Pacific Gas and
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Diablo Canyon Power Plant
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November 18, 2008

PG&E Letter DCL-08-098

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

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Supplement to Response to Request for Additional Information on "License Amendment Request 07-05, Revision to Technical Specification 3.5.2 – Increase in Completion Time for Emergency Core Cooling System from 72 Hours to 14 days and Revision to Technical Specification 3.6.6 – Increase in Completion Time for Containment Spray System from 72 Hours to 14 Days"

Dear Commissioners and Staff:

By letter DCL-07-112, dated December 17, 2007, Pacific Gas and Electric Company (PG&E) submitted License Amendment Request (LAR) 07-05, "Revision to Technical Specification 3.5.2 – Increase in Completion Time for Emergency Core Cooling System from 72 Hours to 14 days and Revision to Technical Specification 3.6.6 – Increase in Completion Time for Containment Spray System from 72 Hours to 14 Days." This LAR represents a risk-informed licensing change consistent with the objectives of the NRC's Probabilistic Risk Assessment Policy which is based on the guidance in Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," and RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications."

By facsimile dated August 20, 2008, the NRC requested additional information (RAI) to complete the review of LAR 07-05. In a phone conversation with the staff, it was agreed to provide a longer time period for PG&E to respond to Question 1 in the RAI. The responses to Questions 2 through 5 had been submitted by PG&E in letter DCL-08-087, "Response to request for Additional Information on 'License Amendment Request 07-05, Revision to Technical Specification 3.5.2 – Increase in Completion Time for Emergency Core Cooling System from 72 Hours to 14 days and Revision to Technical Specification 3.6.6 – Increase in Completion Time for Containment Spray from 72 Hours to 14 days,'" dated October 2, 2008. PG&E's response to Question 1 in the RAI is provided in Enclosure 1.

A002
A001
NRR

By e-mail dated October 9, 2008, the NRC requested additional information for the review of the response to Questions 5a, 5b, and 5c. PG&E's responses to this RAI are provided in Enclosure 2.

As a result of the conference call with the NRC staff on October 27, 2008, PG&E is revising the proposed Technical Specification (TS) pages originally submitted in LAR 07-05 to include a note specifying the limitations on use of the 14-day extended completion times. A new TS 3.6.6. Required Action A.2 is added to have a clear distinction that the 72-hour Completion Time (CT) associated with Required Action A.1 is for planned maintenance or inspections and the 14-day CT associated with the new Required Action A.2 is for unplanned corrective maintenance or inspections. The word "preventative" is removed from the phase "planned preventative maintenance or inspections" in the proposed TS per management direction to encompass broader planned maintenance activities but with no change of intent to the original LAR. Enclosure 3 provides marked-up TS pages and Enclosure 4 provides retyped TS pages. Enclosure 5 contains the marked-up TS Bases changes for information only. The marked-up TS pages in Enclosure 3, the retyped TS pages in Enclosure 4, and the marked-up TS Bases changes supersede Enclosures 2, 3, and 4 of PG&E Letter DCL-07-112 in their entirety.

This information does not affect the results of the technical evaluation or the no significant hazards consideration determination, previously submitted in LAR 07-05.

PG&E makes no regulatory commitments (as defined by NEI 99-04) in this letter.

If you have any questions, or require additional information, please contact Stan Ketelsen at (805) 545-4720.

I state under penalty of perjury that the foregoing is true and correct.

Executed on November 18, 2008.

Sincerely,

James R. Becker
Site Vice President

why1/4279/DN50034065

Enclosure

cc: Gary W. Butner, California Department of Public Health
Elmo E. Collins, NRC Region IV
Michael S. Peck, NRC Senior Resident Inspector
Diablo Distribution

cc/enc: Alan B. Wang, NRC Project Manager, NRR

Response to Request for Additional Information, dated August 20, 2008, on "License Amendment Request 07-05, Revision to Technical Specification 3.5.2 – Increase in Completion Time for Emergency Core Cooling System from 72 Hours to 14 days and Revision to Technical Specification 3.6.6 – Increase in Completion Time for Containment Spray System from 72 Hours to 14 Days"

NRC Question 1

The submittal identified open review findings arising from a focused peer review conducted on the upgraded human reliability analysis (HRA) and from three limited scope peer reviews conducted on unspecified portions of the probabilistic risk assessment (PRA) model. The licensee stated that these findings will be dispositioned. In order to support this licensing action, these items must be either demonstrated not to significantly impact the risk-informed decision, or the items must be resolved, the PRA model updated, and the risk impacts reevaluated using the updated model. For each open review finding, the licensee is requested to provide an appropriate summary of the deficiency identified, and a description of how the item has been resolved to support this licensing action, including the results of any sensitivity analyses. If revised risk results are necessary, update all sensitivity cases of the submittal.

Pacific Gas and Electric Company (PG&E) Response:

The gap assessments referred to in the emergency core cooling system (ECCS) LAR submittal were performed for the internal events model, Level 2, Flooding and HRA analyses. The focused peer review for the HRA was performed to satisfy the remaining open items from the internal events review.

The following summarizes the open items in each of the internal events, Level 2 and Flooding reviews:

Internal Events/HRA Peer Review

To address the need to review the upgraded HRA, a peer review that focused only on the HRA elements of the PRA American Society of Mechanical Engineer (ASME) standard was performed. This peer review identified eighteen elements that did not meet category level II of the standard. Seven of these were purely documentation issues or did not affect the results of the application. The remaining eleven were subsequently either dispositioned or were demonstrated to have a negligible effect on the results of this application through a sensitivity evaluation.

The disposition of each open issue from the HRA peer review is presented in Table A.1.

