UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING
APPEAL BOARD

In the Matter of	)	Docket Nos. 50-275
	)	50-323
PACIFIC GAS AND ELECTRIC COMPANY	)	
(Diablo Canyon Nuclear Power	)	(Reopened Hearing --
Plant, Units 1 and 2)	)	Design Quality Assurance)
	)	

JOINT INTERVENORS' PROPOSED FINDINGS
OF FACT AND CONCLUSIONS OF LAW

I. INTRODUCTION

1. On July 17, 1981, a Partial Initial Decision was issued by the Atomic Safety and Licensing Board authorizing the issuance of a low power operating license for the Diablo Canyon Nuclear Power Plant ("Diablo Canyon"), and approving Pacific Gas & Electric Company's ("PG&E") Quality Assurance ("QA") Program.

2. On September 21, 1981, the Commission issued an immediate effectiveness decision authorizing the licensing of Diablo Canyon for low power operation. One week later, the first of a series of design errors was discovered at the plant, which led the Commisson to suspend the low power license on November 19, 1981.

3. On June 8, 1982, the Joint Intervenors filed a motion to reopen the issue of Quality Assurance. The motion was granted by this Board as to design Quality Assurance in April 1983. On August 16, 1983, the Board stated that:

> [T]he history and nature of the design quality assurance issue of Diablo Canyon make this reopened proceeding unusual. Normally, an effectively functioning design quality assurance program ensures

that the design of a nuclear power plant is in conformance with the design criteria and committments set forth in an applicant's PSAR and FSAR. In the case of Diablo Canyon, however, this confidence has been seriously eroded by the existence of significant evidence that the design quality assurance program was faulty (i.e., it failed to comply with 10 C.F.R. Part 50, Appendix B). Hence there is now substantial uncertainty whether any particular structure, system or component was designed in accordance with stated criteria and commitements.

4. We thereafter admitted a series of contentions, which are listed in Appendix A to PG&E's proposed findings submitted to this Board. Hearings were held on these issues in Avila Beach, California, from October 31, 1983 through November 21, 1983. Prefiled testimony of numerous witnesses was admitted in evidence, and these witnesses were cross-examined by the parties. Exhibits were identified and admitted in evidence, and a list thereof is attached to PG&E's proposed findings as Appendix B.

II. CONTENTIONS 1 AND 2 -- SCOPE OF THE IDVP AND ITP

A. Review of Nonseismic Design

5. The testimony of witnesses offered by PG&E and the IDVP was highly inconsistent with respect to the amount of nonseismic review work performed by the verification program. PG&E's own witness originally testified that approximately 50-70% of all nonseismic design documents were reviewed. (Anderson, Tr. 435.) Later in his testimony, however, Mr. Anderson stated that the amount of work reviewed was approximately 75-80% of the nonseismic design, using a different method of calculation. (Id. at 1419-20.) During his deposition, Mr. Anderson testified that

approximately 50% of the design work was reviewed by the verification program. (Id. at 1430.) Mr. Anderson finally admitted on cross examination that different numbers could be obtained depending on the methodology, and that the 75-80% figure was "soft." (Id. at 1439-41.) The Staff was not even willing to offer an estimate of the percentage of work reviewed by the verification program. (Wermiel, Tr. 2787-88.)

6. The applicant also attempted to demonstrate the scope of the nonseismic review by an assertion that 3 out of 10 systems were reviewed for nonseismic design. However, on cross examination the applicant's witnesses uniformly agreed that this was not accurate. (Moore, Tr. 410.) In fact, one of the IDVP's witnesses testified that using the IDVP's method of "counting," one would arrive at the conclusion that 3 out of 21 systems were in fact reviewed. (Krechting, Tr. 1715.) Since the applicant's own witnesses have been unable to agree on a precise figure for the evaluation of the amount of review done of the nonseismic design, the Board will adopt the lower bound of PG&E's witnesses' testimony, and finds that 50% of the nonseismic design was reviewed by the verification program.[1]

7. Contrary to the requirements imposed by the staff letter of November 19, 1981 (PG&E Ex. 87), the IDVP failed to verify the nonseismic work of all service related contractors performing work after June 1978. (Cooper, Tr. 1462.) Although

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1 It should be noted, however, that the work done by the ITP was concededly less in-depth than that done by the IDVP. (Anderson, Tr. 1426.)

IDVP witnesses testified that their interpretation of the letter was that such a review was not required, the NRC Region 5 personnel disagreed with this interpretation, which is inconsistent with the terms of the November 19 letter itself. (Cooper, Tr. 1464.)

8. The Board finds that a number of contractors who did safety-related nonseismic design work were improperly excluded from the scope of the IDVP review. For example, Western Canada Hydraulic Laboratories performed safety-related design work at Diablo Canyon, but was excluded from the IDVP's review mainly because they were a post-1978 contractor. (Cooper, Tr. 1782.) However, this exclusion was not justified, particularly in light of the fact that Western Canada had no Appendix B Quality Assurance Program at the time the work was done. (PG&E Ex. 157, Enclosure 5.) The Board is not persuaded by the fact that the NRC may have audited Western Canada, given the fact that Western Canada's work at Diablo Canyon appears not to have been within the scope of the NRC's audit. (Cooper, Tr. 1750-51.)

9. Another contractor which was unjustifiably excluded from the IDVP's review was Stafco. Although Stafco performed admittedly safety-related work, they were not included in the IDVP's verification efforts. (Reedy, Tr. 1486-87.)

10. Despite the fact that they performed significant safety-related design work at Diablo Canyon, none of the IDVP participants were included in the scope of the IDVP or ITP verification. (Cloud, Cooper, Tr. 1484-85.) In fact, the IDVP developed procedures to insure that their own work would be

reviewed, but left the decision as to whether these procedures should be followed to PG&E. There is no evidence in the record that PG&E has performed such a review, despite the fact that Dr. Cooper himself stated that it was his opinion that all such work should be reviewed. (Cooper, Tr. 1752-54.)

11. The failure to include these contractors in the verification program's review renders any conclusions about the adequacy of the nonseismic design at Diablo Canyon invalid. Without the inclusion of these contractors in the verification sample, there can be no confidence that the work performed by such organizations met the various design criteria contained in PG&E's licensing commitments.

12. One of the most significant ommissions in the nonseismic review was the verification program's failure to address systematically all of the 10 C.F.R. 50 Appendix A criteria applicable to Diablo Canyon. (Moore, Tr. 246; Cloud, Tr. 1504.) The absence of any systematic comparison of the design of Diablo Canyon with the requirements of Appendix A suggests to the Board that the review was not sufficiently broad in scope to assure compliance with all applicable criteria.

13. The most fundamental flaw in the scope of the nonseismic review was the failure to review 100% of the nonseismic design at Diablo Canyon. As originally set forth in our August 16, 1983 Order, the focus of these proceedings would be to determine whether the verification program provided an equivalent level of assurance that Diablo Canyon was properly designed as would have

been obtained had there been a properly functioning quality assurance program. It was undisputed that while a quality assurance program reviews 100% of all design documents, the verification program did not conduct such a review. (Moore, Tr. 439.) In fact, PG&E witness Anderson testified that the DCP Quality Assurance program does two separate 100% reviews of all design documents. (Anderson, Tr. 401.)

14. Starting from the premise that one has a far stronger basis for confidence when one actually reviews a system than when one must extrapolate to the system (Cooper, Tr. 1711.), it becomes apparent that the verification program's sampling approach to nonseismic design could not possibly provide an equivalent level of assurance as a properly functioning quality assurance program.

15. The Board finds the testimony of Mr. Hubbard persuasive on this point. Mr. Hubbard testified that even a 100% design review, in and of itself, cannot provide the same level of assurance as a properly functioning quality assurance program because of the absence of various "management gates" which are designed to detect errors not uncovered by the technical reviews. (Hubbard, Tr. 2193, 2195.) The fact that the IDVP possessed considerable expertise in the area of nonseismic design cannot compensate for its lack of knowledge about those systems which it did not review, a process which Dr. Cooper himself admits cannot give one the same level of assurance as would be obtained had each system in fact been reviewed. The IDVP felt pressured to get the

job done as quickly as possible, and regardless of whether this pressure was self-imposed, the Board believes that it resulted in an erroneous decision to review less than 100% of the nonseismic design. (See Cooper, Tr. 1693.)

16. To justify performing less than a 100% review, PG&E attempted to draw a distinction between seismic and nonseismic design. PG&E attempted to justify the distinction in part based on the fact that the Hosgri reanalysis imposed significant new requirements. However, PG&E's witnesses admitted that new requirements were also imposed by the accident at Three Mile Island, and Browns Ferry. (Anderson, Tr. 368.) The requirement to consider seismic design is not a recent one, and the only changes which have occurred have been changes in the criteria required. (Anderson, Tr. 369, 371.) This situation is not significantly different from that in the nonseismic design area, where preexisting requirements were substantially altered, and new requirements were added, as a result of Three Mile Island and Browns Ferry. PG&E's own witness in the seismic design area stated that the basic process for seismic qualification is the same as was the case 15 years ago. (White, Tr. 378.)

17. Furthermore, although PG&E attempted to justify the seismic/nonseismic distinction based on the complexity of seismic design, design errors such as the "switched blueprint" problem were not the result of advanced, complex technology. (Schierling, Tr. 3000.) The Board finds that the other design discrepancies uncovered in the seismic area similarly do not warrant a blanket

conclusion that they were the result of complex, advanced technology which has no counterpart in the nonseismic design area.

18. This conclusion is reinforced by a large volume of evidence submitted by the Joint Intervenors and the Governor indicating that many of the basic causes of the design errors resulted from factors which would be equally applicable to nonseismic and seismic design. For example, PG&E's witness De'Uriarte testified that several deficiencies in the PG&E Quality Assurance Program, identified during PG&E's so-called Lookback Review, identified factors which would be applicable to nonseismic as well as seismic design. (De'Uriarte, Tr. 886.)

