

## DiabloCanyonNPEm Resource

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**From:** Stuyvenberg, Andrew  
**Sent:** Wednesday, November 24, 2010 11:11 AM  
**To:** Tan, Miranda; Grebel, Terence  
**Cc:** DiabloCanyonNPEm Resource  
**Subject:** SAMA RAIs Issued Today  
**Attachments:** ML102990531.pdf

Miranda, Terry –

Attached are the SAMA RAIs. Please let me know if you have any questions. I hope you both have happy Thanksgivings.

Best,  
Drew

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Drew Stuyvenberg  
U.S. Nuclear Regulatory Commission  
301-415-4006  
[Andrew.Stuyvenberg@nrc.gov](mailto:Andrew.Stuyvenberg@nrc.gov)

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**From:** Stuyvenberg, Andrew

**Created By:** Andrew.Stuyvenberg@nrc.gov

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

November 24, 2010

Mr. John Conway  
Senior Vice President  
Generation and Chief Nuclear Officer  
Pacific Gas and Electric Company  
77 Beale Street, MC B32  
San Francisco, CA 94105

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RELATED TO THE ENVIRONMENTAL REVIEW OF THE DIABLO CANYON NUCLEAR POWER PLANT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION: SAMA CLARIFICATIONS (TAC NOS. ME2825 AND ME2826)

Dear Mr. Conway:

The U.S. Nuclear Regulatory Commission (NRC or the staff) has reviewed Pacific Gas and Electric's responses, dated August 27, 2010, to the NRC requests for additional information submitted on July 6, 2010, and has identified areas where the staff requires additional clarification in order to complete its review. Enclosed is the staff's request for additional information.

As discussed with your staff, we request that you provide your responses no later than 30 days after the issuance of this letter. If you have any questions, please contact me at (301) 415-4006 or by e-mail at [andrew.stuyvenberg@nrc.gov](mailto:andrew.stuyvenberg@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Andrew L. Stuyvenberg".

Andrew L. Stuyvenberg, Project Manager  
Projects Branch 2  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

Enclosure:  
As stated

cc w/encl: Distribution via Listserv

**REQUEST FOR CLARIFICATION  
REGARDING PACIFIC GAS AND ELECTRIC'S RESPONSES TO  
DIABLO CANYON POWER PLANT  
REQUESTS FOR ADDITIONAL INFORMATION  
SEVERE ACCIDENTS MITIGATION ALTERNATIVES**

**1. RAI 1.e**

The response to this request for additional information (RAI) states that station blackout (SBO) due to loss of offsite power (LOOP) initiating events accounts for 6% of the core damage frequency (CDF). What is the contribution from consequential LOOPS for other initiating events?

**2. RAI 1.f**

- a. Confirm that the modeling of Unit 2 systems in the Unit 1 probabilistic risk assessment (PRA) takes into account the operational and maintenance status of Unit 2.
- b. The response to this RAI does not include mention of a two unit LOOP. This would impact the availability of the Unit 2 emergency diesel generators. Discuss this and any other two unit initiating events

**3. RAI 1.g**

The response to this RAI ("Some important component variables that increased in failure rate include the emergency diesel generator ...") implies that there are other important component failure rates that have increased. If this is true, identify other important variables that have increased and their potential impact on the Severe Accidents Mitigation Alternatives (SAMA) analysis.

**4. RAI 1.i**

The response to this RAI indicates that the DC00 stage 1 model reviewed in the Pressurized Water Reactor Owners Group peer review is different than the DC00 model described in Section F.2.1.6 of the Environmental Report (ER). Identify the most significant changes made to the prior model to obtain the DC00 stage 1 model and the most significant changes made in the DC00 stage 1 model to obtain the DC00 model. Also provide the internal events, fire and seismic contributions to the total CDF.

**5. RAI 1.k**

The response to this RAI states, "Given that the PRA impact of each of the open items is small, their resolution is not expected to change the conclusions of the SAMA analysis." Further, it is stated that the exercise in re-evaluating the SAMAs using the 95<sup>th</sup> percentile "...more than bounds the impact of PRA open items found in Addendum 1." While the evaluation of the open

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items in Addendum 1 concludes for most of the items that the impact of the PRA is insignificant or that the results are conservative, this is not the stated conclusion for all the items. For some items, the acceptability of the current model is stated to be that a SAMA has been identified that addresses the stated impact of the model deficiency. While this may partially justify the adequacy of the model for the SAMA identification process, it does not justify the adequacy of the model for the cost-benefit analysis. Further, the assessment at the 95<sup>th</sup> percentile is intended to provide insights associated with the uncertainty in input parameters not in the best estimate model. Provide further justification for those open items for which the conclusion of no impact on the SAMA identification process described in Addendum 1 is not necessarily applicable to the SAMA cost benefit analysis. In the response, specifically address SAMAs 727 (p. F-277), 289 (p. F-309), 419 (p. F-315), 420 (p. F-315), and 431 (p. F-317).

