facilitates FPRA applications, upgrades, and peer review. (Note: This F&O was generated during the December 2010 review).	This F&O has been resolved by a documentation update. The risk modeling workbooks have been revised to identify the cause of target damage.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
IGN-A4	IGN-A4-01 (2008), CC II, possible Bayesian update for Diesel Generator fire frequency or provide justification, Associated SRs: IGN-B4.	Closed	DCPP documented their review of plant-specific fire experience between 1996 and 2006 in Attachment 10 to F.3.6. As stated in Section 5.3, "Based on the review of the plant fire events and the facts that: (1) there was no unusual pattern in the fire events, (2) no common-cause problem was identified for two fire events associated with the Diesel Generators, and (3) there were only a small number of "potentially challenging" fire events in last 10 years of plant operation, it is decided that a plant-specific update of the generic fire frequencies is not warranted." However, the two Diesel Generator fires in 20 plant years translate to a rough fire frequency of about 1E-1/plant year. This is approximately an order of magnitude greater than the generic frequency. DCPP should consider either performing a Bayesian update for the Diesel Generator fire frequency or providing a more	This F&O has been resolved by a documentation update. The two DG fires have been further reviewed and additional justification for not using the plant-specific experience has been documented. The use of generic fire frequency data without a Bayesian update has been specifically addressed as a source of uncertainty.	This is closed. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			detailed justification of the basis for not performing the Bayesian update. If DCPP does not perform the update, they should add this to their list of epistemic sources of uncertainty. (Note: This F&O was generated during the January 2008 review).		
QNS-B1	QNS-B1-01 (2008), NOT MET, lack of documenting the screened fire areas, Associated SRs: QNS-D1	Closed	Compartments with risk below the screening criteria and the risk results are not documented in F.3.5. It is not possible to verify that all fire areas/compartments identified in the plant partitioning have been analyzed. Add a list of all fire areas/compartments analyzed to the results in F.3.5, including those below the 1E-07/year CDF. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by a documentation update. The documentation was confirmed to list the fire compartments with risk below the screening criteria, including both CDF and LERF. The 2010 peer review concluded that SR QNS-B1 is met.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
QNS-B1	QNS-B1-02 (2008), NOT MET, lack of LERF screening results, Associated SRs: QNS-D1	Closed	Screening Results as supplied in F.3.5, Step 6.2 do not provide LERF results. LERF results are part of the screening criteria (and criteria for determining additional modeling for Diablo) identified in Section 5.2. Without LERF results, some fire areas may not be analyzed, even though LERF results are too high. Perform and document the LERF results in Section 6.2 of F.3.5 for screened and unscreened fire areas/compartments. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by a documentation update. The documentation was confirmed to list the fire compartments with risk below the screening criteria, including both CDF and LERF. The 2010 peer review concluded that SR QNS-B1 is met.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
CF-A1	CF-A1-02 (2008), CC I, circuit failure probability estimate involving dependent/ independent circuits (e.g., off-schemeor interlock circuits)	Closed	Circuit Failure Probabilities in Attachment 2 are incorrectly combined when there are multiple cables in a fire area. For example, two cables with a spurious operation probability of 0.1 each are added as 0.1 + 0.1*(1-0.1) = 0.19. In most cases, when the first cable is damaged (and does not spuriously actuate), the grounding of the cable will blow the fuse of the component. Damage to the second cable will have no impact on the component and should not be considered in the probability calculation. Discussions with the NUREG/CR-6850 authors indicate that the write-up on this issue is confusing in NUREG/CR-6850, but the interpretation in Diablo FPRA is not correct for most circuits. Most Components include multiple components	This F&O has been resolved by a model update. The circuit failure mode probability calculations have been revised to properly combine multiple cable failure probabilities. The 2010 peer review concluded that this SR was met at Capability Category I with a new finding F&O CF-A1-01 (2010).	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			in each fire area. This means that on average, the spurious operation probabilities used are conservative by a factor of 2. Use the bounding generic spurious operation probability for each component in each fire area as a starting point. For components with off-scheme or interlock circuits, which are supplied from an independent power supply should be considered additive. Other circuits should be considered dependent and not additive. (Note: This F&O was generated during the January 2008 review).		
CF-A1	CF-A1-01 (2010), CC I, detailed circuit failure calculation based on specific circuit configuration for risk significant components using appropriate method (e.g., FAQ 08-047)	Closed	F&O: Detailed circuit failure analyses have been performed and documented. However, only a few of the circuit failure probability calculations make use of the methodology provided in FAQ 080047. A substantial number of risk significant components (based on RRW) need to have circuit failure probabilities updated, since the current calculations are conservative. Additionally, for probabilities with more than two events, the equations in Attachment 2 should be checked. For example, with 3 events A, B and C, the exclusive OR calculation should be: A + B + C - A*B - A*C - B*C + A*B*C Basis for Significance: CC II/III requires that risk-significant events have circuit failure calculations performed based on the specific circuit configuration and appropriate method (FAQ 08-0047). Possible Resolution: Review the risk rankings for fire induced failures and spurious events. Calculate the conditional failure probabilities for these events based on the specific circuit configuration and accounting for the method discussed in FAQ 080047. (Note: This F&O was generated during the December 2010 review).	This F&O has been resolved with a model update. The circuit failure probabilities were updated for basic events with risk reduction worth (RRW) values greater than 1.05 for fire CDF and LERF employing the FAQ 08-0047 methodology. With this F&O resolved, PG&E judges that SR CF-A1 is now met at Capability Category II/III, based on consideration of the specific circuit configuration for risk-significant components.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
CF-A2	CF-A2-01 (2008), NOT MET, Uncertainty values and distribution types for the circuit	Closed	Uncertainty values and distribution types for the circuit failure probabilities was not provided in the analysis files, CF tables or in RISKMAN. The CF values are from NUREG/CR6850, Chapter 10. Use of these and an assumed distribution can be used to	This F&O has been resolved with a documentation update. The documentation was revised to add a discussion on distribution types and uncertainty values for the circuit failure probabilities.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	failure probabilities was not provided.		characterize the uncertainty for each spurious operation probability. When spurious operation probabilities are combined, the new uncertainty may need to be estimated. (Note: This F&O was generated during the January 2008 review).	The 2010 peer review concluded that SR CF-A2 is met.	