Human Error Probability (HEP) Sensitivity Evaluation

A sensitivity evaluation was performed for the open issues that were not dispositioned. Human failure events (HFEs) were identified, screened, and reviewed to determine applicability to the ECCS/CS allowable outage time (AOT) extension application. HEPs that occur in scenarios where a safety injection (SI) is either generated or required due to the initiating event or where SI is actuated as a response strategy were included within the scope of the sensitivity evaluation. A total of 34 HEPs were identified and were increased by a factor of five to calculate the HRA peer review sensitivity case. As Table A.1 describes, this factor bounds the impact that the HRA open issues have on the PRA.

In addition, the sensitivity evaluation increases the dependency between the operator action for switchover to recirculation and makeup to the refueling water storage tank (RWST) as described in element HR-G7-1 (See Table A.1).

The results of this sensitivity analysis are summarized in Table 1 and show that only a small increase in change in core damage frequency (ΔCDF) and change in large early release frequency (ΔLERF) occurs as a result of undispositioned HRA peer assessment issues. The total CDF increases to 9.57E-05/year for the limiting case (One train of residual heat removal (RHR) subsystem), which is within the region specified in Regulatory Guide (RG) 1.174 where very small increases in CDF are allowed. Similarly, total LERF is within the region for which very small increases in LERF would be considered.

Table 1 - HEP Sensitivity Results

Risk Metric	**One train of Containment Spray System**	**One train of Safety Injection Subsystem**	**One train of Charging Subsystem**	**One train of RHR Subsystem**
CDF_{OOS}	9.10E-05	9.288E-05	9.309E-05	9.57E-05
$LERF_{OOS}$	1.02E-05	1.020E-05	1.021E-05	1.07E-05
T_{OOS} (days)	0	0	0	0
ΔCDF	0.00E+00	1.84E-06	2.06E-06	4.66E-06
ΔLERF	2.65E-08	4.37E-08	5.07E-08	5.59E-07
ΔCDF_{AVG}	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$\Delta LERF_{AVG}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ICCDP	0.00E+00	7.05E-08	7.88E-08	1.79E-07
ICLERP	1.02E-09	1.68E-09	1.94E-09	2.14E-08

The incremental conditional core damage probability (ICCDP) and incremental conditional large early release probability (ICLERP) results in Table 1 are similar to the analysis results submitted in LAR 07-05. This demonstrates that an increase in HEP value affects both the base and train unavailable cases nearly equally. Many HEPs that are important to this application, if failed, will result in core damage regardless of the status of ECCS (i.e., switchover to recirculation, RHR pump trip with high reactor coolant system (RCS) pressure, etc.).

The sensitivity performed for the increase in the average time out of service was re-performed using the increased HEPs. The following tables display the results from this new sensitivity evaluation. In each case, the risk metric is less than the RG 1.177 threshold values of 1E-06 and 1E-07 for ΔCDF_{avg} and $\Delta LERF_{avg}$, respectively.

Table 2 - 14/3 T_{oos} Sensitivity for ΔCDF

Sub System/System	**ΔCDF**	**ΔCDF_{avg}**
CS	0.00E+00	0.00E+00
SI	1.84E-06	1.85E-08
CH	2.06E-06	2.49E-08
RHR	4.66E-06	5.27E-08
Total		9.61E-08

Table 3 - 14/3 T_{oos} Sensitivity for ΔLERF

Sub System/System	ΔLERF	$\Delta LERF_{avg}$
CS	2.65E-08	4.22E-10
SI	4.37E-08	4.39E-10
CH	5.07E-08	6.15E-10
RHR	5.59E-07	6.31E-09
Total		7.79E-09

Level 2 Peer Review

The level 2 peer review comments were reviewed for impact on the ECCS completion time LAR. None of the identified issues were determined to have a significant impact on the results of the original evaluation. Table A.2 in the attachment to this response details the open issues and their disposition relative to this application.

Internal Flooding Peer Review

In 2005, the Internal Flood PRA was reviewed to identify any specific weaknesses in its approach or implementation. As an attachment to the final report of the review, a table was provided to compare DCPP's approach to the ASME Standard RA-Sb-2005, Addenda to ASME RA-S-2002.

The main concerns identified in this assessment are associated with: the lack of a documented walkdown confirming the assumptions utilized in the analysis, a general lack of proper justification and clarity in the application of the qualitative screening criteria, the need to account for the potential impact of floods on human errors included internal events analysis when analyzing flood scenarios, and the lack of consideration of the impact of isolating flood sources. However, based on the plant configurations, location of PRA credited components, elevations of the buildings in comparison with the major flood sources, and the numerous ways that water will migrate to lower elevations and finally to the outdoors, it is judged that the impact of the above concerns on the conclusions of the current application will be negligible.

In addition, internal flood events are not postulated to directly cause loss of coolant accidents (LOCA)s and as such, the results from this application will not be sensitive to changes in the flooding analysis.

Table A.1 – HRA Peer Review Observations

ID	L	Observation *	Resolution
HR-F2-1	B	Better, more detailed, and more precise accident sequence descriptions should be provided. The description should include all of the preceding actions/indications, the initiating events, relevant plant response, concurrent actions/indications, etc. Especially for actions that may be applied in a variety of sequence conditions, the description should make clear which one of the conditions forms the basis for the action evaluation. This information is important to evaluate whether the HEP so obtained is later applied appropriately in the sequence models. See reviewer notes for sample action ZHECV1 (Recovery from seismic relay chatter).	Documentation issue. If a HEP is used for a variety of sequence conditions, the most conservative of the sequence conditions is used to calculate the HEP.
HR-F2-2-1	B	The HRA analysis was largely updated in the spring of 2002. Many of the procedures referenced at that time have been revised since the analysis was first performed. It is therefore unclear how it can be concluded that the current assessment represents the current, as-operated design.	Although procedure revision numbers and step numbers may change, the critical steps and recovery steps would essentially be the same and would therefore not impact the quantification as such. It is not expected that there have been any significant changes to Emergency Operating Procedures (EOPs) since 2002, as the EOPs are standardized. It is unlikely that any additional critical steps have been added. If critical steps have been added, the expected change would be small relative to the total HEP and bounded by the HEP sensitivity.
HR-F2-2-2	B	For the analysis of ZHEFO4 (Fuel Oil Recovery), the most important procedure step in the current procedures was not identified as part of the tasks to be performed and the evaluation of the execution errors did not cover it. In the analysis of the execution error for ZHEOR1 (steam generator tube rupture (SGTR) – reactor coolant system (RCS) cooldown and depressurization), it was assumed that level control in the intact S/Gs was already successful since level control for the ruptured S/Gs was successful. However, this task was not analyzed and accounted for in action ZHEOX1 either.	ZHEFO4 and ZHEFO5 are actions involving restoration of diesel fuel oil and will not impact the ECCS allowed outage time (AOT) extension application results. Impact of an additional task in the execution analysis will have a small impact on the HEP for ZHEOR1 and is bounded by the sensitivity evaluation.