#### **6. RAIs 2.b and 2.c**

The response to RAI 2.c indicated that source term (ST)4 is made up solely of release category (RC)17 while ST5 is made up solely of RC18. The frequencies for these RCs provided in response to RAI 2.b are different from those provided for ST4 and ST5 in Table F.3-7 of the ER as shown below.

		Freq. In Table F.3-7	Freq. In RAI 2.b Response
ST4	RC17	1.23E-06	1.34E-06
ST5	RC18	2.88E-07	1.82E-07

It appears from the response to RAI 2.e that a portion of the steam generator tube rupture (SGTR) events (RC17) is allocated to ST5. Clarify the derivation of these ST frequencies.

#### **7. RAI 2.c**

The response to this RAI indicates that the grouping of the 37 release categories into six source term categories was performed in a manner similar to that described in Individual Plant Examination (IPE) Section 4.8. The IPE release category groups were stated to be for the purposes of gaining insights. In the SAMA analysis the source term categories function to provide a representation of radioactive release that can be used in the level 3 analysis to provide a reasonable estimate of the consequences. The IPE release category groups termed small and large are based on containment leak size and not the amount of fission products released. The appropriateness of the release category grouping for providing source terms that yield a reasonable consequence analysis is not clear. Provide further justification for the appropriateness of the release categories assigned to the source term categories and of the resulting consequence analysis.

#### **8. RAI 2.d and 2.e**

The response to RAI 2.d indicates that the representative modular accident analysis program case chosen for each source term category for the consequence analysis was based on their contribution to the total RC (ST) frequency. This approach does not account for release categories of lower frequency but higher release fractions.

The response to RAI 2.e indicates that for small early releases (ST2) the release category selected (RC14) represents over 50% of the RC frequency and would tend to represent the

highest consequence conditions. RC16U makes up 36% of the ST2 category and appears to be similar except that the debris is uncoolable.

Provide further support for the selection of representative cases for each ST category and specifically confirm that use of RC16U release fractions would not result in a higher dose-risk or offsite economic cost risk (OECR).

Also clarify the use of the term release category versus source term category in the response to this RAI. For example, in the above discussion and the discussion of containment bypass.

#### **9. RAI 2.h**

The response to this RAI indicates that no post core damage recoveries are included in the L2 model (except, for limited cases, containment isolation). Is recovery of AC power post core damage credited?

#### **10. RAI 2.j**

- a. The response to this RAI notes that the individual fission product release shows a stable condition at the end of the simulation except for the noble gas release for ST2 and ST6 which does increase beyond the 50 hour analysis cut off, but that the sensitivity analyses described in the ER bound the potential impact on the SAMA analysis. However, the release fractions reported in Table F.3-6 are in many cases appreciably less than those reported in Table F.2-8. For example, the total release fraction for ST2 noble gases is shown to be 0.36 in Table F.3-6 and 0.89 in Table F.2-8 (similar results are shown for other source terms), suggesting that the dose-risk could potentially be double that reported in the ER for ST2. Provide further justification for the conclusion in the RAI response that the simulation time cut off does not impact the results of the SAMA analysis.
- b. The response to this RAI also notes the potential for onsite or offsite mitigation measures for releases that extend beyond the simulation time. Provide a discussion of these mitigation measures and clarify the reason for why these measures were not considered as SAMAs.

#### **11. RAI 3.c**

- a. A portion of the response to this RAI discusses the evaluation of SAMA 18 and indicates that credit could not be taken for seismic events larger than 1.75g because most of the Class I equipment needed for safe shutdown is only seismically qualified up to that level. The NRC staff understands that some equipment for which credit was not taken may be likely to remain operable for seismic events beyond 1.75g. For any such equipment that may be beneficial for mitigating the detrimental effects from an earthquake greater than 1.75g, indicate the extent to which the equipment may remain operable and the extent to which the equipment could be credited toward reducing the need for various modifications contained in SAMA 26.