HRA-A3	HRA-A3-01 (2010), CC II, basis for screening undesired actions in response to spurious annunciators	Closed	Section 6.4 of Calculation File No. F.3.12, "Post-fire Human Reliability Analysis" states that the FPRA screened all undesired actions in response to spurious annunciators [and indications]. The basis for screening many spurious or erroneous indications is either inadequate or not provided in the FPRA documentation. Examples: • F.3.2, Attachment 7 identifies 6 alarms that could result in operator taking action without any other cues. The actions taken in response to these spurious annunciators were determined to be recoverable, and were screened based on the fact that the recovery action was estimated to be less than 5E-2. There is no basis for why this screening level is appropriate. • There are some adverse actions listed in F.3.12 Table C-4 that do not appear to be discussed or dispositioned anywhere else (e.g., E-1, steps 14, 16, and 17). • There are many alarm responses in Attachment 7 of F.3.2, (pages 18, 19 and 20), which do not require verification, but had been screened out without proper basis. • The screening disposition for several operator actions in F.3.12 Table C-2 does not appear to be complete. For spurious RWST level indication, the screening disposition states that the spurious indication "Could be screened" based on redundancy, but there is an open-ended "However..." at the end of the disposition. There are other examples in Table C-2 where the screening criteria are not definitive, as the disposition states "Could be screened..." (e.g., E-0, Steps 26 and	This F&O has been resolved by additional review and update of the documentation. The screening basis for all annunciators and indications was reviewed and confirmed to be acceptable. The specific examples identified were corrected in the documentation.	This documentation issue is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			27). The screening criteria should be stated explicitly, as opposed to suggested with the phrase 'could be.'		
HRA-B1	HRA-B1-01 (2008), MET, additional instrumentation beyond that explicitly addressed in the internal events PRA (e.g., RCS pressure and temperature indications in support of Bleed and Feed operation.	Closed	The validity of the actions as they were defined and evaluated for the internal events PRA has generally be considered appropriately as they are carried over into the FPRA. The availability of indications, context for the actions, etc., has been assessed in modifying the existing analyses to apply for fire scenarios. One potential exception was encountered. The HFEs relating to failure to initiate feed-and-bleed cooling (e.g., event ZHEOB1_0) account for indications relating to steam generator level. These indications provide the cues for initiating feed-and-bleed cooling. The procedure includes a caution and instructions for maintaining RCS conditions (pressure and temperature) within bounds to ensure adequate heat removal but not excessive cool down. For the internal events, this control function is not addressed; it is implicitly taken to be successful. There are sufficient indications of RCS conditions and the time available is such that this is probably adequate. For some plants, at least, this control function can be critical to the long-term success of the action. For the DCPP fire analysis, the availability of only equipment and cables associated with steam-generator levels have been addressed for this HFE. If control is required and if instruments needed to support control could be affected by fires in particular compartments, this is not being tracked. This is an element of the manner in which the HFEs are addressed as they are adapted from the internal events PRA to the fire analysis that needs to be considered. It is expected to affect a very small number of HFEs. This event should be evaluated to determine if additional equipment and cables should be addressed. A review should be made of other HFEs for which additional instrumentation beyond that explicitly addressed for internal initiators (and therefore captured for the fire analysis) is credited.	This F&O has been resolved by additional evaluations and model updates. A review was conducted of operator actions to identify additional equipment or cables to be evaluated; this included the feed-and-bleed action.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			(Note: This F&O was generated during the January 2008 review).		
HRA-C1	HRA-C1-01 (2008), NOT MET, open F&Os from the focused peer review of HRA in 2007	Closed	R-1736044-1728, Dated August 10, 2007, documents the results of the Diablo Canyon focused scope Peer Review of HRA. This document contains a number of Facts and Observations documenting specific issues affecting the application of the methodology in general and some specific HFEs. These F&Os have not been resolved for the Level 1 HRA as yet. There was no indication that DCPP had reviewed these issues for any impact on their fire HRA. Several of these new F&Os were reviewed to determine if any of identified issues had the potential to influence the fire HRA and to determine if the impacted HFEs had carried over to the Fire HRA. In the limited spot-check, two such HFEs, ZHEFO4 and ZHOE1, were identified. They are associated with the new F&Os, HR-F2-1, HR-G3-2 and HR-G3-3. The issues identified in these F&Os could be influenced by fire conditions. There is no indication that DCPP had reviewed these issues in preparing the fire HRA. There is some indication that the DCPP's methodology for developing screening HEPs may, at least in part, cover some of the issues. Note that for ZHECV1, one of the other HFEs referenced one of the fire variants for this HFE, ZHECV1_0, but only the base case was quantified in the HRA course. Furthermore, Table 2 and Table A-1 contain the base case value and the _0 case value. DCPP needs to review the F&Os in R1736044-1728 to determine if any of the issues could be influenced by a fire and if so any of the impacted HFEs carried over into the FPRA were. DCPP should then identify how they addressed these issues in the fire HRA. (Note: This F&O was generated during the January 2008 review).	The internal events HRA was updated in 2012 and included review and resolution of the previous F&Os. Results of the updated internal event HRA were incorporated into the fire HRA. The 2010 peer review concluded that SR HRA-C1 is met at Capability Category II with a new finding F&O HRA-C1-01 (2010).	This is closed. There is no impact on the ILRT Extension Risk Analysis.