19. The Board finds that the most fundamental cause for the design errors at Diablo Canyon was not the factors identified by the IDVP, but rather the broader problem of lack of PG&E management recognition of the need for a formal Quality Assurance Program. There is extensive evidence in the record to substantiate such a conclusion. For example, Roger Reedy stated, in essence, that such a lack of management commitment was responsible for the seismic design errors discovered at Diablo Canyon. (De'Uriarte, Tr. 1001-02.) Witnesses testifying on behalf of the staff offered similar testimony:

> [Mr. Strumwasser] O.K. And I am asking you whether, in order to correct the root cause -- since you only say there is one -- you would expect to see a greater management recognition by PG&E of the need for a rigorous and well controlled design Quality Assurance Program?
>
> [Schierling] Yes. I agree with that.

(Schierling, Tr. 3011.)

20. Finally, lack of management commitment to a formal Quality Assurance Program was identified as one of the factors which caused the design errors at Diablo Canyon by the NRC Case Study C Team in its final report on the causes of these errors. (Staff Ex. 54, at 9.) Other factors noted in the same study would also be applicable to nonseismic design, including the fact that PG&E "had developed a false sense of security with respect to its engineering capabilities" (JI Ex. 128, at 6), and that PG&E had an attitude of "do anything and everything to expedite bringing the plant on line." (Id. at A-1.)

21. This management attitude was obviously not restricted to seismic design (Shierling, Tr. 3003), and therefore the Board finds PG&E's attempt to justify a lesser level of review for nonseismic design to be unpersuasive. The fact that PG&E's Quality Assurance Program was deficient, and that this was partly the result of poor management attitude, indicates to the Board that a 100% review of nonseismic as well as seismic design is warranted.[2]

B. Failure to Use Statistical Methodologies.

22. The testimony of PG&E witnesses with respect to the utility of statistical methodologies was inconsistent. At one point, Mr. Anderson testified as follows:

> [Mr. Strumwasser] It was the view, then, of the DCP that statistical techniques offered nothing of value to the verification program, is that right?

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2 We would note parenthetically that PG&E has provided a further justification for our concern in the nonseismic area by virtue of Mr. De'Uriarte's testimony that the best people were assigned to the seismic area. (De'Uriarte, Tr. 1013.)

[Mr. Anderson] Yes, that was our view at the time. (Anderson, Tr. 397.) However, at another point Mr. Anderson offered testimony directly contrary to this originally expressed view:

> [Mr. Strumwasser] Do you believe that statistical methods would have no utility in the design of a verification program for Diablo Canyon?
>
> [Mr. Anderson] I think I said they would have some utility. They could be used in some cases.

(Anderson, Tr. 258.) These conclusions with respect to the utility of statistics were not based on consultation with a statistical expert. (Anderson, Tr. 397.)

23. The IDVP similarly rejected the need to hire a statistician, based on Dr. Cooper's judgment that such advice was unnecessary -- despite Dr. Cooper's own admission that he was not even aware of the uses of Bayesian statistical methods. (Cooper, Tr. 1526, 1527.) Dr. Cooper attempted to bolster his position by stating that the Staff had reached a similar conclusion, but this determination likewise was arrived at without the benefit of a person who was an expert in statistics. (Knight, Tr. 2855.)

24. The Board finds wholly without justification PG&E's, the IDVP's, and the Staff's complete failure to seek out the advice of a competent statistician given the importance of the question involved. While the Board does not dispute that as engineers the individuals who made these decisions had some knowledge in the field of statistics, the advice of an individual expert in that particular field would have resulted in greater assurance that the

systems sampled in the nonseismic area were representative of those not sampled.

25. There is substantial evidence to the effect that members of the NRC believed that a greater use of statistical analysis was needed in order to ensure that the verification program was adequate. As the staff stated to the Commission:

> We did not think that the program plan did use statistical sampling methods to the extent it could have, and one of our conclusions will be that whoever does this program plan should expand the use of sampling criteria as far as possible.

(PG&E, Ex. 89, Appendix C at 2.) (Phase II Program Management Plan.)

26. Although the staff had access to experts in the area of statistics, only one apparently evaluated the IDVP. (Knight, Tr. 2766, 2768.) However, the conclusion of this single individual should have alerted the IDVP to the need for additional statistical analysis.

> The following assertion in Additional Information for Supertrut Statistical Analysis seems symptomatic of the lack of statistical sophistication or arm waiving or both. ". . . the adequacy of sample size cannot be determined mathematically. Therefore, the adequacy issue is one of engineering judgment. The sample sizes recommended by Benjamin were based on such judgment and deemed to be adequate." I have two questions. Have the authors encountered any examples in text books of statistics on how to determine sample sizes? For what purposes or decisions was the sample size of the H type deemed adequate?

(Gov. Ex. 60, at 2.) (emphsis added).

27. In light of the above evidence, the Board finds that the failure to utilize a statistician in the actual design of the

IDVP resulted in an inadequate evaluation of how to sample a representative number and type of systems in the nonseismic design area. The eleventh hour decision to hire Dr. Kaplan (apparently the result of a desire to rebut the testimony to be offered by the Joint Intervenors and the Governor) does not cure the initial failure to consult with a statistician. (Anderson, Tr. 459, 461.) Dr. Kaplan's testimony does not alter this conclusion. For example, Dr. Kaplan concluded that random sampling, even within a stratified sample, was inappropriate at Diablo Canyon. But on cross-examination Dr. Kaplan admitted that he could point to no research whatsoever where non-random sampling was used within stata. (Kaplan, Tr. 1329.) Dr. Kaplan's inability to cite such an example is not surprising in light of his own admission that he is not familiar with the sampling literature (Kaplan, Tr. 1329.) The Board finds it remarkable that Dr. Kaplan is offering unequivocal opinions on the value of random sampling without having read the "fundamental and pivotal source on sampling" in the literature, William Cochran's Sampling Techniques. (Samaniego, Tr. 2393; Kaplan, Tr. 1366.) Under these circumstances, Dr. Kaplan's conclusions with respect to the validity of non-random sampling cannot be accepted by this Board.

28. The purpose of random sampling is to screen out unforeseen biases. (Apostolakis, at 15; Kaplan, Tr. 1361.) A recent study demonstrated that the largest single cause of design errors at nuclear power plants was unanticipated conditions. (Apostolakis, at 8.) Therefore, the need to screen out unforeseen

biases is particularly strong in the context of the design of a nuclear power plant. Yet absent the use of random sampling, it is not possible to state with any degree of confidence that such biases have indeed been eliminated. For example, Dr. Apostolakis testified that the IDVP's emphasis on the most complex systems could in fact underestimate the error rate at the plant, since the best engineers might be assigned to the most difficult areas. (Apostolakis, at 15.) Furthermore, the decisionmaking process with respect to the sample is difficult to ascertain where engineering judgment is the basis for choosing the sample. One example of this is apparent from the testimony. Dr. Cloud and Dr. Cooper both testified that it was not possible, a priori, to determine where one was most likely to discover design errors. (Cloud, Tr. 1547; Cooper, Tr. 1549.) By contrast, Mr. Anderson of the DCP testified confidently that the ITP focused on those areas where design errors were most likely to occur. (Anderson, Tr. 1186.)

29. It is apparent to the Board that one cannot rely upon the assurances of the IDVP or the ITP that the areas looked at were those most likely to contain design errors, or were representative of the unsampled areas. The influence of unforeseen biases is too subtle to enable any particular individual to state with confidence that such considerations have not crept into the decisionmaking.[3]

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3 Although the Board is most concerned with unforeseen biases, there was evidence in the record to demonstrate that open biases were also present. For example, there was evidence that the IDVP edited several ITRs in such a way as to ameliorate the criticisms of PG&E. (Krechting, Tr. 1588, 1609, 1788.)

30. Even if one were to presume that random sampling was in fact used by the verfication program, Dr. Kaplan testified that there could be 40 undisclosed instances at Diablo Canyon where licensing criteria were not met. (Kaplan, Tr. 1169.) Although the IDVP and ITP offered testimony to the effect that they were confident the undisclosed errors were not safety significant, the Board is not persuaded by this testimony. The fundamental reason for the Board's skepticism is that it is not possible to extrapolate from a non-random sample to the unsampled areas, and state that the undisclosed errors are similar to those which have been uncovered. The failure to use random sampling techniques makes a realiable extrapolation impossible and creates the suspicion that there may be errors whose type are not yet known. Furthermore, the same lack of random sampling does not allow the estimation of error frequencies or absolute numbers. The design of the IDVP was not amenable to providing a basis for estimating frequencies. (Apostolakis, at 19.)

31. The reliability of results based on an analysis of a sample selected by "judgment" is impossible to assess since judgment sampling does not provide a basis for describing the general character of the entire plant. There is no justifiable methodology which enables one to extrapolate validly from a judgment sample to a population. (Samaniego, at 9.)

32. Given this inability to extrapolate from the sampled systems to the unsampled systems, the Board concludes that it is not possible to predict the safety significance of those errors

which remain undetected. The reason for the Board's concern with respect to the undisclosed errors was well stated by Dr. Cloud:

> In addition to what Dr. Cooper said, we were very interested in generic concerns,and we felt that they were significant because a generic conern could conceivably go into places that were not being sampled and could have significance beyond what we might be able to know about them.
>
> That's why we felt it was important to chase them all down, and be sure they were all resolved.

(Cloud, Tr. 1764.) Dr. Cooper agreed that one could not ascribe any greater safety significance to 40 errors which were the result of a generic concern than to 40 errors which were random. (Cooper, Tr. 1767-68.)

33. Furthermore, even if the Board were convinced that the undisclosed errors were not of substantial safety significance, it has not been demonstrated that the combination of these errors might not produce a safety hazard. The witnesses agreed that the best means of assessing the risk of undisclosed errors at Diablo Canyon would be a probabilistic risk assessment ("PRA"). (Kaplan, Tr. 1393-97; Apostolakis, Tr. 2321.) Dr. Apostolakis further testified that it was unnecessary to do a full scale PRA in order to assess the significance of undisclosed errors at Diablo Canyon. An abbreviated version of a PRA would be adequate under these circumstances. (Apostolakis, Tr. 2358.) The Board is persuaded by Dr. Apostolakis' analysis, and finds that the failure to perform a PRA with respect to the errors discovered at Diablo Canyon has rendered it impossible to ascertain the safety hazard posed by the 40 remaining undiscovered errors.