- b. Updated results are provided for SAMAs 5, 9 and 18. Relative to these SAMAs provide the following:
- i. Given that the change in results is substantial for each SAMA, it appears that the "Assumptions" and the "PRA Model Changes Made to Model SAMA" descriptions in the ER may have changed for these SAMAs. Provide updated "Assumptions" and "PRA Model Changes Made to Model SAMA" for each of these SAMAs.
  - ii. The revised evaluations of SAMAs 5 and 18 did not include the revised quantification method provided in response to RAI 6.o even though the change in dose-risk and OECR was greater than the change in internal event CDF. Provide an updated evaluation of SAMAs 5 and 18 for both the DC01A and DC01B models that uses the revised quantification method described in the response to RAI 6.o.
  - iii. Table 3.C-3 indicates that SAMA 9, evaluated using the DC01B model, is potentially cost-beneficial. Provide the detailed cost-benefit results for the DC01A model. Also, describe Pacific Gas and Electric's plans regarding further evaluation of this SAMA and any other SAMAs determined to be cost-beneficial in response to RAIs.
- c. Table 3.C-3 provides the change in averted cost-risk due to the change in seismic hazard modeled in DC01B and other non-seismic related changes made to other SAMAs in response to RAI 3.c and RAI 6.o. However, the averted cost-risk was reported to have changed for all SAMAs, even those that were not impacted by RAI responses (e.g., SAMAs 2, 7, 8, and 12-17). Describe the significant changes made to PRA Model DC01A to develop PRA Model DC01B.

#### **12. RAI 3.d**

The third highest seismic CDF sequence is described as involving seismic failure of the auxiliary feedwater system. A review of the importance analysis provided in response to RAI 3.c includes important events (OB1SE and AW1S) that are described to include auxiliary feedwater (AFW) failure due to operator error. Clarify the cause of AFW failure for this sequence.

#### **13. RAI 3.e**

The response to this RAI attributes the changes in FS type fire scenario results to routine changes in the internal events models that are used in evaluating the FS fire scenarios as opposed to relatively minor changes in the CSR1/CSR2 fire scenarios that utilize their own simplified event trees that have not had as many changes. The reason for the reduction in the VB1 fire scenario CDF contribution from the individual plant examination of external events (IPEEE) is not discussed. As the IPEEE notes, this control room fire scenario utilizes its own special event tree and not the internal events event tree. Discuss the reasons for the reduction in the VB1 fire scenario CDF from that given in the IPEEE.

**14. RAI 5.b**

The response to this RAI discusses the potential for a specific cost beneficial SAMA (strengthening a block wall) that focuses on one of the contributors to a split fraction rather than a SAMA that addresses the overall function represented by the split fraction. While this particular SAMA may not be cost beneficial, it does illustrate that there are potential SAMAs that can be identified from a review of the individual contributors to a split fraction. It is stated that basic event level results are often reviewed during the sequence analysis to determine what the dominant contributors to a split fraction may be, but that the process is not documented. Provide further assurance that a review of the basic event contributors to the important split fractions will not yield additional SAMAs that may be cost beneficial.

**15. RAI 6.e**

The response to this RAI indicates that there is a 2% reduction in the seismic CDF for SAMA 3 and that the cost benefit analysis results are provided in response to SAMA RAI 3.c. Table 3.C-2 indicates that there is no change in seismic CDF for SAMA 3. Clarify and provide complete CDF results and the C/B evaluation for SAMA 3 for the DC01A and DC01B models. Also update the response to RAI 6.o for SAMA 3.

**16. RAI 7**

The response to this RAI dismisses the feasibility of using a gagging device for closing a steam generator stop valve based on the challenging work environment. Expand on this rationale particularly if gagging is implemented for a SGTR prior to the onset of core damage. If considered feasible in this situation, provide an assessment of the cost-benefit of using such a device.

November 24, 2010

Mr. John Conway  
Senior Vice President  
Generation and Chief Nuclear Officer  
Pacific Gas and Electric Company  
77 Beale Street, MC B32  
San Francisco, CA 94105

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RELATED TO THE ENVIRONMENTAL REVIEW OF THE DIABLO CANYON NUCLEAR POWER PLANT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION: SAMA CLARIFICATIONS (TAC NOS. ME2825 AND ME2826)

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Sincerely,

*/RA/*

Andrew L. Stuyvenberg, Project Manager  
Projects Branch 2  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

Enclosure:  
As stated

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DATE	11/05/10	11/03/10	11/10/10	11/15/10	11/24/10

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Letter to J. Conway from A. Stuyvenberg dated November 24, 2010

**SUBJECT:    REQUEST FOR ADDITIONAL INFORMATION RELATED TO THE  
              ENVIRONMENTAL REVIEW OF THE DIABLO CANYON NUCLEAR POWER  
              PLANT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION: SAMA  
              CLARIFICATIONS (TAC NOS. ME2825 AND ME2826)**

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