HRA-C1	HRA-C1-02 (2008), NOT MET, no detailed analyses addressing	Closed	HFEs adapted from the internal events PRA have been evaluated for general fire conditions, using bounding parameters for some elements of the analysis.	This F&O has been resolved by completion of the detailed analyses for the important operator actions modeled in the fire PRA.	This is closed. There is no impact on the ILRT

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
	conditions associated with a specific fire scenario.		Additional cause-based mechanisms (in the cause-based decision-tree method that forms the basis for assessing the cognitive contribution in their HRA approach) have been considered to account generally for fire conditions. For example, branch points different from those for the equivalent HFE in the internal events PRA are selected for cases in which the fire scenario implies that a partial set of indications would be available In addition, the recovery factors internal to the cause-based assessment have been set to 1.0, rather than retained at the values assessed for the HFE in the internal events PRA. The execution assessment has also been modified, both to remove this internal recovery and to increase the execution time. For HFEs reflecting actions identified from the fire response procedure, a screening assessment has been performed. No detailed analyses of HFEs have been completed, either to address conditions associated with a specific fire scenario, or to adjust further the factors treated as bounding in the analysis. This process is planned as the fire quantification progresses, but clearly has not been completed. Moreover, it would appear likely that at least some HFEs would need to be treated using a time-reliability correlation, because the cause-based approach may not adequately capture time constraints. It is not clear that this is planned at the current time. The detailed assessment of fire scenarios will need to be supported by detailed treatment of HFEs. The detailed assessment will need to be completed for fire scenarios that contribute to core-damage frequency. Moreover, it is likely that additional methods will need to be applied to assess HFEs corresponding to time constrained actions. (Note: This F&O was generated during the January 2008 review).	The 2010 peer review concluded that SR HRA-C1 is met at Capability Category II with a new finding F&O HRA-C1-01 (2010).	Extension Risk Analysis.
HRA-C1	HRA-C1-01 (2010), CC II, HRA dependency analysis	Closed	F&O: Human action dependencies have been accounted for in the FPRA. The internal events HRA (from which the Fire HRA events were developed) dependency analysis is complete, and only four new fire-specific events have been added. The final check for dependent	This F&O has been resolved by completion of the fire PRA HRA dependency analysis.	This is closed. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			operator actions (quantification of the FPRA with HEPs set to a high value) has not been completed. Basis for Significance: The evaluation with all HEPs set to a high value will ensure that no dependencies have been overlooked. Possible Resolution: Check for dependent HFEs in the FPRA model by quantifying it with HEPs set to a high value. (Note: This F&O was generated during the December 2010 review).		
HRA-D1	HRA-D1-01 (2008), NOT MET, recovery actions for risk significant fire scenarios	Closed	No recovery analysis beyond the HFEs included initially in the model has yet been identified. For example, some scenarios that appear to be contributing include loss of offsite power independent of the fire effects. Consideration of the recovery of offsite power has not yet been made. Consideration of recovery will be necessary in conjunction with the definition and assessment of detailed fire scenarios. The recovery analysis will need to be performed as the sequence quantification progresses from bounding to detailed. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by a model update. A review of the dominant scenarios and areas was conducted, and appropriate recovery actions were added to the model. Screening analyses were initially incorporated followed by detailed analyses for the important operator actions modeled. The 2010 peer review concluded that SR HRA-D1 is met at Capability Category II.	This is closed. There is no impact on the ILRT Extension Risk Analysis.
HRA-E1	HRA-E1-01 (2008), NOT MET, open F&Os from 2007 focused HRA peer review	Closed	F.3.12, the fire HRA analysis report contains a set of assumptions (see page 3 of 1167). The first assumption is "The internal events PRA and HRA are complete and in compliance with the ASME PRA Standard [1] Category II as endorsed by Reg. Guide 1.200 ". However, R-1736044-1728, Dated August 10, 2007, documents the results of the Diablo Canyon focused scope Peer Review of HRA. This document contains a number of Facts and Observations documenting specific issues affecting the application of the methodology in general and some specific HFE. These F&Os have not been resulted for the Level 1 HRA as yet. Based on these F&Os, several of the RA-Sb-2005 HRA SRs are identified as being not met. Thus, it cannot be unequivocally stated that the	The internal events HRA was updated in 2012 and included review and resolution of the previous F&Os. Results of the updated internal event HRA were incorporated into the fire HRA. The 2010 peer review concluded that SR HRA-C1 is met at Capability Category II with a new finding F&O HRA-C1-01 (2010).	This is closed. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			DCPP HRA is in full compliance with the ASME PRA Standard. DCPP needs to address/resolve the new F&Os in R-1736044-1728, Dated August 10, 2007. (Note: This F&O was generated during the January 2008 review).		