34. The computations done by Dr. Kaplan which reveal a low likelihood that a significant error remains undetected do not alter the Board's conclusion in this regard. It was conceded by all witnesses that the results of Bayes' theorem obtained by Dr. Kaplan are dominated by the prior distribution supplied by the DCP. (Kaplan, Tr. 1227-29; Samaniego, Tr. 2402.) It strains the credibility to presume that the DCP would not grossly have underestimated the likelihood that there remained an undetected safety significant error at the plant. Evidence of this bias is found in the transcript itself in the form of testimony by Mr. Anderson of the DCP:

> [Mr. Havian] Am I correct in understanding you to say that despite the large number, in the thousands, of physical modifications, you believe there have been relatively few errors discovered at Diablo Canyon over the past two years?
>
> [Mr. Anderson] I think we believe that, yes.

(Anderson, Tr. 452.)

35. The Board agrees with Dr. Apostolakis' conclusion that it was important for Dr. Kaplan to have considered the potential bias of the DCP, and that Dr. Kaplan's use of .999 was unjustifiable. Using more realistic prior distributions, the Board concludes that it is reasonable to assume that there is a 23% chance that a safety significant error remains undisclosed at the plant. (Apostolakis, Tr. 2320; Kaplan, Tr. 1268.)

36. The Board is likewise not persuaded by PG&E's assertion that engineering judgment rather than statistical methodologies is appropriate for the IDVP. As Dr. Kaplan himself

stated, the use of random sampling does not preclude the simultaneous utilization of engineering judgment. (Kaplan, Tr. 1361.) Statistical analysis and engineering judgment are complementary. In the design of a statistically valid verification program, an engineer must use experience and judgment in defining the population of interest, what characteristics of the population are to be inferred on the basis of a sample, and how precise such inferences must be. Large and diverse populations are best studied through stratification into relatively homogeneous subpopulations. Such a division into parts is again a matter of judgment. Finally, after a statistical study of a specific question is complete, the engineer will often identify follow-up questions to be investigated through subsequent statistical experiment. Thus, engineering judgment plays a crucial role in the planning of a statistical study for a nuclear power plant. The IDVP's sole reliance on engineering judgment to the exclusion of statistical methodologies was therefore inappropriate and unjustified.

37. Witnesses for PG&E and the Staff both agreed that Dr. Kaplan was hired in order to satisfy IDVP commitments contained in their Program Management Plan. (Anderson, Tr. 459; Schierling, Tr. 2758-60.) However, in light of Dr. Kaplan's lack of statistical qualifications, and open bias in favor of the applicant, it is impossible to conclude that his employment satisfies these commitments by the IDVP.[4] The following testimony

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4 To provide a contrast, Dr. Apostolakis, although testifying on behalf of a party opposing the applicant, has worked for utilities many times in the past. (Apostolakis, Tr. 2323.)
(footnote continued)

is illuminating on this point:

> [Mr. Havian] Do you have a Ph.D. in statistics?
>
> [Dr. Kaplan] No.
>
> [Mr. Havian] Have you ever taken any graduate level courses offered by a Department of Statistics at any university?
>
> [Dr. Kaplan] No.
>
> [Mr. Havian] Have you ever taken any undergraduate level courses in a Department of Statistics at any university?
>
> [Dr. Kaplan] No.
>
> [Mr. Havian] Have you ever heard of the American Statistical Association?
>
> [Dr. Kaplan] Yes.
>
> [Mr. Havian] The Institute of Mathematical Statistics?
>
> [Dr. Kaplan] Yes.
>
> [Mr. Havian] The Biometric Society?
>
> [Dr. Kaplan] Yes.
>
> [Mr. Havian] Aren't those three of the main American Statistical Societies?
>
> [Dr. Kaplan] I believe so.
>
> [Mr. Havian] Are you a member of any of the three?
>
> [Dr. Kaplan] No.
>
> [Mr. Havian] Do you know what a referee [sic] journal is?
>
> [Dr. Kaplan] Yes.

(footnote continued from previous page)
Dr. Kaplan, however, not only has worked exclusively for utilities, but proudly considers himself to be "pro nuclear." (Kaplan, Tr. 1411-13.)

> [Mr. Havian] Can you, in your resume, point to which articles of yours have been published in a referee [sic] journal in statistics?
>
> [Dr. Kaplan] None in a statistical journal.
>
> [Mr. Havian] What is a referee [sic] journal?
>
> [Dr. Kaplan] It's, it's a journal which, when you send your articles, they sent [sic] it out to referees before accepting it for publication.
>
> [Mr. Havian] Isn't the purpose of sending it out to those referees to ascertain whether the methodologies used in the article are valid?
>
> [Dr. Kaplan] That's one of the purposes.

(Kaplan, Tr. 1348-49.) Even more disturbing to the Board is the following testimony regarding Dr. Kaplan's objectivity:

> [Mr. Havian] Weren't you brought into this case for the express purpose of offering testimony disputing what Mr. Hubbard said in that affidavit?
>
> [Dr. Kaplan] I would say that that's fair. No one put that to me as such.
>
> * * *
>
> [Mr. Havian] But it was your impression that that was what you were expected to do, correct?
>
> [Dr. Kaplan] Yes.

(Kaplan, Tr. 1413-14.) Both Dr. Cooper and the Staff's project manager believed that if this were Dr. Kaplan's purpose, he would be unacceptable as the IDVP's statistician. (Cooper, Tr. 1832; Schierling, Tr. 2854.) In the Staff's view, in which the Board concurs, the mere fact that Dr. Kaplan did not consider himself to be a statistician renders him incapable of satisfying the IDVP's commitment to hire such an individual. (Kaplan, Tr. 1349; Schierling, Tr. 2852.)

commitment to hire such an individual. (Kaplan, Tr. 1349; Schierling, Tr. 2852.)

III. CONTENTION 3 -- SEISMIC DESIGN

A. Uplifting Of The Containment Mat.

38. The direct testimony of Dr. Roesset was uncontradicted by witnesses testifying on behalf of PG&E, the IDVP, or the Staff. The phenomenon of uplifting of the containment mat can be described as follows. It is normally assumed in seismic analysis that the base of the containment building always remains in contact with the underlying medium (soil or rock). The inertia forces in the structure will, however, cause an overturning moment that will tend to make the structure rock around a horizontal axis. If due to the combination of the vertical force (caused by the weight of the structure increased or reduced by the vertical acceleration) and the overturning moment the stresses at any point between the slab and the soil (or rock) become tensile, the building will tend to uplift. During uplifting, a part of the mat will no longer be in contact with the soil and the area of contact will thus be reduced. (Roesset, at 5-6.)

39. Uplifting may cause increased stresses in parts of the containment structure, and may cause increases in vertical acceleration that can affect the design of equipment within the structure. While separation of the mat and uplifting of the building will have some beneficial effects, it will have some detrimental effects as well. The two areas in which some

detrimental effects can occur are that stresses in the lower part of the shell may increase, and vertical accelerations under a horizontal excitation may appear due to the shifting of the axis of rotation. (The centroid of the area of contact). (Roesset, at 6-7.)

40. The Board concludes that for an earthquake such as the Hosgri event, some uplifting of the containment at Diablo Canyon would take place. The Board further finds that the increase in forces in the base mat and neighboring walls, and the response in the vertical direction due to horizontal motion, are effects which should have been considered by the DCP. However, the DCP has only considered forces in the containment shell, despite the fact that a simple model could have been used to model all effects. (Roesset, at 8-9.) Between 10% and 20% increase in vertical accelerations can be expected, an amount which may be important for certain types of equipment. (Roesset, Tr. 2216.) Given these significantly increased forces, the Board finds that the equipment within the containment is not seismically qualified, in violation of licensing commmitments made by PG&E.

B. Auxiliary Building.

41. Although 2000 feet per second would be a reasonable estimate for the lower bound of soil springs for the auxiliary building, the IDVP concluded that the rock had a velocity of 3,500 feet per second. The Board finds that this difference is significant, and not justifiable. (Constantino, Tr. 2518-21.) In fact, in light of Dr. Roesset's testimony, it appears that the

likely velocity of the material underlying the auxiliary building is 1,500 feet per second. As Dr. Roesset testified:

> If these data are correct and are representative of the rock there, then we would have to say that at elevation 100 for the auxiliary building, you also have about 1,500 feet per second. If there we had 1,500 feet per second, we would have no longer rock but hard soil. If now you were reducing that by the level of strain, under Hosgri, you might have something like 1,000 feet per second or less.
>
> Now if you look at the studies done for the auxiliary building, the soil springs, we found that for a value of 2,000 there was an increase of 20% in the response spectra but the IDVP judged that that was acceptable because 2,000 was an unrealistic lower-bound. Well, if here we're talking about 1,500 or 1,000, then that unrealistic lower-bound would not be that unrealistic and, in fact, we may have much larger amplifications.

(Roesset, Tr. 2227.)

42. The Board finds that the analysis done by the DCP, based on the erroneous calculation of the velocity of the underlying rock, is not justified and therefore inadequate.

C. Buried Tanks.

43. The properties of the backfill for the buried diesel fuel oil tanks appeared not to have been properly calculated by the IDVP. Figures 13 and 14 of ITR 68 (PG&E Ex. 155) show results for the variation of the modulus of elasticity of the fill in the analysis of the buried fuel tanks as a function of the confining stress and the effective mean stress. The modulus is considered proportional to the stress raised to a power that changes from 0.18 to 0.70 (an exponent as high as 0.75 is shown in figure 22 of ITR 68). A more typical value in the literature of this exponent is between 0.4 and 0.5. A value of 0.18 is much lower than typical

and a value of 0.7 or 0.75 is too high. In addition, the variation in property between the different lines shown in figure 14 is very large, larger than is reasonable. (Roesset, at 18.) The use of these values must be justified before the Board can consider it acceptable, and therefore, the analysis done of the backfill is inadequate.