*Page references in the peer review observations make reference to the DCPP HRA calculation file G.2 Revision 5.

Table A.1 – HRA Peer Review Observations (Continued)

ID	L	Observation	Resolution
HR-G2-2	B	On page 2, it is stated that memorized actions use the human cognitive reliability/operator reliability experiment (HCR/ORE) method while on page 4 this is contradicted. There it states that both memorized and time critical actions use the HCR/ORE method. Assumption 1 in Section 4.2.3 and Section 5.4 on Page 19 indicate that the HEPs for the cognitive part of early memorized actions (i.e., those associated with reactor trip, reactor trip required, safety injection or safety injection required) can be considered negligible. The reviewers disagree with this assertion. Based on our understanding, this assertion is refuted by simulator data performed for Diablo Canyon and, which in part, formed the basis for the HCR/ORE model; (i.e. for reactor trip under Anticipated Transient Without Scram (ATWS) conditions).	Documentation issue. Documentation will be updated to clarify that the assumption of a negligible HEP for entering E-0 given a reactor trip (RT) or safety injection (SI) does not apply to ATWS.
		There are also other actions that were assumed to have negligible HEPs for the cognitive contribution and were not evaluated for cognitive errors (there are a total of 15 actions which have zero values in Table 1 for the human cognitive response probability; (e.g., ZHEOR1 for SGTR cooldown and depressurization). This review does not accept the assertion that these actions can be assigned zero cognitive error probabilities.	Applicable HEPs were reviewed and it was determined that the sensitivity case bounds the impact of including cognitive failure probabilities for each applicable HEP. For ZHEOR1, the cognitive failure probability is negligible when compared to the execution failure probability (~1% of the total HEP).
		The HCR/ORE model can be interpreted as accounting for the time-dependent contribution to both cognitive and execution type errors. In actions where time-pressures are large, the time-dependent errors may dominate. However, where such time-pressures are computed to be small, the contribution from time-independent errors should be incorporated; (e.g. execution errors if not negligible).	The DCPP PRA model uses cause-based-decision-tree-methodology/technique-for-human-error-rate-prediction (CBDTM/THERP) for all HEPs. This methodology accounts for the contribution from time-independent errors. The comments from the observation specifically address the time-independent impact of execution errors that should be incorporated if time pressures are small. All DCPP HEPs reflect these time independent errors.
		HEPs were derived using EXCEL for reactor trip and turbine trip actions and documented in Appendix A, but the HEPs listed in Table 1 for execution errors for these actions are the same as those obtained in Appendix A for cognitive errors.	Documentation issue only.

Table A.1 – HRA Peer Review Observations (Continued)

ID	L	Observation	Resolution
HR-G3-1	B	Due to the short time window available for cognitive diagnosis and decision-making (excluding cue time, any other delay time, and manipulation time), some actions may be significantly influenced by the performance shaping factor (PSF) for "Time" (e.g., ZHERE5, ZHEPR1, ZHEOE1, ZHERF2, of the 10 sampled are of this type). These actions were evaluated using the CBDT approach only. For actions evaluated using the CBDT, the PSF for "Time" is accounted for only in the assignment of the level of dependency for recovery. For the evaluation of the initial errors; however, the PSF for "Time" (which may contribute to the occurrence of error due to the time pressure) is not accounted for in the CBDT tree branches.	HCR/ORE calculated for the HEPs identified in the observation to verify if time-based contribution should be incorporated. All applicable HEPs increased by a factor of 5.
HR-G3-2	B	The methodology description provides a brief summary of the CBDT approach (in section 4.2.1) and references a 1992 description. The write-up also notes a number of modeling assumptions specifically identified for Diablo Canyon for both cognitive and execution contributions. However, since 1992 much work has gone into standardizing the judgments needed to implement the CBDT approach (see, for example, draft "Guidelines for Performing Human Reliability Analyses – using the HRA calculator effectively" dated June 2003). The judgments used in the update are not all consistent with the more recent EPRI guidance.	Documentation issue. Update the methodology description using the latest EPRI guidance for the use of HRA Calculator.
		Section 5.3 on Page 19 states that "single" procedure should be selected for PCE but this seems inconsistent with EPRI guidance. (See actions ZHEPR1, ZHERF2).	Using cause based decision tree methodology (CBDTM), the largest difference between single procedure and multiple procedure cognitive probability is 2E-03. This is bounded by the sensitivity for these HEPs.
		For Assumption 11 in Section 4.2.3 on Page 9, the provisions for using check-offs and provisions for place-keeping are not evident in most of the procedures referenced (e.g., the use of E-1.3 for the analysis of ZHERF2 and the use of annunciator response procedure for the analysis of ZHECV1).	AD1.ID2 "Procedure Use and Adherence" directs procedure users to sign off each step after it is performed and prior to performing the next step. This procedural requirement ensures that placeholding/checkoffs are performed.