HRA-E1	HRA-E1-02 (2008), NOT MET, uncertainty analysis	Closed	Documentation of the initial (screening or bounding) methods has been completed, but the manner in which more detailed assessments will be performed is not yet documented. The detailed assessments of HFEs and of recovery actions are not yet documented because the analyses have not been performed. Documentation of assumptions and sources of uncertainty has also not yet been done. Documentation currently is limited to the methods used for the general treatment of HFEs as they are adapted to the FPRA, and for the screening analysis of HFEs associated with actions identified from the fire response procedure. Documentation of the detailed treatment of HFEs, of recovery analyses, and of the assumptions and uncertainties will need to be developed. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by completion of the detailed HRA analyses and documentation of uncertainty considerations. The 2010 peer review concluded that SR HRA-E1 is met.	This is closed. There is no impact on the ILRT Extension Risk Analysis.
SF-A1	SF-A1-01 (2010), MET, clarify which areas were considered in the IPEEE walkdown	Closed	F&O: Diablo Canyon Calculation F.3.13, Rev. 0 covers Seismic-Fire interaction. This calculation uses a part of the IPEEE submittal as the basis to conclude that all fire scenarios resulting from an earthquake are identified and qualitatively analyzed. The IPEEE submittal bases much of these conclusions on a walkdown. While the identification of seismically-induced fires appears to be reasonable, the IPEEE does not provide sufficient documentation of what areas were considered and what areas were screened out. At present, there does not appear to be sufficient documentation to support the conclusions relating to this SR in the calculation. Basis for Significance: The SR is judged to be met, even though this supporting information is needed to meet the SR. The required information is needed to fully meet the	This F&O has been resolved by a documentation update. The documentation was revised to demonstrate the areas considered in the IPEEE walkdown were consistent with the global plant analysis boundary (GPAB) considered in the current fire PRA, and that the conclusions adequately support the seismic-fire interaction analysis.	This is closed. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			SR. Note, however, that item this item does not impact the results of the FPRA. Possible Resolution: It is recommended that either the supporting data for the IPEEE plant walkdown be reviewed to provide more bases for identifying seismic-fire interaction scenarios, or another walkdown be done and documented to identify seismically induced fires in support of this SR. (Note: This F&O was generated during the December 2010 review).		
SF-A3	SF-A3-01 (2010), MET, no clear conclusion that SR SF-A3 is met.	Closed	F&O: The SR SF-A3 requires assessment of the potential for common-cause failure of multiple fire suppression systems due to the seismically-induced failure of supporting systems. Diablo Canyon Calculation F.3.13, Rev. 0 addresses seismic-fire interaction. Section 6.2 addresses SR SF-A3. While there is a lot of supporting information in this section, there is no clear conclusion made that this SR is met. There needs to be a clear conclusion drawn that the SR is met based on the supporting information. Basis for Significance: Even though the review team concluded that this SR is met, this item is needed to meet the SR. Possible Resolution: Rewrite Section 6.2 of the Calculation F.3.13 to draw the conclusion that SR SF-A3 is met. (Note: This F&O was generated during the December 2010 review).	This F&O has been resolved by a documentation update. The documentation was revised to disposition CCF of fire protection systems due to a seismic event as not credible.	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
SF-A5	SF-A5-01 (2010), MET, TQ1.DC12 needed to be revised	Open	F&O: Diablo Canyon Calculation F.3.13, Rev. 0 covers Seismic-Fire interaction. In this calculation it was noted that a Notification SAPN 50294777 (Task 23) has been created to revise TQ1.DC12 to include fire brigade training to cope with a seismically-induced fires and associated system, equipment, communications and brigade access logistics. This recommendation needs to be implemented in order to meet this SR. The review team is judging this SR to meet, however, an F&O has	Update to the training program is being tracked by a plant action item, and will be closed when SAP Notification50294777, Task #23 is implemented fully. The status of training has no impact on calculations of risk changes associated with the ILRT Extension Risk Analysis.	The status of training has no impact on calculations of risk changes associated with the ILRT Extension Risk Analysis. Therefore, there is

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			been written to require implementation of this recommendation. Basis for Significance: The SR is judged to be met assuming that this recommendation is being implemented. Possible Resolution: Implement the suggested recommendation. (Note: This F&O was generated during the December 2010 review).		no impact on the ILRT Extension Risk Analysis.
FQ-B1	FQ-B1-01 (2008), NOT MET, complete quantification and document the results, Associated SRs: FQ-C1, FQ-D1, FQ-E1, and FQ-F1.	Closed	The sequence quantification is in process but is in a preliminary state. It does not yet meet the requirements of FQ-B1, FQ-D1, FQ-E1 and FQ-F1. Completion of the quantification process is obviously essential for the fire analysis. It is expected that the quantification process will be carried through consistent with the manner in which it has been started. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by completion of quantification of the fire PRA model and the associated documentation. The 2010 peer review concluded that SR FQ-B1 is met with on new F&O FQ-B1-01 (2010).	This is closed. There is no impact on the ILRT Extension Risk Analysis.