44. With respect to the diesel fuel tank rock properties, the Board has similar concerns about proper justification for current values. Harding Lawson's use of the linear relationship

$$V = 9,667-83.3x$$

is not justified. Figure 25 of ITR 68 (PG&E Ex. 155) shows another set of variations of shear wave velocity with depth which should be somewhat similar (unless there are very different rocks along the site). Yet, the average curve on figure 25 is given by 2000 + 40x, a very different slope in the variation with depth from the one of the formula on page 38 of the ITR. (Roesset, at 19-20.) The use of this linear variation must be justified before the Board can conclude that the analysis of rock properties in this area is proper.

D. Auxiliary Salt Water Piping.

45. The calculation of the properties of the backfill for the auxiliary salt water ("ASW") piping and circulating water intake ("CWI") conduits are not consistent with what one would expect. For the shear modulus of the back fill, the result of three tests are shown in figure 23 of ITR 68 (PG&E Ex. 155)

together with the Seed and Idriss curve for sands. Since laboratory tests will generally produce values smaller than those measured in situ, it is common to apply a correction factor to obtain the curves of variation of modulus with strain. This is particularly important if the values at low levels of strain are measured in the field as reportedly was done here (Id. at 42). Yet, no correction factor was applied in this case, and therefore, with the three points uncorrected, the actual values in the field will higher, indicating a smaller reduction with level of strain than implied by the curve in figure 23. (Roesset, at 20.)

46. Furthermore, three values of damping are shown in figure 24. These values fall much closer to the Seed and Idriss curve for clays than to the one for sands. The shear modulus for clays was not indicated in figure 23. The failure to correct these values would result in their being excessively high. (Roesset, at 20-21.) The Board therefore concludes that the values for the backfill for the ASW piping and CWI conduits are not justified.

IV. CONTENTION 4 -- NONSEISMIC DESIGN

A. Fire Protection

47. Because of the fact that the grated ventilation opening in the ceiling of the motor-driven AFW pump room was larger than previously considered, there is a danger of a more rapid propagation of elevated temperatures and products of combustion through the floor opening. (Kubicki, Tr. 2870-71.) The larger opening would make it more likely that hot gases from a fire in the

pump room could pass through the enlarged opening to the room on the other side of the grate. (Kubicki, Tr. 2872.) This, in turn, would create a greater risk that a fire in the pump room would propagate to another part of the plant, in violation of applicable criteria.

48. In other words, complete separation, or what is commonly known as a fire barrier, does not exist to prevent a fire from spreading from the pump room to the room on the other side of the grating. (Kubicki, Tr. 2878.) Furthermore, although a study of air flow patterns would be relevant to an analysis of this problem, the Staff has no knowledge about such patterns. (Kubicki, Tr. 2877-2877A.)

49. In light of the foregoing, the Board concludes that there cannot be adequate assurance that fire protection for the motor-driven AFW pump room is consistent with the PG&E licensing commitment for fire zone separation as stated in its November 13, 1978 Supplemental Information for Fire Protection Review.

B. Jet Impingement

50. PG&E has committed to performing a formal analysis for jet impingement inside containment. However, PG&E has only postulated breaks in lines which have a temperature in excess of 200 degrees and pressure in excess of 275 psi. (Connell, Tr. 584.) The source for these criteria purportedly was Section 3.6.4 of the FSAR, which addresses pipe break outside containment. (Connell, Tr. 585.) However, Section 3.6.4, page 3.6-17, states:

> Open crack breaks are postulated to occur in the most adverse locations in piping having fluid temperature or

> pressure greater than the above [200 degrees or 275 psig]. (Emphasis added.)

Furthermore, page 3.6-3b of the FSAR specifically states that Mr. Giambusso's letter of December 18, 1972 governs the criteria for determination of which lines will be considered for pipe break outside containment. The terms of this letter state that pipe breaks must be postulated in lines where the temperature is greater than 200 degrees or the pressure exceeds 275 psi. (Connell, Tr. 593-94; JI Ex. 136.)[5] In light of the fact that the criteria for pipe break outside containment do not justify PG&E's decision to postulate breaks in lines only if both temperature and pressure exceed certain limits, it is necessary to look at the language of the specific section of the FSAR which addresses pipe break inside containment.

51. The only references to temperature and pressure criteria contained in the FSAR sections addressing piping inside containment are found in Section 3.6.3. Pages 3.6-13 to 3.6-14 provide a description of those lines in which pipe whip must be postulated and a restraint must be installed. (Knight, Tr. 2887-88.) This section states that if the temperature is less than 200 degrees and the pressure is less than 275 psi, no restraint is needed. (Knight, Tr. 2896.) In other words, pipe whip effects must be mitigated if the pipe is subject to high temperature or

---

5 Although the Giambusso letter by its terms is applicable to breaks postulated for pipe whip, the criteria for breaks for jet impingement are the same as for pipe whip. (Connell, Tr. 600; Knight, Tr. 2893.) Therefore, throughout this discussion, the Board will assume the criteria for postulated breaks for pipe whip and jet impingement are identical.

pressure. (Knight, Tr. 2896.) Therefore, the FSAR is consistent in its specification of locations for pipe break. All lines with a temperture greater than 200 degrees or pressure greater than 275 psi must be considered. Because PG&E's use of the "and" criterion rather than "either/or," three lines which should have been included in the jet impingement analysis were excluded. (Connell, Tr. 613-14.) PG&E's failure to consider breaks in such lines constitutes a violation of the commitment set forth in the FSAR.[6]

C. Circuit Breakers

52. The load which would need to be interrupted by circuit breakers on 4160 volt buses F, G, and H, was above the nameplate ratings for those buses. Although the rating of the breakers was 33.1 kA, the breakers were required to interrupt voltages of 39 kA. (Moore, Tr. 524.)

53. Despite the fact that PG&E witnesses testified that subsequent testing was done which determined that the breakers were capable of withstanding the higher voltages, the Board finds that this testimony is not sufficient to assure that the breakers will indeed perform as they were intended. PG&E witnesses testified that manufacturers normally only warrant their breakers for the nameplate value, and that they were unaware if the manufacturer of the breakers in question would warrant this equipment for values in excess of the nameplate rating. (Vahlstrom, Tr. 566-67.) PG&E witness Vahlstrom also testified that the reason manufacturers do

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6 If, as PG&E contends, the lines listed on page 3.6-4 of the FSAR constitute all high energy lines, then it would render the criteria for pipe break specified in every other part of the FSAR erroneous. The Board rejects this interpretation.

not warrant their breakers for above the nameplate value is that it is not worth the economic risk. (Id., at 569.)

54. The Board is unwilling to assume a risk which the manufacturer of the breaker itself would not assume, and therefore finds that the failure to install circuit breakers with adequate nameplate ratings on 4160 volt buses F, G, and H constitutes a violation of commitments contained in the FSAR.

V. CONTENTION 5 -- AS-BUILTS

55. All reviews of PG&E's design control practices for design activities conducted prior to November 1, 1981 disclosed numerous examples where the as-built Diablo Canyon plant failed to conform to the design documents. This pattern of configuration control non-compliance was identified by PG&E in its review in response to NRC Bulletin 79-14. A similar pattern of differences between the as-built plant and design documents was disclosed by the IDVP in the Phase I reviews and by Brookhaven National Laboratory (BNL) in its independent analysis of the vertical response of the containment annulus structure. In addition, the Institute of Nuclear Power Operations (INPO) visited the Diablo Canyon site during the week of January 25, 1982. In its report dated February 12, 1982, INPO recommended changes to the design change control practices as follows:

> Improve the existing modification program to ensure that changes to the plant are controlled and performed in a timely manner. For example:
>
> a. Complete revisions to affected documentation before modified systems are returned to service.
>
> b. Issue final as-built documentation and update procedures as soon as possible.

c. Assign review and approval responsibilities for non-critical modifications to on-site technical support department engineering.

(Hubbard, at 13-14.) Although the DCP modified the design configuration control practices in effect prior to November 1981, the IDVP's recent review of the sample of design documents resulting from the DCP's Corrective Action Program identified a number of instances where the as-built plant still differed from the design documents. (Hubbard, at 14-15.)

56. The most significant EOIs resulting from the IDVP corrective action review are briefly summarized in Table 8-1, appended to the direct testimony of Mr. Hubbard. Configuration control errors identified by the IDVP included the following:

(a) Differences disclosed between "as analyzed" and "as built" bolt sizes (EOIs 1120, 1121).

(b) Differences disclosed between "as built" and "as analyzed" instrument tubing support (EOI 1123).

(c) Design analysis finite element model of the control room slab used to generate Hosgri spectra not agreeing with the field verified location of the supporting wall (EOI 1124).

(d) Incorrect valve modeling in DCP seismic reanalyses (EOIs 1133, 1135, 1137).

Hubbard, at 15.

57. The IDVP also identified other discrepancies which were not made the subject of EOIs. A large number of configuration control discrepancies were summarized in the ITRs, and a list of these discrepancies is provided in Table 5-1 (appended to Mr. Hubbard's testimony). For reasons not documented by the IDVP, the majority of the discrepancies documented in this table were not the

subject of EOIs. The failure of the IDVP to initiate EOIs for these matters is a serious omission, and the failure systematically to initiate EOIs is contrary to the IDVP's procedures for identifying and evaluating potential errors. (Hubbard, at 15-16.)[7]

58. Configuration control discrepancies between the as-built plant conditions and the design documents identified by the IDVP during its verification of post-November 1981 design activities are denoted with an asterisk in Table 5-1, appended to Mr. Hubbard's testimony. Some examples of such configuration control discrepancies in design documents are the following:

> (a) Pipe Weight: A 2,000 pound flow element (weight equivalent to a pipe length of about 2.7 times pipe diameter) was not included in the DCP model (ITR 59).
>
> (b) Piping Geometry: The DCP coded one portion of 20-inch diameter pipe 3 feet shorter and another portion of 12-inch diameter pipe 4 feet longer, than indicated by IDVP field verification (ITR 59).
>
> (c) Support Modeling: Support 55S/64R was modeled as a rigid +/- Y-directional support, whereas the IDVP field verification found it to be a gravity support (ITR 59).
>
> (d) Valve Modeling: The weights for Valves LCV-113 and -115 were modeled 45% low for valve bodies and 8% low for valve operators. In addition, minor differences in the DCP eccentricity calculations were noted (ITR 59).
>
> (e) Support Locations: A 3-foot difference

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7 The IDVP in its Phase II Program Plan stated that

> Open Item Reports are prepared for the purpose of reporting an IDVP response to a QA and Design Control Practices deficiency, a violation of the verification criteria or an apparent inconsistency identified in the performance of the work.

