NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

PACIFIC GAS & ELECTRIC COMPANY

(Diablo Canyon Units 1 and 2)

Docket Nos. 50-275
50-323

Place - Avila Beach, California

Date - 9 February 1979 Pages 9100 - 9265

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UNITED STATES OF AMERICA

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Cavalier Room,
San Luis Bay Inn,
Avila Beach, California.

Friday, 9 February, 1979

The hearing in the above-entitled matter was reconvened, pursuant to adjournment, at 8:30 a.m.

BEFORE:

ELIZABETH BOWERS, Esq., Chairman,
Atomic Safety and Licensing Board.

DR. WILLIAM E. MARTIN, Member. (Not present.)

GLENN O. BRIGHT, Member.

APPEARANCES:

On behalf of Applicant, Pacific Gas & Electric Company:

BRUCE NORTON, Esq., 3216 No. Third Street,
Phoenix, Arizona 85012.

PHILIP CRANE, Esq., Legal Department, Pacific
Gas and Electric Company, 77 Beale Street,
San Francisco, California 94106.

MALCOLM H. FURBUSH, Esq., Legal Department,
Pacific Gas & Electric Company, 77 Beale
St., San Francisco, California 94106.

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APPEARANCES: (Continued)

On behalf of Joint Intervenors:

DAVID S. FLEISCHAKER, Esq., Suite 602, 1025 15th Street, N.W., Washington, D.C.

STEPHEN KRISTOVICH, Esq., Center for Law in the Public Interest, 10203 Santa Monica Blvd., Los Angeles, California 90067.

On behalf of the NRC Regulatory Staff:

JAMES R. TOURTELLOTTE, Esq., MARC STAENBERG, Esq., and EDWARD KETCHEN, Esq., Office of Executive Legal Director, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

On Behalf of Office of the General Counsel, NRC:

MARJORIE S. NORDLINGER, Esq., Office of General Counsel, U.S. Nuclear Regulatory Commission, 1717 H St., N.W., Washington, D.C. 20555.

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PROCEEDINGS

MRS. BOWERS: May I have your attention, please?

To review the situation very, very briefly, yesterday afternoon about two o'clock the Board received a telegram which I will read into the record, addressed to me as the Atomic Safety and Licensing Board, referring to the Diablo Canyon docket number.

"Dear Mrs. Bowers. Please enter my appearance on behalf of the San Luis Obispo Mothers for Peace in the above referenced matter. I'm a member of the California Bar. I intend to participate in the Diablo Canyon security systems tour Monday, February 12th. Please notify me by telephone or Elizabeth Apfelberg" -- giving the telephone number -- "or David Fleischaker where and when I should appear to begin the tour. Regret that another case required my return to San Francisco. Respectfully, W. Andrew Baldwin, Friends of the Earth," -- giving the telephone number and address.

Mr. Baldwin was here the day before, requesting to make a limited appearance on behalf of Friends of the Earth. And that's the reason for his reference to returning to San Francisco.

Now late yesterday afternoon after we were able to obtain the copy of the wire and all parties had copies,

we did ask for response from the parties on this matter, and both applicant and staff spoke in opposition; the Staff primarily because of the fact that the intervenors had been represented for months and month, actually a couple of years or more, by two lawyers, Paul Valentine of Palo Alto and Yael Jones of San Francisco, and counsel for the intervenors, limited only to the security contention, filed a pleading on January 19, 1979 where they recited the history of the effort to get several individuals qualified as expert witnesses for the purpose of discovery of the security plan, and recited the failure to qualify any of the individuals that they proposed, and, anyway, concluded -- and this is a statement Mr. Staenberg read into the record yesterday but I'll repeat it:

> "This intervenor has been denied access to the security plan and has been denied the qualification of expert witnesses to review the plan either for preparation for cross-examination or the presentation of affirmative evidence as to the inadequacy of the appellant's security plan. Without the qualifications of an expert witness to inspect the plan and to advise intervenors' attorney, it is impossible for this intervenor to prepare either for significant cross-examination on the inadequacies of the appellant's

RB/wb3

security plan or to present affirmative evidence to support intervenors' contentions. Therefore this intervenor will not be able to participate in the hearings now scheduled for the first week of February as to the adequacy of appellant's security plan."

Now the Staff, as I mentioned, read this into the record and took the position that the intervenors in the matter of security systems have withdrawn from the case.

If the Board had been in session and we hadn't been traveling other places andhad been in our home office we would have immediately issued an order dismissing the intervenors from the proceeding for the security contention. It was simply the logistics of the situation that prevented that order from being issued on receipt of this document which told us that they were no longer going to participate in the matter of the security contention.

We now have-- Well, first let me mention that the applicant said yesterday afternoon that there was no way that a new lawyer appearing at the twelfth hour in this proceeding was going to be permitted to inspect the security system at Diablo Canyon, and the only way that they would ever permit such a thing would be a direct order from the Commission itself. And, of course, there is no time for such a thing to happen.

WRB/wb4

Well this morning informally Mr. Kristovich told those who were within earshot that he had a phone call late yesterday evening from Mr. Baldwin, and he simply repeated to him what had transpired yesterday afternoon, and Mr. Baldwin said that he wants to come Monday morning.