FQ-B1	FQ-B1-01 (2010), MET, truncation analysis, Associated F&Os: FQ-F1-01.	Closed	F&O: The FPRA does not achieve convergence at the current truncation level of 1E-8 below the scenario frequency. Establishing a proper truncation level is required by QU-B2 and QU-B3 (the QU-B SRs are referenced in FQB1). The FPRA truncation is discussed in F.3.5, Appendix S; the increases in CDF and LERF by lowering the truncation one order of magnitude are 12% and 24%, respectively. Basis for Significance: A proper truncation level is required to ensure that quantification results properly reflect the risk contributors, and that significant sequences and/or contributors are not eliminated. The increases in CDF and LERF by lowering the truncation frequency by one order of magnitude are greater than 5% (QU-B3 requirement). Possible Resolution: Use lower truncation limit or address model issues which may be causing convergence problem.	This F&O has been resolved by a model update. The truncation level in the fire PRA model is documented to demonstrate convergence.	This is closed. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			(Note: This F&O was generated during the December 2010 review).		
UNC-A1	UNC-A1-01 (2008), NOT MET, uncertainty analysis not done, Associated SRs: UNC-A2, UNCA3	Closed	The FPRA shall identify key sources of CDF and LERF uncertainties, including key assumptions and modeling approximations. These uncertainties shall be characterized such that their impacts on the results are understood. Uncertainty and sensitivity analysis have not completed yet, Items could not be verified for SRs UNC-A1, UNC-A2 & UNC-A3 therefore, assumed as not met. Once the FPRA model becomes stable, perform the CDF and LERF uncertainties, including key assumptions and modeling approximations. (Note: This F&O was generated during the January 2008 review).	This F&O has been resolved by completion of the uncertainty and sensitivity analyses and documentation. The 2010 peer review concluded that SR UNC-A1 is met with one new F&O UNC-A1-01 (2010).	This is resolved. There is no impact on the ILRT Extension Risk Analysis.
MU-A1	MU-A1-01 (2008), MET, update PRA administrative procedures to include fire considerations, Associated SRs: MUA2, MU-B1 through B4, MU-C1, MU-E1, MU-F1	Closed	DCPP has an Administrative Procedure for Control of the PRA, TS3.NR1. While this procedure is written at a relatively high level, but appears to focus primarily on the internal events PRA. DCPP intends to use this process for control of the maintenance and update of the FPRA. In general, the process in TS3.NR1 appears to be applicable for the FPRA but it should be modified to specifically address fire specific issues. For this review, TS3.NR1 was reviewed against the MU SRs which are based on Section 5 of RA-Sb-2005 with the assumption that the words "FPRA" are inserted for "PRA" and assuming that DCPP will update the process to specifically address the FPRA and any unique aspects thereof. DCPP should update TS3.NR1 to specifically address the FPRA and any unique aspects thereof. In particular, TS3.NR1 and appropriate plant process and procedures should be updated to require monitoring changes to the Fire Protection Program and evaluating any plant changes that impact the Fire Protection Program for potential impact on the FPRA. Section 5.4, PRA Software should also be modified to explicitly call out any codes such as Modular Accident Analysis Program	This F&O has been resolved by updating the administrative procedures to address changes in PRA technology and industry OE. The 2010 peer review concluded that SR MU-A1 is met.	This is closed. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			(MAAP), the HRA Calculator or fire modeling codes that are not are ready controlled under other QA requirements. (Note: This F&O was generated during the January 2008 review). Update from PRA RAI 1.m: F&O MU-A1-01 (2008) observes that the PRA administrative procedure focuses on internal events, and therefore needs to be updated to address the FPRA per the guidance in the PRA Standard. F&O MU-A2-01 (2008) observes that the licensee's procedure does not require monitoring changes in PRA technology and industry experience. The disposition to these F&Os explains that "DCPP Procedures AWP E-028 and TS3.NR1 will provide the overall program of the PRA model maintenance and upgrade." Though implementation Item S-3.26 of the LAR commits to new plant administrative procedure AWP E-028 for scheduling updates and controlling associated models and files, there does not appear to be a process for updating the applicable administrative procedures. It is not clear whether improvements to the applicable administrative procedures have been performed yet. Explain whether the cited improvements to the administrative procedures have already been performed or are included in an existing implementation item listed in LAR Attachment S, Table S-3. If the cited improvements have not yet been made and are not described in an existing implementation item, then discuss the method to ensure that the cited improvements in FPRA procedure TS3.NR1 will be made before it is used as a basis in self-approval of post-transition changes.		
MU-A2	MU-A2-01 (2008), NOT MET, include monitoring, reviewing changes in PRA technology and industry OEs	Closed	DCPP has an Administrative Procedure for Control of the PRA, TS3.NR1. This procedure does not explicitly require monitoring changes in PRA technology and industry experience. Update Section 5.1.3 of TS3.NR1 to explicitly require monitoring/reviewing changes in PRA technology and	This F&O has been resolved by updating the administrative procedures to address changes in PRA technology and industry OE. The 2010 peer review concluded that SR MU-A2 is met.	This is closed. There is no impact on the ILRT Extension Risk Analysis.

Table A-3 Fire PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	Disposition	Impact on ILRT Extension
			industry experience on an every other Unit 2 outage basis. (Note: This F&O was generated during the January 2008 review).		

Table A-4 Seismic PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	ILRT Disposition
The seismic peer review was performed against a draft version of the Diablo Canyon seismic PRA model, which used updated hazard and fragilities analyses. As noted, the current seismic PRA model, which uses the existing hazard analysis and fragilities, is proposed to be used for the ILRT Extension; therefore, the F&Os for the seismic hazard model (SHA) and seismic fragility model (SFR) elements do not apply to the model proposed to be used.				