(Hubbard, at 16 n. 2.)

in location of one of the supports was noted (ITR 59).

(f) Valve Modeling: The DCP analyzed Valve 8805B with the operator in the vertical position, but an IDVP field verification found this operator to be in the horizontal position. Also, differences were found for valve center of gravity locations for valves 8805A and 8805B and IDVP [sic] and for operator support locations (ITR 59).

(g) The IDVP field verification noted a weld across the top of a member attached to the process pipe. The DCP drawing did not show this weld (ITR 60).

(h) The IDVP field verification noted that one of the four restraints comprising support #98/83 was a small box frame bilateral rather than a tee-shoe and clamp assembly as shown on the DCP support drawing (ITR 60).

(i) Unintentional restraints, as shown on the DCP walkdown isometric and by IDVP field verification, were not explicitly addressed in the analysis (ITR 61).

(j) DCP sketches and as-built data did not correlate with the support analysis. In addition, DCNs for modifications were omitted from the documentation package (ITR 63).

(k) Two of the bolts in the four bolt plate joint between two column members had been cut out to prevent pipe movement interference. The impact of the reduced section was not evaluated (ITR 65).

(Hubbard, at 16-17.)

59. The IDVPs reviews to date of a sample of the design documents resulting from the QA/QC process for the DCP's corrective action measures demonstrate that configuration control deficiencies continue to exist at Diablo Canyon. Such configuration differences between the as-built plant and the design documents are contrary to the design control and document control requirements of Criteria 3 and 6 of Appendix B. The configuration control deficiencies also

indicate a failure to comply with the requirements of Criteria 10 and 11 that inspections and tests be conducted to verify conformance with drawings in that the proper conduct of such tests and inspections would not result in differences between the as-built plant and design documents remaining undetected. The continued existence of discrepancies between the "as-built" and "as-designed" configuration of the plant indicate that, contrary to Criterion 16 of Appendix B, the corrective actions by the DCP have not been adequate to assure that all conditions adverse to quality are identified and corrected, and that the cause of the discrepancy is determined and action taken to preclude repetition of similar discrepancies. (Hubbard, at 17-18.)

60. Evidence in the record from various other sources confirms the Board's conclusion. Staff witness Morrill agreed that the IDVP discovered as-built discrepancies in pre-1981 and post-1981 design work. (Morrill, Tr. 29:48-49) An independent review by EDS Nuclear also concluded that PG&E's design document control practices were inadequate:

> The existing procedures do not adequately describe the engineering interface with the Records Managment System nor identify the various engineering documents and/or programs which have been utilized on the project. This would include, for example, the Systems Interaction Program, engineering computer information, letters of design delegation, field "as built" criteria, and special procedures/instructions.

(Gov. Ex. 36 at PGA 16098.)

61. Finally, a review of Diablo Canyon's present design document control practices by the Case Study C Team also revealed

weaknesses in the basic procedures. (JI Ex 128, at Appendix A, p. 5.)[8]

VI. CONTENTION 6 -- WESTINGHOUSE

62. The IDVP review of Westinghouse consisted solely of a limited review of the Westinghouse-PG&E design interface. For example, with respect to seismic design, when the IDVP examined the transmittal of Hosgri spectra it only verified on a sampling basis that the applicable spectra were actually used for equipment qualification. Similarly, the IDVP review of the nonseismic safety aspects of the Auxiliary Feedwater System design, as well as the Reedy Phase II QA audit, failed to involve anything more than an examination of the design interface between PG&E and Westinghouse. (Hubbard, at 21.)

63. There is evidence that design errors have remained undetected by the Westinghouse QA program. For example, the vertical spectra used by Westinghouse for qualifications of the accumulators is in error. For the vertical direction, Westinghouse

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8 Although Dr. Altman testified for the Staff that the draft version of this document had been superceded, the Board finds that conclusions contained in the draft are valid, and that the document which has been designated as the final version was produced in an attempt to soften criticisms of PG&E. The Board bases this conclusion upon a comparison between the draft version of the document and the final version. In almost all instances, statements were changed to reflect more favorably on PG&E, and most of these were suggested by PG&E in a letter to the NRC. (JI Ex. 139) Absent a conscious attempt to soften the criticisms in the draft document, the Board finds it implausible that the changes made by the NRC simply corresponded fortuitously with those suggested by the utility. The following represents an accurate comparison among the three documents:

[FOOTNOTE CONTINUED IN APPENDIX A ATTACHED HERETO]

used two-thirds of the tau filtered spectra, rather than two-thirds of the unfiltered spectra as committed to at page 4-3 of the Hosgri Report. Further, in the BNL review of ITR-11, BNL reviewers noted that errors were disclosed in 30% of the Westinghouse samples examined by the IDVP. Therefore, BNL questioned the adequacy of the IDVP's verification of Westinghouse seismic design activities as follows:

> Further, the large percentage of exceptions (30%), where Westinghouse qualification spectra did not completely envelope the Hosgri spectra, would warrant additional samples if a complete check of the spectra criteria was intended.

However, there is no evidence that TES implemented the BNL suggestion to conduct additional sampling. (Hubbard, at 21-22.)

64. The verification of system design pressures and temperatures for safety-related systems, including its use in equipment specifications, resulting from a generic concern was not included in the IDVP's additional verification program for items within the Westinghouse design scope, but rather was limited by the IDVP to PG&E design scope systems. (Hubbard, at 22.)

65. Even the ITP's limited review disclosed design errors in the Westinghouse work. The seismic review of the main control Boards ("MCB") conducted by Westinghouse in response to new spectra for the auxiliary building developed by the ITP identified an error in the original seismic qualification analysis. The MCB was procured by Westinghouse from Reliance, and Reliance used a private consultant to qualify the MCB seismically by analysis. The original analysis in the early 1970's predicted the lowest natural

frequency of the MCB to be above 70 Hz based on the analytical model used. In the current evaluation process, the MCB was modeled using field measurements and results of in-situ tests. The in-situ tests pointed out the existence of natural frequencies between 15 to 28 Hz which is much below the 71 Hz calculated originally. Because of this error, and because of the severity of the current Hosgri spectra at the base of the MCB in the 15 to 33 Hz range, Westinghouse has provided modifications to the MCB. (Hubbard, at 22-23.)

66. It is evident that the conclusions resulting from the IDVP and ITP reviews of samples of other design service contractors cannot be extended to provide meaningful conclusions as to the adequacy of Westinghouse-supplied NSSS equipment or of the adequacy of Westinghouse design services. Further, Westinghouse was the responsible design organization for over 70% of the Diablo Canyon safety-related systems. As NSSS contractor, Westinghouse had responsibility to develop and implement the majority of the non-structural Diablo Canyon safety features committed to by PG&E in the FSAR and other licensing commitments provided in response to NRC regulations. In particular, Westinghouse supplied the Diablo Canyon designs provided to assure compliance with a significant number of the General Design Criteria set forth in Appendix A to 10 C.F.R. Part 50. (Hubbard, at 23-24.)

67. The Board therefore finds that there is no reasonable assurance that the work performed by Westinghouse

complies with applicable licensing commitments, and that its exclusion from the verification program was without justification.

VII. CONTENTION 7 -- ROOT CAUSE

68. The testimony of Mr. Hubbard on the issue of root cause was largely uncontradicted. The IDVP Final Report in Section 6.0 contains its evaluation of the basic causes of design errors, with the documentation set forth in a very general manner in Section 6.3. The significance is set forth in Section 6.4, while the impact is briefly discussed in Section 6.5. (Hubbard, at 26.)

69. The ITP documentation of basic causes is provided in Section 1.8 of the Phase I Final Report and Section 3.0 of the Phase II Final Report. (PG&E Exs. 91 and 92.) In no case, however, did the ITP or the IDVP correlate the basic causes cited to the identified errors. The IDVP's and the ITP's failure to make this correlation is contrary to the corrective action requirements of Criterion 16 of Appendix B. Criterion 16 requires that a QA audit ascertain the causes of QA program failings so that an appropriate corrective action program can be devised. Part of any proper corrective action program is a determination as to whether the observed failure has generic implications. Fundamental to any investigation of the generic implication of any QA failure is a determination of the root cause of that failure. It is only when the root cause of a failure is identified that the question of its generic implications can be addressed. Instead of analyzing the root cause of each design error it uncovered as a mechanism toward assessing the generic implications of that error, the IDVP and the

ITP provided no more than global conclusions regarding basic cause with no specific reference to any of the identified errors. Further, the global basic causes identified by the IDVP and the ITP primarily relate to the seismic errors. Thus, the multiple failures (basic causes) which resulted in the nonseismic design errors were not systematically addressed. (Hubbard, at 26-28.)

70. The Board finds that the failure to evaluate properly the root cause of design errors is illustrated by the IDVP resolutions of EOI Nos. 7002, 8010, 8017, 8022, 8023, and 8060. These resolutions demonstrate a failure to address completely the basic causes of the identified errors. Given this failure, combined with the fact that the verification program did not review 100% of the nonseismic design, the Board finds that it is impossible to state that similar errors are not present in the unreviewed areas of the plant.

VIII. CONTENTION 8 -- QUALITY ASSURANCE

71. Because of the fact that approximately 20% of the work done by the ITP was performed under PG&E's Quality Assurance program (Dick, Tr. 1024), and the fact that this work was significant (id.), it is necessary for the Board to evaluate PG&E's Quality Assurance program as well as that of the DCP.