Table A.1 – HRA Peer Review Observations (Continued)

ID	L	Observation	Resolution
HR-G3-2 (continued)	B	The stress level is underestimated in some cases (e.g., work in radiation environment). The stress level for SGTR sequences is stated in one place as moderate (Modeling Convention 8.1 in Section 4.3.4 on Page 14) and another as high (Assumption 1 in Section 4.1 on Page 2).	Documentation issue. High stress is reserved for scenarios where the procedural options are exhausted or are not successful due to multiple failures (Functional restoration procedures). High stress is also related to workload exceeding available manpower (e.g., in loss of support system scenarios such as station blackout or loss of instrument air). For SGTR, the stress level assumed is low to moderate. The documentation needs to be clarified.
		Regarding Assumption 7 in Section 4.1 on Page 4, not all procedures use the "Response Not Obtained" format so it is unclear if the THERP tables used are correctly adjusted for all actions. For example, Step 3.h in Appendix B of Procedure OP AP-11 was treated in the analysis of the execution error for ZHECC1 (CCW heat load reduction) as if the procedure is in a columnar or "Response/Response Not Obtained" format, while this procedure is not written in this format. Another example is the annunciator response procedure used for the analysis of ZHECV1 (Control room ventilation recovery).	Actions important to risk typically involve procedures that are in a response not obtained (RNO) format (All EOPs except for some appendices). Neither of the HEPs that this finding refers to directly mitigate a LOCA. Therefore, the ECCS AOT extension evaluation is not sensitive to these HEPs.
		For Modeling Convention 6 in Section 4.3.4 on Page 13, the reviewers do not believe that NUREG/CR-1278 intended that the first 10 steps of a long list can be assumed to be from a short list (e.g., in the analysis of ZHERF2).	Using THERP, errors of omission are increased by a factor of 3 when a long checkoff list is used. The recoveries credited in ZHERF2 reduce this factor to 1.5. The sensitivity bounds the impact from this observation.
		Section 5.1 on Page 15 states that most errors of commission that use Table 20-12 should select Item 3, but this is not what is used in the actions reviewed. Seldom is Item 3 selected.	This is a documentation issue. Section 5.1 also states that all ECCS pumps use item 4 in Table 10-12 (error of commission in selecting mimic controls). Use of the word typical in the documentation does not imply that all selections from table 20-12 should use Item 3.

Table A.1 – HRA Peer Review Observations (Continued)

ID	L	Observation	Resolution
HR-G3-2 (continued)	B	The sequence descriptions do not always identify all of the preceding and concurrent events/actions/indications, and as such the operator work load and distractions involved may be underestimated and unaccounted.	This is a documentation issue. Original determination of workload was based on operator interviews. This determination was made independent of sequence description detail.
		Credit for recovery (e.g., due to self review for the cognitive error and consideration of specific procedure steps for the execution error) may need to be reexamined in some cases. For example, credit for self review when performing a local action in a radiation environment may not be appropriate.	This observation refers to ZHEMU3 (Makeup to refueling water storage tank (RWST) from spent fuel pool). The self review recovery is performed in the control room as it involves reading RWST level indications. The radiation environment would not impact likelihood of self review.
		No recovery was considered for some of the procedure steps (e.g., opening of one pressurizer power operated relief valve (PORV), closing the PORV, etc.) in the analysis of ZHEOR1, although the steps for checking the RCS pressure can certainly serve as opportunities for recovery from previous failures.	Potential credit for recovery not taken in the model. The application results are conservative.
HR-G3-4	B	The DCPRA considers multiplicative factors on the post-trip operator actions following a strong earthquake. These factors should be considered screening values because they are not action specific. Per requirement SA-B2 of the external events standard (ANS-58.21-2003), the factors used should be justified	For spectral accelerations between 1.75 and 2.5g, the operator may be disconcerted and confused by equipment and structure movement taking place around him, but he is unlikely to be physically affected. A multiplication factor of 5 typically was assigned to error rates for seismic events within this range. For spectral accelerations greater than 2.5g, the operator may be even more anxious and may be physically affected. He may be knocked down or knocked against something; things may fall on him, or the atmosphere may be clouded by dust limiting visibility. It is not expected that operators will be trapped or otherwise disabled by falling objects. A multiplication factor of 30 was used for these cases.

Table A.1 – HRA Peer Review Observations (Continued)

ID	L	Observation	Resolution
HR-G3-4 (continued)	B	The methodology section does not describe the modeling of actions after a strong earthquake.	Detailed analyses had been performed (e.g., ZHECT1, ZHECT2 and ZHECT3 (seismic relay chatter)) using CBDT.
		Detailed analyses for these post-earthquake actions should consider the time elapsed since the earthquake, the access routes to control stations outside the control room, and the potential direct effects of the earthquake on operator conditions.	During the development of the DCPP IPEEE, all of the operator routes to remotely actuated equipment were checked for potential blockage resulting from a seismic event. No operator routes were judged as likely to be blocked.
HR-G4-1	A	For many of the sample actions reviewed, the reference provided does not document thermal hydraulic (T/H) analyses to support the assumed time available for the action analyzed. The times assumed for occurrence of the indications is also often not tied to T/H analyses. For example, action ZHEMU3 states the Tw is 2 hours and references an earlier version of G.2. That reference does not contain T/H analysis, only an unreferenced estimate for the two hour value. Similarly, the assessment of action ZHEPR1 again references G.2 but there is no T/H analysis to support the 16 minute estimate.	Documentation basis for timing has been updated. In some cases, the timing used is based on input assumptions for thermal hydraulic calculations. For example, the time requirement of 10 minutes to isolate a faulted steam generator is based on the analysis assumption used in the thermal hydraulic calculation.
		In Section 5.4 on Page 19, the time windows for reactor and turbine trip are noted here. Based on our understanding, these times were originally selected for the success criteria to avoid a PORV challenge or an SI signal, and therefore they may not be appropriate for ATWS mitigation.	Time windows for ATWS mitigation would be longer than time windows to avoid PORV challenge or SI signal. The use of shorter time windows would result in a conservative calculation of the HEP.