SPR-B1	SPR-B1-01, MET, basis for delay time in seismic HRA	Open	**Observation:** The human action analysis is carried forward from the internal events is adjusted based on time delay defined in Attachment 1, Evaluate Seismic Event Mitigation Strategies (Task 2). The delay times are generic for all actions and it is not clear how they were defined. The refined results for the first 3 ranges seem to be overly refined given the experience database. Further, a task analysis for the additional work load in response to the seismic event was not documented **Basis for Significance:** It is believed that the seismic influence is considerable with relation to operator stress particularly with regard to higher accelerations. The timing consideration is one factor to address due to delayed responses occurring as operators recover from the effects of the seismic event. The current timing impacts the OCR/TRC method but does not appear to influence the CBDTM method. Given that the internal analysis already assumes a high stress level the net result is that the proceduralized actions are effectively insensitive to seismic effects which seem unrealistic and controlled by the methods selected. **Possible Resolution:** A re-evaluation of the actions with regard to the seismic evaluation and considerations with regard to the methods selected and perform a reasonableness assessment of the results. In any case the rationale for the generic time and the changes in delay time by acceleration range needs to be sufficiently documented to provide adequate support the final approach.	This F&O is judged to have no significant impact on the ILRT Extension Risk Analysis. The seismic HRA is relatively unimportant, and any increase in HEP values would not have a significant impact on seismic risk.
SPR-B1	SPR-B1-02, MET, diesel mission time	Open	**Observation:** The model for lower acceleration credits the restoration of the diesel generators. The assessment appears to assume the same conditions and timing as found in the internal events analysis assuming a 6-hour mission time. This appears to be inconsistent with the general guidance for the study that the EDGs are to function for 24 hours due to the impact of the seismic event on the offsite grid **Basis for Significance:** The use of the internal events analysis is based on a convolution using experience data for all causes of offsite power loss and is not consistent with the situation being addressed. Use of this value for seismic is not appropriate. **Possible Resolution:** Revise the assessment to be based on 24 hours.	This F&O has no impact on the ILRT Extension Risk Analysis. The DG recovery is only credited for non-seismic failures for lower acceleration earthquakes. No diesel recoveries are credited for scenarios in which the components suffer a seismic failure; therefore, the impacts of the seismic event on the recovery action will be minimized. The failure probability and basis was reviewed and confirmed to be correct for seismic events.

Table A-4 Seismic PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	ILRT Disposition
SPR-B1	SPR-B1-03, offsite power fragility	Open	**Observation:** The fragility for the offsite power is based on DCL-90-205 which examines the seismic capacity for the 230kV switchyard. It does not address external impacts of transmission lines to the site or potential for other failures that would occur beyond DCPP. **Basis for Significance:** The typical value for the median capacity for offsite power is on the order of 0.3g mpga (0.7 MSA) and it would be expected that a probability of failure at DCPP would exceed that found for most plants due to the awareness of seismic impacts. The documentation indicates a performance of 1.4g MSA (ZOSPWR). The first seismic range is from 0.2g MSA to 1.25 MSA and the associated probability (SOP1) is 0.0144. Given that the capacity should cross 0.5 somewhere over this range, the calculated value appear to understate the probability. Further the next range is up to 1.75g MSA with an average value of 5.37E-01. Overall the range appears to be under predicting the likelihood of a loss of offsite power. **Possible Resolution:** Review the method and determine if the calculation is accurate.	This F&O will be resolved by additional review and model update if required. The current SPRA model provides a reasonable estimate of the seismic CDF and LERF for the purposes of the ILRT extension risk analysis.
SPR-B2	SPR-B2-01, NOT MET, operator interviews in HFE basis	Open	**Observation:** The current HFE basis appears to not include any impacts gained from operator interviews related to how the seismic event would impact timing or other stress factors necessary to adjust the internal events HFE for seismic. The basis for selecting generic time delays used to modify time delay does not appear to be based on any consideration for timing and the complexity of the scenario. It also appears to have little impact on the assessed unreliability for the seismic-specific events. **Basis for Significance:** The time windows and cues would be altered based on the seismic event. Following any significant seismic event staff will be involved in verification activities which may delay subsequent activities modeled in the PRA and slow response. Stress may also be present for larger seismic events as the operations staff will have increased workload restoring the plant following the event. **Possible Resolution:** Re-baseline the timing for events addressed (counted) in the SPRA using additional operator discussions and considering as a minimum the impact of higher accelerations in terms of work load.	This F&O has no significant impact on the ILRT Extension Risk Analysis. The seismic HRA is relatively unimportant, and any increase in HEP values would not have a significant impact on seismic risk.
SPR-B2	SPR-B2-02, NOT MET, seismic HRA dependency	Open	**Observation:** No dependency assessment has been developed for the seismic PRA at this point.	This F&O has no significant impact on the ILRT Extension Risk Analysis. The seismic HRA is relatively unimportant, and any

Table A-4 Seismic PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	ILRT Disposition
			Basis for Significance: The current assessment does not account for dependence between postulated operator actions as is required by back reference HR-G7. **Possible Resolution:** Define the HFE combinations in the seismic PRA and complete the assessment for dependence in keeping with the standard.	increase in dependent HEP values would not have a significant impact on seismic risk.