72. It was uncontradicted that the implementation of PG&E's QA program was deficient until mid-1982. (Morrill, Tr. 3024.) The Board finds it difficult to understand the fact that work at Diablo Canyon was not abated pending the complete implementation of the DCP QA program, particularly in light of the

deficiency in PG&E's program prior to this date. Therefore, the Board cannot conclude that the significant amount of work reviewed by PG&E's program is adequate.

73. In addition to the fact that the implementation of PG&E's QA program was deficient, there was evidence to the effect that the program itself was deficient. One of the frequently repeated criticisms was that PG&E's Quality Assurance program was in essence a number of relatively autonomous programs implemented by different departments, at times inconsistently. (Reedy, Tr. 915; Gov. Ex. 35, at 5.) As PG&E's own witnesses testified, "the QA manual sets the stage for the quality assurance program. It should be a comprehensive document." (Gouveia, Tr. 3222.) Even PG&E witness Stokes, who was openly supportive of PG&E's Quality Assurance program, stated that PG&E should "put together a cohesive program." (Stokes, Tr. 3219.) See also JI Ex. 128 at Appendix A, p. 7 (Case Study C).

74. Another problem with the PG&E QA program is that it occupied a level within the organization which did not have sufficient authority to conduct its activities with the independence required by Appendix B. This criticism was made by Mr. Reedy, as well as two independent reviewers who examined PG&E's Quality Assurance program. (Reedy, Tr. 917; Gov. Ex. 35, at 6 (PAC Audit); Gov. Ex. 36, at 1 (EDS Audit).) Regardless of whether PG&E is now correcting these deficiencies, the fact that they existed during the time when the ITP's work was being reviewed indicates that there can be no confidence that the work was properly done.

the indoctrination and training of personnel was found to be a general weakness throughout the various manuals and departments. It is recommended that the existing program be modified as follows, in order to bring the program into conformance with industry practice and regulatory requirements.

(Gov. Ex. 36, at 3.)

76. Finally, various inadequacies were revealed with respect to PG&E's engineering manuals. This subject is of particular concern to the Board because of the fact that these manuals were being used by the DCP. The following criticisms of the manual were set forth by EDS:

> (a) There is a lack of defined responsibilities for personnel within the Engineering Department.
>
> (b) Interfaces and controls within the Engineering Department, and between Engineering and other PG&E departments are not well defined.
>
> (c) The minimal role which quality assurance has been given in performance of activities such as procurement document review, and program/procedure development and review.
>
> (d) The role of the Engineering Department during the operations phase and its interface with the various technical review committees is not adequately described.
>
> (e) The lack of a comprehensive and well integrated corrective action program.
>
> (f) A well defined system does not exist for assuring and verifying that all required documents are incorporated into the design program and that design changes, as necessary, are reflected in design documents.
>
> (g) With the exception of the piping design group and engineering quality control, department

instructions for performing work activities are not current.

(Gov. Ex. 36, at PGA 16096.)

77. Although PG&E attempted to rebut the contents of the PAC and EDS reviews, the Board is not persuaded by the rebuttal testimony. For example, Mr. De'Uriarte stated that the items which PAC stated were missing could be found in other manuals. (De'Uriarte, Tr. 3152.) However, there were deficiencies found by PAC which did not stem from the fact that it only reviewed a portion of PG&E's Quality Assurance program. Items 2 and 3 on page 4 of the PAC review identify inconsistencies and direct violations of ANSI standards. (Gov. Ex. 35, at 4.) Similarly, PAC found not only "errors and omissions," but also "contradictions" among the various manuals. (Id., at 5.) Furthermore, PAC observed that it was "familiar with the review of the various implementing manuals . . . and [we] understand it has produced similar results." (Id., at 4.)

78. Although witness Stokes attempted to undermine the criticisms contained in the EDS review, he admitted on cross-examination that he had not reviewed any manuals pertaining to design. (Stokes, Tr. 3190.) Mr. Stokes also admitted that Mr. Stock was the one who had actually reviewed the manuals, that Mr. Stock had a Quality Assurance background, and that he probably participated in drafting the final EDS report. (Stokes, Tr. 3223-24.)[9]

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9 PG&E's attempt to discredit the findings of PAC and EDS is belied by the fact that it has hired PAC to modify its
(footnote continued)

79. The Board also finds that there is persuasive evidence that the DCP's Quality Assurance program was inadequate, in both its programmatic aspects and its implementation. With respect to the program itself, neither the Staff nor the IDVP is in a position to offer credible testimony. Despite the fact that the DCP QA program is comprised of 5 documents, the Staff only reviewed the Bechtel Topical. (Haass, Tr. 2977.) It also appears that the IDVP failed to review the DCP QA program itself, and only reviewed the implementation of the program. (Haass, Tr. 3028-30.)

80. The evidence presented with respect to programmatic aspects of the DCP QA Program indicates that there is reason for concern. In addition to document control problems identified in a Bechtel Quality Assurance audit of the DCP (Jacobson, TR. 944-47), a recent PG&E Engineering Quality Control audit disclosed that 48% of the Engineering Manuals inspected "were found to be deficient in some way." (Gov. Ex. 40.) Apparently, a number of these manuals were in possession of DCP personnel. (Jacobson, Tr. 960.) PG&E's Chief of Engineering Quality Control reacted as follows to this disclosure:

> This failure to keep our Engineering Manuals up-to-date appears to run uniformly across the Engineering Department. Obviously, it is very difficult for us to maintain that we have a controlled quality program in the Engineering Department when nearly half of our Engineering Manuals are not maintained by their owners.

(footnote continued from previous page)
Quality Assurance manual to correct the conditions identified in PAC's original report. Apparently, the changes needed must be fairly extensive, because PAC has been hired for an 18 month period. (Gouveia, Tr. 3191-92.)

(Gov. Ex. 40.) Even PG&E's own witness, Mr. De'Uriarte, admitted that he had a concern about the failure to update the Engineering Manuals. (De'Uriate, Tr. 1058.)[10]

81. The implementation of the DCP QA appears likewise to have been deficient in many respects. There were numerous discrepancies noted in the IDVP's review of the Corrective Action Program which should have been discovered by an adequate Quality Assurance program. The errors identified in the IDVP's design product review of design modifications since November 1, 1981 are summarized in Table 8-1 (appended to Mr. Hubbard's testimony). As set forth in the table, the review to date has identified approximately five (5) errors of Classes A and B, twelve (12) Class C errors, and one (1) so-called deviation. (Hubbard, at 40.)

82. In addition, as previously noted by the Board, the IDVP's corrective action review identified numerous design discrepancies which could have, but did not result in the issurance of EOIs. A list of such discrepancies is provided in Table 5-1, appended to Mr. Hubbard's Testimony. These discrepancies should have resulted in EOIs, since they met at least one of the IDVP's criteria for issuing an EOI in that they represented:

> (a) A deficiency in a QA and Design Control Practice;
>
> (b) A violation of the verification criteria; or
>
> (c) An apparent inconsistency identified in the performance of the work.

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10 The Board is also concerned by the fact that the DCP Quality Assurance Audit failed to detect such widespread discrepancies. (Jacobson, Tr. 963.)

The EOIs identified by the IDVP in its review of the DCP Corrective Action Program therefore understate the nature and extent of the discrepancies actually discovered by the IDVP. (Hubbard, at 41.)

83. The Board finds that the Reedy design process review of the DCP QA Program was also inadequate. The IDVP audit basically took a snapshot of the DCP design QA program at one point in time. In its limited review, the IDVP design control audit disclosed 24 deficiencies in the DCP Quality Assurance program development and implementation, including incomplete records documentation, lack of procedures, procedures not being followed, inadequate training, failure to implement commitments in a timely manner, inadequate document control, deviations in design control activities, and failure to control procurement activities. However, these conditions were determined by the IDVP "to be due to incomplete documentation, because this audit was performed in the early stages of the DCP QA Program implementation." While it is true that the DCP QA Program was not established until August 20, 1982, it should also be remembered that the Reedy audit took place nearly one year after the issuance of the Order suspending the Diablo Canyon license. Thus, one would have expected more progress in QA program implementation. (Hubbard, at 43-44.)

84. The Diablo Canyon QA/QC measures presumably were drawn up such that (a) they were designed to achieve a necessary objective, and (b) if implemented properly, they would have achieved the objective. In fact, however, the necessary implementation was not achieved. Instead, over a number of years,

there were recurring observations of lack of necessary QA/QC attention. The failure to implement the design control measures represents a serious concern primarily because it reflects a lack of discipline in, and management attention to, the QA/QC program. The QA/QC management program requires that specified standards be reliably and repeatedly achieved, and that program objective was not realized. In QA/QC, such lack of attention to prescribed measures cannot be tolerated. Each QA/QC measure, once issued by responsible management, must be assumed to be important. The fact that the IDVP now in hindsight apparently finds the instances of non-compliance to be acceptable (or at least not a significant concern) represents a lack of attention to the necessary discipline and detail which constitutes a basic ingredient of a successful QA/QC program. (Hubbard, at 44-45.)

85. The results of the IDVP design product verification, as well as its design process audits demonstrate that the ITP failed to satisfactorily execute a design Quality Assurance program for the design modifications developed since November 1, 1981. The results further indicate that, contrary to the requirements of Criteria 1 and 2 of Appendix B, the DCP failed to establish and execute a design Quality Assurance program. Further, contrary to Criterion 3, the DCP's design control measures failed to assure that the Diablo Canyon design criteria were correctly translated into design documents. Indeed, the errors and potential errors set forth in Tables 5-1 and 8-1 of Mr. Hubbard's Testimony demonstrate that the DCP QA program failed to implement adequately the required

audits and corrective action measures, contrary to Criteria 18 and 16 of Appendix B. This conclusion inevitably follows as a result of the identified errors since Criterion 18 requires that PG&E and its design contractors perform planned and scheduled audits to verify compliance with all aspects of the Quality Assurance program and to determine its effectiveness. Follow-up action is intended to be initiated to address the identified discrepancies. Guidance for such follow-up action is provided by Criterion 16, which requires that appropriate corrective action be initiated to correct the identified and any similar discrepancy, to determine the cause of the discrepancy, and to preclude recurrence of further similar discrepancies. (Hubbard, at 46-47.) In the absence of a satisfactory Quality Assurance program, the Board concludes that there can be no confidence that the ITP Corrective Action Program work was performed in accordance with applicable criteria.