Table A.1 – HRA Peer Review Observations (Continued)

ID	L	Observation	Resolution
HR-G7-1	B	From the documentation provided, it is unclear how the sequences listed are determined to contain multiple actions. Some cross-reference between split fractions and HFEs is needed. The analysis assumes that one can identify combinations of action by revising each HEP to 0.1, and then quantifying the core damage sequences. By this approach, sequences with 3 or more actions may be discarded prior to qualitative evaluation. The number of core damage sequences reviewed individually (100 for internal events, and 50 each for seismic and fires) for dependence between actions is insufficient to ensure that this does not happen. As an example, small LOCA sequences involving failure of both switchover for cold leg recirculation and failure to align RWST supply to the RWST did not appear in the latest dependency analysis reviewed. However, these sequences did appear in an earlier dependency analysis and at that time were judged to be highly dependent.	Dependency analysis was re-performed using a higher weight for HEPs (0.5 instead of 0.1). 200 internal and 100 seismic/fire sequences were reviewed. No required changes to the PRA model were identified. The dependency between switchover to RWST was increased in the sensitivity evaluation. (0.5 conditional failure probability was modeled)
		The dependence analysis does not describe the actions already assessed as completely dependent (i.e., where the later actions are not credited in the sequence model due to earlier action failures).	This observation refers to a lack of documentation for actions assessed as completely dependent and modeled as such. Since the dependencies are modeled, this will not affect the application.
		Consideration should be given to actions important for LERF and/or containment bypass.	Sequences leading to Large Early Release do not have additional operator actions for mitigation of offsite releases.
HR-G7-2	B	In the dependence analysis, the HFEs in most sequences with two or more operator actions were judged to be independent or only with very weak dependence (i.e., dismissed as low dependence actions) due to such considerations as "different functions (performed for different reasons)," while directed by the same procedures, or "different procedures," etc. In some cases, a common cognitive element may still exist, even though different detailed functions are involved. The basis for these judgments should be examined (e.g. to say which functions and to identify the different reasons).	Documentation issue. The HRA documentation describes the purpose for each of the separate actions. Additional detail is needed in the documentation.

Table A.1 – HRA Peer Review Observations (Continued)

ID	L	Observation	Resolution
HR-G7-2 (continued)	B	The dependence analysis documentation suggests that there was a general assumption that if actions are directed by procedures with different numbers they can be considered independent. This is questionable. Other factors, such as time required, increased stress, availability of resources, and common instrumentation, can lead to dependencies between actions. Such dependencies governed by time are noted in the HRA methodology write-up.	The sensitivity case provided increases HEPs relevant to the application by a factor of 5.
		In some sequences, the presence of an intervening successful action (i.e., in the same sequence) can be used to dismiss actions failed in the same sequence as being only weakly dependent. Successful actions were not considered in the dependence review.	Not crediting successful intervening actions is conservative. Disposition of this issue will not adversely affect the results of this application.
		The summary of quantified actions in Table 1 does not incorporate any dependencies found in attachment A.7. The highest HEP is only 6.8E-2.	Documentation issue. It will not affect the results of the application.
		Some HEPs are said to be highly dependent on other actions but assigned values of 0.1. High dependence should be assigned values of 0.5, per Table 20-17 in NUREG/CR-1278.	The sensitivity case provided adjusts the dependency impact to 0.5 for actions considered highly dependent.
		For one selected sequence involving ZHEOE1, the analysis asserts that the action quantification analysis itself (using CBDT) adequately considers dependence with preceding actions in the sequence. This is not correct. Another example of a need to carefully evaluate the dependence on preceding actions in specific sequences is ZHEMU3.	High ZHEMU3 (makeup to the RWST) dependency on switchover to recirculation included in the sensitivity analysis. ZHEOE1 was increased by a factor of 5 in the sensitivity.
HR-H2-1	B	For the analysis of recovery actions (e.g., in the case of ZHECT1), it is unclear if credit can be taken, when the procedural guidance referenced is not sufficiently detailed to determine the operator's execution steps. Failure mechanism PCF may better be evaluated as item (g) 6E-2, rather than (a) negligible.	ZHECT1 is an operator recovery action for seismic relay chatter. The ECCS AOT extension application is not sensitive to changes in this HEP.
		The action contained in recovery split fraction RE6A is mentioned in the dependency analysis but is not included in summary Table 1	RE6A is a recovery for a loss of switchgear ventilation. The ECCS AOT extension application is not sensitive to changes in this HEP.

Table A.2 - Summary Resolution for Level 2 Peer Review Comments

Issue Index	Met/Not Met	Issue	Disposition
LE-C2a	Met at CC-I	LE-C2a is met at Capability Category I. Post-core-damage actions are not modeled. Although the treatment of such actions is conservative, the evaluation of potential LERF contributors, as documented in Calculation N.1, indicates that it is unlikely that inclusion of post-core damage operator actions would significantly affect LERF insights or conclusions.	Non-modeled actions have small LERF impact. Actions may provide additional benefits for late release assessments.
LE-C2b	Met at CC-I	LE-C2b is Not Applicable to Category I. The Capability Category II/III criteria are not met, and there is no criterion for Capability Category I. For particular applications in which a plant issue might directly affect containment systems or SSCs that are significant contributors to LERF, additional consideration of post-core damage recoveries per EOP actions noted by the re-peer reviewers, and possibly severe accident management guideline (SAMG) actions, may be warranted.	As a result of the rapid progression of LERF events, repair of equipment is of low probability and is not considered in the PRA model. Thus, the impact on the baseline PRA is not considered significant for the overall LERF and the impact on the use of the PRA for application is expected to be small and limited to specific component related applications.