SPR-B3	SPR-B3-01, NOT MET, no acceleration screening criteria	Open	**Observation:** The standard requires defined criteria and documentation of the screening process. The DCPP SPRA does define the criteria for the screening (SSCs with capacity >11g); however, there is no description of usage of a systematic process for screening SSCs for the DCPP SPRA model. **Possible Resolution:** Add documentation that considers and dispositions all plant equipment for inclusion in the SPRA model, and clearly provide a documented basis for the final SEL for which the fragilities are developed and used in the SPRA quantification. Provide a list of the screened out SSCs in a table so that this process is understood by future reviewers.	This F&O has no impact on the ILRT Extension Risk Analysis. Because the original seismic PRA model was developed concurrent with the internal events PRA model, no screening was used. Updating the documentation to better describe this process will not impact the calculations of risk changes for the ILRT Extension Risk Analysis.
SPR-B8	SPR-B8-01, NOT MET, EDG recovery	Open	**Observation:** The model includes a recovery of the Emergency Diesel Generators (EDGs) following a seismic event with an intensity where they did not fail due to seismic considerations but rather due to random failures. The analysis appears to utilize the same analysis as utilized in the internal events analysis without alteration and is based on a 6 hour duration. **Basis for Significance:** The use of a 6 hour duration would be inconsistent with the ground rules applied in the seismic model and would understate the probability of failing to restore onsite sources. It is also not considered appropriate to include non-seismic experience for higher accelerations due to resources being displaced to address other plant issues. The standard curves found in most the literature are not considered appropriate. **Possible Resolution:** Review the existing assessment and ensure that the EDG recovery is consistent with the need to provide onsite power for at least 24 hours. If EDG recovery is retained, it should be adjusted to reflect the impact that increasing severity and the potential for aftershocks are addressed.	The diesel generator recovery referenced by the reviewer is only credited for non-seismic failures for lower acceleration earthquakes. No diesel recoveries are credited for scenarios in which the components suffer a seismic failure therefore the impacts of the seismic event on the recovery action will be minimized. The diesel basic events in the seismic model use a 24 hour mission time.
SPR-B9	SPR-B9-01, CCI, time-motion study	Open	**Observation:** No time or task analysis seems to be developed or documented to provide the basis on an individual action to demonstrate	This F&O has no significant impact on the ILRT Extension Risk Analysis. The seismic

Table A-4 Seismic PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	ILRT Disposition
			the ability to perform the action and to estimate not only initial delay but delays in diagnosis and implementation. **Basis for Significance:** The current assessment only captures in a very general basis the initial delay and does not provide any delay impact for resources being diverted or delayed to do	HRA is relatively unimportant, and any increase in HEP values would not have a significant impact on seismic risk. The time delay used in the seismic HRA was based on scenario specific interviews with Operations personnel; therefore, it is expected that these values are valid, and therefore additional documentation may be needed to resolve this F&O.
SPR-B11	SPR-B11-01, MET, seismically induced floods	Open	**Observation:** Table 1 in PRA Calculation F.6 includes a number of failure modes that would result in loss on inventory with the potential for flood impacts that go beyond the local seismic failure. For example, Containment Spray Pump failure mode is line break, loss of contents. These failure modes should be considered during the seismic-induced flood walk down. **Basis for Significance:** Equipment failure modes include a number of potential flood sources. **Possible Resolution:** Examine the potential for expanded damage from seismically induced flood during the walk down.	This F&O has is judged to have no significant impact on the ILRT Extension Risk Analysis. The unconditional seismic failure probability for SSCs that could result flooding was reviewed to estimate the impact of this issue. In all cases, the total unconditional failure probability for these types of SSCs (piping, tanks, etc.) was less than 1 E-06. Therefore, the potential impact of additional seismically induced flooding is not significant. Therefore, resolution of this F&O is judged not to significantly impact the calculations of risk changes for the ILRT Extension Risk Analysis.
SPR-C1	SPR-C1-01, MET, chattering of solid state relays	Open	**Observation and Basis for Significance:** The DC SPRA model reflects the as-built, as-operated plant with some exceptions. These include the conservatism assumption related to the solid state protective relays on the 4kV breakers and the updated charging pump. **Possible Resolution:** Evaluate the impact of the solid chatter of relays and the charging pump.	This F&O has no adverse impact on the ILRT Extension Risk Analysis. Conservatisms in the seismic response of components will not adversely impact the calculations of risk changes for the ILRT Extension Risk Analysis.
SPR-E1	SPR-E1-01, MET, expand number of bins to allow for a better fragility representation	Open	**Observation:** Due to the definition of the hazard bins, the failure fragility probability for offsite power (SOP) has a value of 0.014 in the first bin and 0.54 in the second bin. The discrete bins do not provide a good representation of the offsite power fragility curve in this range. While RISKMAN properly handles this in the fragility calculation with the use of 100-bin representation of the fragility curve in each initiator bin, the use of the mid-point may not accurately reflect the range of plant conditions for HRA and recovery.	This F&O has no adverse impact on the ILRT Extension Risk Analysis. The issue is how the initiator binning is used to credit operator recovery actions. Because the upper bin boundary was used in developing operator actions and not bin midpoint values, the operator actions are conservative for a given range of

Table A-4 Seismic PRA Peer Review – Facts and Observations

SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	ILRT Disposition
			Basis for Significance: Due to the range of the first bin compared to the change in fragility for offsite power, it is possible that the first bin is non-conservative for the upper portion of that bin. **Possible Resolution:** Expanding the number of bins would allow for a better representation of fragility in discrete bins.	acceleration. If additional binning is added, it is possible that more credit could be taken for a recovery action at lower accelerations. Therefore, resolution of this F&O would not to adversely impact the calculations of risk changes for the ILRT Extension Risk Analysis.