IX. CONTENTION 9 -- COMPONENT COOLING WATER SYSTEM ("CCWS")

86. Although the Staff had previously approved the CCWS heat removal capability under design basis accident conditions, as a result of some allegations with respect to this system it was discovered that PG&E's analysis did not consider the most limiting single failure concurrent with the worst design basis heat load. (Wermiel, Tr. 2879-80.) As a result of this error, and also the fact that it is uncertain whether the current temperature levels in the Diablo Canyon cove will continue in the future (Connell, Tr. 564-65), it is possible that the plant will have to be shut down more frequently that was originally contemplated in the design

basis. (Connell, Tr. 563.) According to the Staff's own witness, it is desirable to avoid challenges to systems involved in plant shutdowns. (Wermiel, Tr. 2885.)

87. The Board finds that the possibility of an increased number of plant shutdowns erodes the original margin of safety planned into the design basis for Diablo Canyon. As a result, the current procedure for shutting the plant down under the most limiting single failure occurring with the worst design basis heat load is inadequate.

PROPOSED CONCLUSIONS OF LAW

1. The Board now considers its prior decision not to reopen the issue of construction Quality Assurance in response to the motions by the Governor and Joint Intervenors to have been erroneous. The Board now finds that the standards for reopening the record have been met, and therefore grants the above motion.

2. The Board now concludes that its prior decision not to admit the Joint Intervenors' and the Governors' contentions that PG&E failed to implement a Quality Assurance program which addressed structures, systems and components important to safety, but not safety-related, was erroneous. Such a requirement is mandated by General Design Criterion 1, 10 C.F.R. 50, Appendix A, and the Board is without authority to waive this requirement for Diablo Canyon.

3. PG&E, as the applicant, has the burden of proof to demonstrate compliance with all applicable regulations. 10 C.F.R. §§ 2.732, 50.57.

4. Intervenors may property build their cases on the basis of cross-examination. In the Matter of Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B, and 2B), ALAB-463, 7 NRC 341, 356 (1978); In the Matter of Commonwealth Edison Co. (Zion Station, Units 1 and 2), ALAB-226, 8 AEC 381, 389 (1974).

5. PG&E's Quality Assurance program prior to November 1981 was not in compliance with the requirements of 10 C.F.R. Part 50, Appendix B. Before the Board is authorized to issue an operating License for Diablo Canyuon, PG&E must provide evidence that the current verification program provides an equivalent to compliance with Appendix B.

6. The Board concludes that PG&E failed to carry its burden of proof that the IDVP and ITP verification programs have provided a level of assurance that the design of Diablo Canyon complies with all regulatory criteria equivalent to that provided by a Quality Assurance program fully in compliance with 10 C.F.R. Part 50, Appendix B. Furthermore, the Board finds that there continue to exist deviations from applicable regulatory criteria and licensing commitments in the design of Diablo Canyon. The fact that such deviations are not considered "significant" by PG&E, the IDVP, and the Staff, is deemed irrelevant in the opinion of the

Board. In light of the foregoing findings of fact, we cannot conclude that

(a) Diablo Canyon will operate in conformity with the provisions of the Atomic Energy Act, 42 U.S.C. §§ 2011 et seq., and regulations of the Commission;

(b) There is reasonable assurance (i) that the activities authorized by the operating licenses can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations; and

(c) The issuance of the requested license will not be inimical to the common defense and security or to the health and safety of the public.

10 C.F.R. § 50.57.

CONCLUSION

The Board has carefully considered the entire record of this proceeding. Based upon that review and the findings of fact and conclusions of law set forth above, we must deny the application for licenses to operate Diablo Canyon, Units 1 and 2, because PG&E has failed to demonstrate compliance with the Commission's regulations and provide the requisite assurances that such operation can be conducted without undue risk to the public health and safety.

This Initial Decision is effective immediately and shall constitute the final action of the Commission subject to review

Exceptions to this Initial Decision may be filed by any party(s) within 10 days after the service of this Initial Decision. A brief in support of exceptions shall be filed within 30 days thereafter (40 days in the case of the Staff).

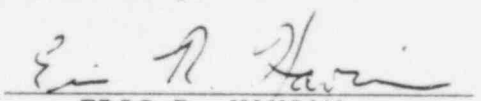
Within 30 days of the service of the brief of appellant (40 days in the case of the Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

DATED: January 23, 1982

Respectfully submitted,

JOEL R. REYNOLDS, ESQ.
JOHN R. PHILLIPS, ESQ.
ERIC R. HAVIAN, ESQ.
Center for Law in the
Public Interest
10951 W. Pico Boulevard
Los Angeles, CA 90064
(213) 470-3000

DAVID S. FLEISCHAKER, ESQ.
P. O. Box 1178
Oklahoma City, OK 73101

By: 
ERIC R. HAVIAN
Attorneys for Joint
Intervenors

SAN LUIS OBISPO MOTHERS
FOR PEACE
SCENIC SHORELINE
PRESERVATION CONFERENCE, INC.
ECOLOGY ACTION CLUB
SANDRA SILVER
ELIZABETH APFELBERG
JOHN J. FORSTER

APPENDIX A

[FOOTNOTE 8 CONTINUED]

CHANGES FROM DRAFT TO FINAL CASE STUDY C
WHICH RESULTED IN MORE POSITIVE OR NEGATIVE
TREATMENT OF THE LICENSEE

	Draft Language	Final Language	Page Reference in PG&E Letter
1.	The Licensee had developed a false sense of security with respect to its engineering capabilities. (p.6)	Deleted (p.6)	1
2.	The Licensee's staff resisted the imposition of management controls required for assurance of quality that were applied elsewhere in the company and/or on its contractors. A contributing factor may have been that many of the Licensee's top management had come out of the engineering function. They had confidence in it and did not impose the management controls required by the nuclear process. (p.6)	Deleted (p.6)	2
3.	Further, and as previously stated, the Licensee was frequently within a matter of months of bringing the plant into operation. As pressure mounts to complete a project, shortcuts are often taken. Actions that the Licensee might take over a longer run would be different than those taken when it appeared that the project would be completed in a short time, or if additional	Deleted (p.6)	2

	Draft Language	Final Language	Page Reference in PG&E Letter
	nuclear plants were planned. As time went on, the Licensee abandoned plans for additional nuclear generating capacity. The Case C nuclear station would be its only nuclear capability in the near term. (p.6)		
4.	Control of Purchased Material, Equipment, and Services [was deficient]. (p.8)	Control of Service Contracts [was deficient]. (p.8)	8
5.	These factors include . . . an atmosphere of contention between engineering and quality assurance. (p.9)	These factors include . . . the resistance by engineering of the application of formal quality assurance procedures. (p.9)	--
6.	As a facility nears completion or is in a pre-startup condition (as the Licensee's station was in the mid-1970s) and new or changed requirements arise, there is an ever present tendency to shortcut procedures and to formalize action later. Such conditions increase the possibility of error. (p.9)	As a facility nears completion or is in a prestartup condition (as the Licensee's station was in the mid-1970s) and new or changed requirements arise, there is a tendency to accomplish the activity and to formalize action later. Such conditions, coupled with informal interface procedures, increase possibility of error. (p.9)	3
7.	The Licensee and its consultants and contractors were just far enough removed from the customary level of informality to promote the possibility of error and misunderstanding. (p.10)	Deleted (p.10)	3
8.	While the Case Study Team was unable to establish	The case study team was unable to establish	4

	Draft Language	Final Language	Page Reference in PG&E Letter
	the attitudes and relationships between engineering and the new quality assurance director in 1977, it is suspected that the relationship was something less than constructive (The new quality assurance director was reassigned in February 1979). (p.12)	the attitudes and relationships between engineering and the new quality assurance director those years [late 1976 and 1977]. (p.12)	
9.	The Licensee had a false sense of security with respect to its engineeting capability. (p.12)	The Licensee had a high degree of confidence with respect to engineering capability. (p.12)	5
10.	Further, and as previously stated, the Licensee was within a few months of bringing the plant on line on several occasions. Thus, actions that the Licensee might take in a longer run would be different when it appears that project completion would be imminent, and no nuclear plants were anticipated in the near term. (p.13)	Deleted (p.13)	5
11.	The Licensee's past experience with construction enabled them to proceed with the necessary controls in place and qualified people to keep them that way. Construction of power plants was "old hat" and they knew how to stay out of trouble and get the job done. New QA/QC requirements were accommodated [referring to the Licensee's "failure to understand and appreciate the potential merit of a fotmal QA program"]. (p.14)	Deleted (p.13)	

	Draft Language	Final Language	Page Reference in PG&E Letter
12.	There was no great experience in seismic matters in the Licensee's organization, and there was no detailed scope of the work that the Licensee specified for its consultants. (p.15)	Deleted (p.15)	--
13.	He [the Licensee's Vice President of Engineering] said these things were good for his staff to experience and it will be better for it when the project is completed. (He commented on a number of problems, mostly personnel related, that had arisen as a result of this integrated matrix organization [the Project Completion Team]). (p.17)	He said these things were good for the staff to experience and it will be better for it when the project completed. (p.16)	6
14.	In the past, he [the Licensee's Manager of Nuclear Power Operations] said, there had been much wheel reinventing. They started with a few of the required procedures and then flooded the place with records without having people to take care of them. The QA guidelines had seemed to restrict the conduct of assuring quality and, thus, it was resisted. (p.17)	Deleted (p.16)	7
15.	The fact that the Project Completion Team adopted the A-E's quality assurance program is indicative of the Licensee's lack of understanding (or perhaps procedures) of how to apply quality to the design/ construction process for nuclear plants. (p.19)	The fact that the Project Completion Team adopted A-E's quality assurance program may be indicative of the judgment that the Licensee's methods of applying QA to the design process for nuclear plants needed improvement. (p.18)	8