Table A.2 - Summary Resolution for Level 2 Peer Review Comments (Continued)

Issue Index	Met/Not Met	Issue	Disposition
LE-C3	Met at CC-I	LE-C3 is met at Capability Category I. The LERF model is believed to contain sufficient logic to provide a "realistic estimation of the significant accident progression sequences resulting in a large early release." However, the features listed for Capability Category II are not included. Credit for mitigating actions, fission product scrubbing, and beneficial failures are not included in the Level 2 model. Inclusion of the additional features listed would not likely have a significant impact on LERF, since only limited credit could be justified.	The assumed value of PORV/pressurizer safety valve (PSV) failure has small LERF impact. Note that overall assessment of TI-SGTR is conservative in that combined impact of operator action to depressurize the RCS and mechanical failure to reseat the PSVs is biased low. Model assumption should not impact application. No credit is taken for fission product scrubbing when feedwater is available. Application results are conservative.
LE-C8a	Met at CC-I based on improved sump design	LE-C8a may not be fully met. The re-peer review recommendations should be addressed to establish that survivability issues are adequately dealt with for the LERF model. The Level 2 re-peer reviewers made several recommendations regarding survivability for the containment fan cooler units (CFCUs) and ducting/hatches in the reactor cavity.	Long term survivability of the CFCUs is not a concern for LERF. New containment sump design addresses the sump concern. The PRA model does not consider the impact of ducting failures on the ability of the reactor cavity to flood following reactor vessel lower head failure. This is not considered an impact on LERF

Table A.2 - Summary Resolution for Level 2 Peer Review Comments (Continued)

Issue Index	Met/Not Met	Issue	Disposition
LE-C9a	Met at CC-I	LE-C9a is met at Capability Category I. Credit is not taken in the Level 2 or LERF modeling for containment failure-related impacts on equipment survivability.	The scenario that is the primary issue has a very low likelihood at DCPP as it requires a low probability core challenge in conjunction with simultaneous failure of all trains of CFCUs and the entire containment spray system (CSS). Credit for operation beyond containment failure is possible; however, there is no value in developing the justification for modeling this issue as containment failure would be expected following off-site evacuation. While this feature may impact long term core performance, the late nature of the failure suggests that the event would not contribute to the plant LERF.
LE-C9b	Met at CC-I	This item requires that the utility review significant accident progression sequences resulting in a large early release to determine if engineering analyses can support operation or operator actions after containment failure that could reduce LERF.	Current treatment is conservative. Upgrade to CC-II would not adversely affect the application results.
LE-C10	Met at CC-I	Credit is not taken for scrubbing in the bypass sequences.	Neglect of scrubbing may bias LERF result. The SGTR PRA model does not credit scrubbing to remove bypass events from LERF. This is a conservative position and may overestimate the LERF contribution. Upgrade to CC-II would reduce conservatism but will not change results.
LE-D3	Met at CC-I pending resolution of IE-C12	IE-C12 Cat-II requires realistic evaluation of interfacing systems LOCA (ISLOCA) probability.	Conservative ISLOCA piping failure probability is used in the DCPP PRA model. Application results are conservative.

Table A.2 - Summary Resolution for Level 2 Peer Review Comments (Continued)

Issue Index	Met/Not Met	Issue	Disposition
LE-F2	Met at CC-I	The Level 2 re-peer reviewers noted a lack of evaluation of impact of key sources of uncertainty on the Level 2 LERF model. The re-peer report discusses a number of potential sources of uncertainty and impacts. For most PRA applications, it is not likely that such issues will affect LERF insights.	A discussion of key sources of uncertainty was included in the LAR submittal.
LE-G1	Not Met	The LERF analysis shall be documented consistent with the applicable supporting requirements (HLR-LE-G). The Level 2 re-peer reviewers commented that the existing documentation generally does not meet the LE-G high level requirement.	Documentation issue. Does not affect the results of the application.
LE-G3	Met at CC-I	The significant contributors to LERF are documented in the quantification calculation (Calculation C.9). Additional detail as noted for Capability Category II/III is not included.	Documentation issue. Does not affect the results of the application.
LE-G4	Not Met	LE-G4 is not met. The basis is the Level 2 re-peer reviewer's assessment. Consideration should be given to developing the recommended evaluation of Key Assumptions and Key Sources of Uncertainty for the LERF model.	A discussion of key sources of uncertainty was included in the LAR submittal.
LE-G5	Not Met	An assessment of limitations of the LERF model that might impact applications has not been developed.	A discussion of key sources of uncertainty was included in the LAR submittal.
LE-G6	Not Met	A statement of the quantitative definition for significant accident progression sequences has not been included in the documentation.	Documentation issue.

Response to Request for Additional Information, dated October 9, 2008, on "License Amendment Request 07-05, Revision to Technical Specification 3.5.2 – Increase in Completion Time for Emergency Core Cooling System from 72 Hours to 14 days and Revision to Technical Specification 3.6.6 – Increase in Completion Time for Containment Spray System from 72 Hours to 14 Days"

NRC Question 5a

Examples were given of types of failure modes not modeled. The staff was more interested in higher level functions of the safety systems which are not assumed to be required by the PRA model. For example, hot leg injection is provided for in the safety basis for the ECCS and is required for operability, but is assumed not required by the PRA? Also, isolation of minimum flow lines is often required to meet design flowrates, but is assumed not required by the PRA? The intent is to justify that the assumptions of the PRA relevant to the ECCS and CS systems are consistent with the safety basis for these systems, or to provide an appropriate justification that the risk significance of the omitted functions is low.

PG&E Response:

Based on the assessment performed in WCAP-15750, "Risk Informing Hot-Leg ECC Switchover Requirements, Phase 1: Basis and Recommendations," hot-leg recirculation is not risk significant. Therefore, switchover to hot-leg recirculation is not modeled in the Diablo Canyon Power Plant Probabilistic Risk Analyses (DCPP PRA). The function, if modeled, would not significantly impact the results of the license amendment analysis. A failure to transfer to hot leg recirculation would affect both the base and component unavailable case equally since the failure would result in core damage regardless of emergency core cooling system (ECCS) subtrain status. In other words, the contribution to core damage frequency (CDF) from a failure of this function is independent of ECCS subtrain unavailability.