SPR-E1	SPR-E1-02, MET, expand bins covering hazard above 4.0g	Open	**Observation:** In the definition of the hazard bins, the last bin represents 3 to 4g median acceleration. However, at this level, the conditional probability of large early release (CLERP) is still well below 1.0. The current model accounts for this by assuming that the value of CLERP for earthquakes above 4g is 0.1, and applying this residual to the LERF results outside the RISKMAN model. While this may be a reasonable assumption with regard to the total LERF value, it results in loss of information regarding the relative importance of LERF contributors. **Basis for Significance:** This approximation results in loss of information regarding the contributors to LERF. **Possible Resolution:** Expand the number of hazard bins, with bins that represent the hazard above 4.0 g. The last bin should be chosen so that the CLERP value is close to 1.0.	This F&O has no impact on the ILRT Extension Risk Analysis. Redefining the hazard bin to ensure LERF importance can be assessed has no impact on the calculations of risk changes for the ILRT Extension Risk Analysis.
SPR-E1	SPR-E1-05, MET, error in ELECPWR	Open	**Observation:** The RISKMAN event tree ELECPWR appears to have an error in the rules for top event DH, specifically split fraction set DH1SB to DH63SB. These use the macro SEISB when they should be using "SEISA + SEISB." **Basis for Significance:** This error will likely not be important to the results because it represents the lower acceleration bins. In addition, this was the only error identified in the seismic-related rules that were re-reviewed. **Possible Resolution:** Correct the error and verify that the error was not important to the results.	This F&O will have no significant impact on the ILRT Extension Risk Analysis. A review of the error concluded that it will not impact the results of the seismic PRA, and therefore will not impact the calculations of risk changes for the ILRT Extension Risk Analysis.
SPR-E5	SPR-E5-01, NOT MET, no uncertainty distribution provided	Open	**Observation:** PRA Calculation C.9 provides point estimates for CDF and LERF, but does not address uncertainty distributions. **Basis for Significance:** The SR requires estimating or addressing uncertainty distributions for CDF and LERF. **Possible Resolution:** Use RISKMAN Monte Carlo tools to calculate uncertainty distributions for CDF and LERF.	This F&O has no impact on the ILRT Extension Risk Analysis. Seismic parametric uncertainty analysis does not impact the quantitative results and will not impact the calculations of risk changes for the ILRT Extension Risk Analysis.

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SR	2009 ASME/ANS Cat II Requirement	Status	Finding/Observation	ILRT Disposition
SPR-F1	SPR-F1-01, NOT MET, modeling of cross ties between Units	Open	**Observation:** The SPRA documentation says in a number of places that the SPRA takes no credit for cross ties between Units following a seismic event (e.g., Page 2 of Attachment 2 to F.6). However, the RISKMAN event tree model does not guarantee failure of all cross-tie options for seismic events. As a result, it is not clear that the model is consistent with the documentation. **Basis for Significance:** Potential inconsistency between documentation and model. **Possible Resolution:** Either revise the Event Tree models so that it is assured that no credit is taken for cross-ties or provide justification for specific cross-ties (for example, at low acceleration levels where independent hardware failures dominate, cross-tie options may be appropriate).	This F&O has no impact on the ILRT Extension Risk Analysis. The issue was reviewed and it was determined that the model appropriately addresses availability for opposite unit equipment. Therefore, resolution of this F&O will not impact the calculations of risk changes for the ILRT Extension Risk Analysis.
SPR-F1	SPR-F1-02, NOT MET, roadmap between current documents and PLG-0637	Open	**Observation:** The current documentation includes references to PLG-0637, but it is not clear how much of that 1988 document is still valid and relied on. **Basis for Significance:** Unclear what current documentation is. **Possible Resolution:** Provide a roadmap from current documentation (e.g., Calculation F.6) back to specific sections of PLG-0637 that are still current.	This F&O has no impact on the ILRT Extension Risk Analysis. Clarification of documentation will not impact the calculations of risk changes for the ILRT Extension Risk Analysis.
SPR-F1	SPR-F1-05, NOT MET, document future plant mods	Open	**Observation:** Page 22 of PRA Calculation F.6 implies that shutdown seals are included in the model. While it is understood that these may be added in the future, the documentation should reflect the as-built plant. **Basis for Significance:** Documentation is not consistent with as-built plant. **Possible Resolution:** Remove this reference to shutdown seals.	This F&O has no impact on the ILRT Extension Risk Analysis. The current seismic PRA model does not include credit for these seals. The documentation issue identified by this F&O does not impact the calculations of risk changes for the ILRT Extension Risk Analysis.
SPR-F3	SPR-F3-01, NOT MET, complete sources of model uncertainty and assumptions	Open	**Observation:** Some modeling uncertainties and assumptions are identified throughout the documentation. However, no complete documentation of sources of model uncertainty and assumptions was identified. **Basis for Significance:** This is required by the SR. **Possible Resolution:** Analyze and document the sources of model uncertainty and assumptions in the plant response model.	This F&O has no impact on the ILRT Extension Risk Analysis. Improving the documentation of model uncertainty and assumptions will not impact the calculations of risk changes for the ILRT Extension Risk Analysis.