	Draft Language	Final Language	Page Reference in PG&E Letter
16.	The Licensee, he [Project Completion Engineering Manager] said, had good quality in each time frame since the job began in 1966. As each of the new quality assurance initiatives occurred, the Licensee responded, but it was more or less reaction. (p.20)	Deleted (p.19)	--
17.	It was admitted that the Licensee was slow to adopt all aspects of quality assurance. (p.24)	Deleted (p.21)	9
18.	Further, the Study Team made the comment that it appeared to them that the Licensee's engineering organization appeared as "prima donnas." This was not disputed by the Licensee's upper management. (p.24)	Deleted (p.21)	9
19.	Based on the results of the IDVP reported by the Project Completion Team, one would not expect to find large numbers of quality-related problems in the design process. (p.25)	Deleted (p.22)	--
20.	The Manager of Nuclear Power Operations highlighted the problem this way; he said that the idea was perpetuated that, if one had the paperwork correct, one had a proper QA program. (p.25)	Deleted (p.22)	--
21.	While some of the top quality control managers felt that Licensee employed [sic] may have been less aggressive than desired,	Deleted (p.26)	--

	Draft Language	Final Language	Page Reference in PG&E Letter
	it is doubtful that certification of these [quality assurance/quality control] personnel would have changed the situation. (p.30)		
22.	Many of the management decisions over the years indicate an attitude of "do anything and everything to expedite bringing the plant on line." The current Independent Design Verification Program (IDVP) and establishing in 1982 the Project Completion Team under an architect-engineer's direction reflects this attitude; however, the extent to which these changes reflect a real commitment to assuring quality rather than providing "cosmetics" is not totally clear. The apparent imbalance between "construction" and "engineering" in assuring quality is considered to reflect some lack of commitment at the top levels of corporate management. (p.A-1)	Deleted (p.A-1)	10
23.	There is evidence that when the Licensee initially set up its QA/QC program, they appointed an old line construction engineer to be Manager position. Also, the individual at the Licensee who knew the most about quality philosophy was transferred to another function. (p.A-2)	Deleted (p.A-1)	10
24.	Corporate QA does audit facilities on a periodic basis; however, general understanding by upper	Corporate QA audits construction activities on a periodic basis, but there did not appear	--

	Draft Language	Final Language	Page Reference in PG&E Letter
	management would indicate that they would not see the need to audit from a management standpoint. There was much talk about engineering taking care of its own problems as they arose, but did not indicate a formal program for corrective action; mainly a personnel function. (p.A-2)	to be the same attention given to engineering activities. (p.A-1)	
25.	Company personnel seem to be afraid of the concept of QA or QC having access to top management. They don't see any benefit/ reason. They do not understand the concept. "QA" is a term used to describe the organization that they were required to organize, but really didn't need. (p.A-2)	At one time, QA to be a term used to describe an organization required by regulations... (p.A-1)	11
26.	In the early days, cost/ schedule did override QA/QC functions. The Licensee had much pride in their abilities, however, and felt that they were doing everything correctly. There is much evidence to indicate that they were willing to admit their limitations and seek help for seismic work. (p.A-2)	Deleted (p.A-1)	11
27.	There is evidence that this is one area [clearly defined and properly implemented responsibility and authority] that was very weak in the early stages, and is one of the reasons for the Licensee's present predicament. There are no observations	There are no observations for the present organization; the licensee is aware that engineering QA should have been more formal in the early program. (p.A-2)	11

	Draft Language	Final Language	Page Reference in PG&E Letter
	for the present organization, other than they are aware that this should have been more formal in the early program. The Licensee's former QA manager made the statement that the early requirements for responsibilities were left to the organization responsible for work. This was a general concensus. EveryLody supposedly understands the requirements, but chose to take care of his own responsibilities. (p.A-3)		
28.	The Licensee did not understand the need for trained quality people in the beginning Many people were put into quality functions without training. The Engineering Manager's philosophy is that the people responsible for the task are the only ones capable of really getting it done. He refuses to accept an independent organization watching his activities. He doesn't understand the concept. In fact, the opposite of quality management seems to have happened. The Corporate QA Manager does not appear to be very dynamic, and the former QA manager, who appears to be very knowledgeable, was transferred. (p.A-4)	The Licensee apparently did not fully appreciate the importance of staffing with experienced QA personnel in the beginning. (p.A-3)	11
29.	Many changes [presently] are made at the facility or plant that are not made on drawings. This indicates a potential	Deleted (p.A-4)	12

	Draft Language	Final Language	Page Reference in PG&E Letter
	problem with drawing changes, and a possible design change/review problem. (p.A-5)		
30.	This factor [prompt reporting of QA program deficiencies] seems to be strongly and effectively supported at the construction site. There is a concern, however, about the effectiveness of earlier inspections and audits of materials suppliers, notably one supplier of electrical system supports. (p.A-6)	This factor seems to be strongly and effectively supported at the construction site. (p.A-4)	12
31.	In the early days, this [prompt reporting] was not done. The Licensee fully understands the need now. (p.A-6)	Deleted (p.A-4)	12
32.	Changes are made at the facility/plant as required. The Licensee seems to justify this by the fact that QC people are engineers, and are often the people who did the design. Therefore, they are capable/justified. Many instances reflect that early-on engineers did not have their designs reviewed. Changes are made as required and appear to be done informally. (p.A-7)	Deleted (p.A-4)	--
33.	QC functions are performed by the departments responsible for the task. This can work, but it is not a common practice in most organizations and is not in compliance with the intent of 10 C.F.R. 50	QC functions are performed by the departments responsible for the task. (p.A-5)	12

	Draft Language	Final Language	Page Reference in PG&E Letter
	Appendix B. (p.A-7)		
34.	This case is a classic of "haste makes waste." The engineering problems which have been so costly appear to have resulted at least in part from very heavy schedule pressures. This was extended to the initial efforts at a design verification program which produced an additional set of problems. There were no indications of lack of resources currently. (p.A-8)	The engineering problems which have been so costly are suspected to have resulted, at least in part, from very heavy schedule pressures. Whether these pressure [sic] were real or felt was not established. There was no indication of lack of resources applied to the project. (p.A-5)	--
35.	Early stages of the design of the Licensee's plant were poorly documented. There is an understanding within the Licensee that this was a bad mistake. Present-day practices not reviewed. (p.A-10)	Deleted (p.A-7)	--
36.	There appears to be no formalized program of audits. The audit program has been very extensively strengthened during the past year, reflecting in all likelihood that it was lacking previously. (p.A-10)	The audit of the design process was probably not a strong emphasis or the design control procedure deficiency would have been noted. The audit program has been very extensively strengthened during the past year. (p.A-8)	12
37.	In the early days, audit activities were probably not performed. The licensee had a quality program, but the problems they have experienced would indicate that a continued system to verify implementation was non-existent. There is also	The Licensee had a QA/QC program, but the problems they have experienced would indicate that they did not have an aggressive system to verify implementation in the design control area. NRC audit reports gave the	12

Draft Language	Final Language	Page Reference in PG&E Letter
evidence that early NRC audit reports gave the licensee good reports on quality program implementation when, in fact, this was not the case, based on a review of correspondence. (p.A-10)	licensee good reports on construction quality program implementation. (p.A-8)	

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of	)	
	)	Docket Nos. 50-275 O.L.
PACIFIC GAS AND ELECTRIC COMPANY	)	50-323 O.L.
	)	
(Diablo Canyon Nuclear Power Plant, Units 1 and 2)	)	(Reopened Hearing -- Design Quality Assurance)
	)	

CERTIFICATE OF SERVICE

I hereby certify that on this 23rd day of December 1983, I have served copies of the foregoing JOINT INTERVENORS' PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW, together with attached exhibits, mailing them through the U.S. mails, first class, postage prepaid.*/

*Thomas S. Moore, Chairman
Atomic Safety & Licensing
Appeal Board
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

*Dr. W. Reed Johnson
Atomic Safety & Licensing
Appeal Board
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

*Dr. John H. Buck
Atomic Safety & Licensing
Appeal Board
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Mr. Fredrick Eissler
Scenic Shoreline Preservation
Conference, Inc.
4623 More Mesa Drive
Santa Barbara, CA 93105

*Denotes service via Federal Express.

**Malcolm H. Furbush, Esq.
Vice President & General
Counsel
Philip A. Crane, Esq.
Pacific Gas & Electric Company
77 Beale Street, Room 3135
San Francisco, CA 94106

*Lawrence Chandler, Esq.
Office of the Executive Legal
Director - BETH 042
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

John Van de Kamp
Attorney General
Andrea Sheridan Ordin,
Chief Attorney General
Michael J. Strumwasser
Special Counsel to the
Attorney General
State of California
3580 Wilshire Boulevard
Suite 800
Los Angeles, CA 90010

*Bruce Norton, Esq.
Norton, Burke, Berry
& French, P.C.
3216 N. Third Street
Suite 202
Phoenix, AZ 85064

Virginia & Gordon Bruno
Pecho Ranch
P.O. Box 6289
Los Osos, CA 93402

Nancy Culver
192 Luneta
San Luis Obispo, CA 93402

Betsy Umhoffer
1493 Southwood
San Luis Obispo, CA 93401

*Docket and Service Branch
Office of the Secretary
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Janice E. Kerr, Esq.
Lawrence Q. Garcia, Esq.
J. Calvin Simpson, Esq.
California Public Utilities
Commission
5246 McAllister Street
San Francisco, CA 94102

David S. Fleischaker, Esq.
2460 Liberty Towers
Park Avenue & Broadway
Oklahoma City, OK 73101

Richard Hubbard
MHB Technical Associates
1723 Hamilton Avenue, Suite K
San Jose, CA 95725

Arthur C. Gehr, Esq.
Snell & Wilmer
3100 Valley Center
Phoenix, AZ 85073

Maurice Axelrad, Esq.
Lowenstein, Newman, Reis
& Axelrad, P.C.
1025 Connecticut Avenue, N.W.
Washington, D.C. 20036

Sandra & Gordon Silver
1760 Alisal Street
San Luis Obispo, CA 93401

Carl Neiburger
Telegram Tribune
P.O. Box 112
San Luis Obispo, CA 93402

Eric R. Havian

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