Residual heat removal (RHR) minimum flow valves are modeled to prevent RHR pump damage when RHR pumps start and dead head against reactor coolant system (RCS) pressure. The RHR minimum flow valve function to close for higher RHR flow rates (large LOCA mitigation) is not explicitly modeled. These valves open on RHR pump start and then must close to allow full RHR flow. Full RHR flow is only a concern for the large LOCA in order to avoid exceeding allowable peak clad temperatures. If modeled, these valves would have a very small contribution to large LOCA CDF (<1E-08/year) based on the large LOCA frequency and valve demand failure probability. Inclusion of the close function of these valves into the PRA model would not affect the results of this analysis since the sequences involving a failure to mitigate a large LOCA due to minimum flow valve failure would be approximately equal in both the base case and ECCS component unavailable case.

Minimum flow lines for the charging and safety injection systems are not modeled in the DCPP PRA. These valves are normally open and do not change state during LOCA response. They are only closed during the recirculation phase of LOCA response to avoid post-accident radioactive release to the environment. Since the injection flow from safety injection and charging is sufficient for LOCA mitigation without closure of these valves the risk significance is negligible.

NRC Question 5b

It is stated that the PRA success criteria is consistent with the licensing basis (page 7) – yet the listed success criteria for small and medium LOCAs can be met by the lower capacity charging pumps alone without functioning of the high pressure SI pumps. Is this the licensing basis criteria?

PG&E Response:

The PRA success criteria for a small break LOCA (SBLOCA) is consistent with the final safety analysis report (FSAR) licensing basis given that the evaluation models and acceptance criteria while related, are still separate and unique. The licensing basis SBLOCA results reported in the DCPP FSAR Section 15.3.1 represent conservatively bounding deterministic analyses that combine worst case assumptions and uncertainties as required by 10 CFR 50 Appendix K to ensure that for even the most limiting event only a small fraction of clad damage occurs and the offsite dose releases would remain within a fraction of the 10 CFR 100 guidelines. These FSAR accidents establish the minimum design basis performance requirements associated with one train of ECCS (one each of RHR, SI, and charging pumps). The DCPP FSAR evaluates a range of cases encompassing two, three, four, and six inch break sizes in order to ensure that the most limiting break size is clearly defined. The SBLOCA results presented in FSAR Update Table 15.3-2 show that the two inch case is much less limiting and the peak clad temperatures remain well below the values at which fuel damage would be a concern.

Therefore, it is not inconsistent that when assuming the better estimate conditions associated with the DCPP PRA model that the availability of one charging pump or one SI pump can acceptably mitigate a SBLOCA of two inches equivalent diameter break size or less for the purposes of evaluating core damage frequency. Similarly, the PRA model assumes that the total best estimate flow from either two charging pumps or two SI pumps can successfully mitigate the PRA model "medium" LOCAs up to six inches equivalent diameter break size. This is not inconsistent with the FSAR cases which credit the minimum degraded flow from one charging pump and one SI pump to demonstrate no significant fuel damage occurs for the worst case SBLOCA scenarios.

NRC Question 5c

Clarify that credit is not taken for mitigation of small LOCAs by cooldown and depressurization of the RCS and injection of low pressure systems, with no high pressure injection available. If credit is taken, then provide the analytical basis for this criteria. (Note that the staff believes that core damage will occur without high pressure injection.)

PG&E Response:

The DCPP PRA model does not take credit for mitigation of small LOCAs with charging and SI pumps unavailable. The PRA model does assume that high pressure cold leg recirculation can be avoided for scenarios in which the reactor coolant system is depressurized to RHR entry conditions prior to exhausting refueling water storage tank inventory. In these scenarios, RHR closed loop recirculation is credited to bring the plant to a stable condition.

Proposed Technical Specification Page (Mark-up)

B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND	6 hours
	B.2 Be in MODE 4.	12 hours

3.6 CONTAINMENT SYSTEMS

3.6.6 Containment Spray and Cooling Systems

LCO 3.6.6 The containment fan cooling unit (CFCU) system and two containment spray trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One containment spray train inoperable.	A.1 Restore containment spray train to OPERABLE status.	---------NOTE------------ ~~The Condition A Completion Times may be extended to 14 days for Unit 2 cycle 12 for containment spray pump 2-2 control circuit cable maintenance.~~ ------------------------------ 72 hours <u>AND</u> 10 days from discovery of failure to meet the LCO
	<u>OR</u>	----------NOTE---------- For planned maintenance or inspections, the Completion Time is 72 hours. The Completion Times of Required Action A.2 are for unplanned corrective maintenance or inspections. ------------------------------
	A.2 Restore containment spray train to OPERABLE status	14 days <u>AND</u> 14 days from discovery of failure to meet the LCO

Add new Required Action A.2

Proposed Technical Specification Changes (Retyped)

Remove Page	Insert Pages
3.5-3	3.5-3
3.6-13	3.6-13

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.2 ECCS - Operating

LCO 3.5.2 Two ECCS trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

-----NOTE-----
In MODE 3, both safety injection (SI) pump flow paths may be isolated by closing the isolation valve(s) for up to 2 hours to perform pressure isolation valve testing per SR 3.4.14.1.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more trains inoperable. AND At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available.	A.1 Restore train(s) to OPERABLE status	72 hours -----NOTE----- The Required Action A.1 Completion Time is to be used for planned maintenance or inspections. The Completion Times of Required Actions A.2.1, A.2.2, and A.2.3 are for unplanned corrective maintenance or inspections. -----
	OR	
	A.2.1 Verify only one subsystem in one ECCS train is inoperable	72 hours
	AND	
	A.2.2 Determine there is no common cause failure in the same subsystem in the OPERABLE ECCS train	72 hours
	AND	
	A.2.3 Restore train to OPERABLE status	14 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2 Be in MODE 4.	12 hours

3.6 CONTAINMENT SYSTEMS

3.6.6 Containment Spray and Cooling Systems

LCO 3.6.6 The containment fan cooling unit (CFCU) system and two containment spray trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One containment spray train inoperable.	A.1 Restore containment spray train to OPERABLE status. <u>OR</u> A.2 Restore containment spray train to OPERABLE status	72 hours AND 10 days from discovery of failure to meet the LCO ----------NOTE----------- For planned maintenance or inspections, the Completion Time is 72 hours. The Completion Times of Required Action A.2 are for unplanned corrective maintenance or inspections. ----------------------------- 14 days <u>AND</u> 14 days from discovery of failure to meet the LCO
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. <u>AND</u> B.2 Be in MODE 5.	6 hours 84 hours
C. One required CFCU system inoperable such that a minimum of two CFCUs remain OPERABLE.	C.1 Restore required CFCU system to OPERABLE status.	7 days <u>AND</u> 10 days from discovery of failure to meet the LCO

(continued)

Changes to Technical Specification Bases Pages
(For information only)

ACTIONS (continued)

A.2.1, A.2.2, and A.2.3

These Required Actions allow restoring one inoperable ECCS train with no more than one inoperable subsystem to OPERABLE status with a CT of 14 days if it is determined that only one subsystem in one ECCS train is inoperable and that the OPERABLE subsystem is not inoperable due to common cause failure. The common cause failure investigation shall be associated with the subsystem failure that prompts the ECCS subsystem to be declared inoperable originally. The common cause failure evaluation can be performed by analyses, inspection, and/or testing. The addition of these Required Actions into this TS was per LA XX for Unit 1 and LA XX for Unit 2. The 14-day CT is intended to be used for unplanned corrective maintenance or inspections.

The justification to extend the CT to 14 days is based on risk-informed insight where the evaluation would meet the NRC risk informed criteria assuming only one subsystem in one ECCS train is inoperable and with the elimination of conditional failure probability of the redundant ECCS subsystem due to common cause failure. PRA analysis assumes no more than one subsystem in one ECCS train is inoperable. The PRA risk-insignificance thresholds are not met for the14-day Completion Time when a RHR subsystem component is found to be inoperable as a result of a higher conditional failure probability of the redundant component due to common cause failure. To comply with the assumption in the PRA analysis that only one subsystem in one ECCS train is inoperable and to eliminate the common cause failure concerns, the 14-day Completion Time assumes that actions are to be taken within 72 hours to determine that there is only one subsystem in one ECCS train inoperable and there is no common cause failure in the same subsystem in the OPERABLE ECCS train. The 72-hour Completion Time in Required Actions A.2.1 and A.2.2 are reasonable and is chosen so that the risk is no worse than the risk associated with the 72 hour Completion Time for Required Action A.1.

The Completion Time is modified by a Note stating that the Required Action A.1 Completion Time is to be used for planned maintenance or inspections. The Completion Times of Required Actions A.2.1, A.2.2, and A.2.3 are for unplanned corrective maintenance or inspections. This is to prevent accumulating excessive Maintenance Rule unavailability hours.

BASES

ACTIONS (continued)

B.1 and B.2

If the inoperable trains cannot be returned to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 6 hours and MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

ACTIONS

A.1

With one containment spray train inoperable, the inoperable containment spray train must be restored to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE spray and cooling trains are adequate to perform the iodine removal and containment cooling functions. The 72 hour Completion Time takes into account the redundant heat removal capability afforded by the Containment Spray System, reasonable time for repairs, and low probability of a DBA occurring during this period.

The 10 day portion of the Completion Time for Required Action A.1 is based upon engineering judgment. It takes into account the low probability of coincident entry into two conditions in this Specification coupled with the low probability of an accident occurring during this time. Refer to section 1.3, "Completion Times" for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO" portion of the Completion Time.

~~The Completion Time is modified by a Note that allows the Condition A Completion Times to be extended to 14 days for Unit 2 during cycle 12 for containment spray pump 2-2 control circuit cable maintenance. The 14-day Completion Time only applies to Unit 2 during cycle 12 and may only be used to support maintenance of the containment spray pump 2-2 control circuit cable. The 14-day Completion Times do not apply to Condition C and do not extend the Condition C Completion Time of 10 days from discovery of failure to meet the LCO. In the event Condition A is entered for greater than or equal to 10 days, and then Condition C is entered, the Condition C Completion Time must be considered not met~~.

The Completion Time is modified by a Note stating that for planned maintenance or inspections, the Completion time is 72 hours. The Completion Times of Required Action A.2 are for unplanned corrective maintenance or inspections.

A.2

With one containment spray train inoperable, the inoperable containment spray train must be restored to OPERABLE status within 14 days. This Required Action applies to unplanned corrective maintenance or inspections. In this Condition, the remaining OPERABLE spray and cooling trains are adequate to perform the iodine removal and containment cooling functions. The 14-day Completion Time is based on PRA analysis and has taken into account the redundant heat removal capability afforded by the Containment Spray System, reasonable time for repairs, and low probability of a DBA occurring during this period.

These Required Action and Completion Time were added to the TS by LA XX for Unit 1 and LA XX for Unit 2. The 14-day Completion Time is intended to be used for unplanned corrective maintenance or inspections

BASES

ACTIONS (continued)	The 14 days from discovery of failure to meet the LCO portion of the Completion Time for Required Action A.2 is based upon PRA analyses and engineering judgment. It takes into account the low probability of coincident entry into two Conditions in this Specification coupled with the low probability of an accident occurring during this time. Refer to Section 1.3, "Completion Times," for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO" portion of the Completion Time.