We have considered this matter. As I said, if the situation had permitted it logistically we would have issued an order dismissing the intervenors from this proceeding on the security contention.

We have determined that the filing from counsel reciting the fact that they could not participate in a meaningful way, even though they had been -- they were fully aware of all that had transpired, all filings, the Appeal Board decision on the security contention, all of that information, and they acknowledged that they could not participate in a meaningful way in the security matter, and so therefore they withdrew.

We cannot conceive that Mr. Baldwin could participate in this matter in a meaningful productive way. He is a stranger to us. We have no information on him, about him. To come in at the twelfth hour with a telegram saying that he is now representing the Mothers for Peace and intends to participate in the tour Monday is simply unacceptable to this Board.

The security contention matter is a very serious

WRB/wb5

matter. We expect the parties to give us full and complete information on the security system. And, fortunately, we have good guidelines from the Appeal Board on this.

So, anyway, it's our determination that Mr. Baldwin has not established a right to participate in the evidentiary hearing in camera Monday, and PG&E has made it very clear, of course, that he will not be permitted to participate in the tour Monday afternoon.

We see no reason for him to make the trip Monday to come down. He's in San Francisco. And it's not a personal matter, it's simply a matter that as far as this Board is concerned that contention from intervenors is dismissed and it's no longer viable.

We will have a full scale hearing on the security system, but it will be the Board, Applicant and Staff and their witnesses. And we expect a thorough examination of the security system.

Perhaps, Mr. Fleischaker or Mr. Kristovich, you could communicate this determination to Mr. Baldwin.

I'll give the parties an opportunity to comment.

Do you have anything further, Mr. Staenberg?

MR. STAENBERG: No; the Staff has no comments at this time.

MRS. BOWERS: Mr. Norton?

MR. NORTON: Nothing.

MRS. BOWERS: Well the in camera session will be in a conference room at the Diablo Canyon facility. It has been suggested we start at nine rather than eight-thirty.

Is that satisfactory, nine instead of eight-thirty? We're ready to begin at eight-thirty. I don't know who made the suggestion of nine, maybe it was Mr. Bloom.

Well, we want to pick up where we were yesterday afternoon on the cross-examination of Dr. Luco and later Dr. Trifunac.

I think, Mr. Furbush, you had concluded your cross-examination of Dr. Luco; is that correct?

MR. FURBUSH: That's correct.

MRS. BOWERS: So now are we correct, the procedure would be for the Staff to proceed with its cross-examination of Dr. Luco?

MR. TOURTELLOTTE: Yes, Mrs. Bowers.

Whereupon,

MIHAILO D. TRIFUNAC

and

J. ENRIQUE LUCO

resumed the stand as witnesses and, having been previously duly sworn, were examined and testified further as follows:

CROSS-EXAMINATION (Continued)

BY MR. TOURTELLOTTE:

Q Dr. Luco, last week when we were discussing your deposition we talked about your experience. And I don't recall in your testimony that you made your experience specific with respect to the participation that you had in the design of structure in Chile.

As I recall, in that deposition you said that you had actually developed information for others to use in design for a shopping center and for a subway; is that correct?

A (Witness Luco) Yes, that's correct.

Q And that the work that you did on those two projects was over a period of about six months?

A Yes; it was a short period of time.

Q And in those cases you did not really select design values but you made recommendations to other engineers who did do that; isn't that correct?

A I'm not quite sure what you mean by "select design values."

Q I'd invite your attention to page 141 of your deposition where the question had been asked whether you used computer programs in your analysis or analyses. --on the bottom of page 140. And you answered first in general, which is not directly to the point of my question, that you didn't

WEB/wb8

run the program. You said "I would indicate to others what had to be done and some other engineer would run them, and I would analyze the results."

A Yes.

Q Is that correct?

A Yes.

Q Did you then come up with design values for the structure itself, or did somebody else use your information to come up with design values?

A Well I would compute -- in one case I would compute the stresses at some critical points in the structures and, using those stressas, to a limited extent I would change the dimensions of some of the structural elements.

One thing you must understand, though, is that design from a general point of view, or the design process involves several steps, it's an iterative process: from a preliminary design you analyze the structures that you have, based on that preliminary design, you compute the response of the structure in terms of the stresses or displacements, and if they are found inadequate then the design is changed, the dimensions of the structural elements are changed, or the amount of steel is changed, and so on.

Once you have that you have a certain version of the design of the structure. You go again through the

RB/wb9

analysis process, and so on, and you end up with a satisfactory structure.

So analysis is a part of design.

Now if you are interpreting design here as dimensioning or as selecting dimensions for the elements, or selecting the amount of steel that has to be put into them, and so on, my experience in that area is limited. But design involves much more than that.

On the other hand, I may add that in the case of Diablo the plant has already been designed and it has been built. What we are trying to do now is to analyse.

Q I certainly understand that.

You indicated that you calculated stresses and then changed dimensions. The question that I have, though, is: Did you really have the responsibility for the ultimate change of the dimensions, or did you suggest changes which somebody else had the ultimate responsibility for deciding?

A Well I was not the principal engineer in that project. The final responsibility was on somebody else's shoulders. But typically the recommendations would be followed.

Q You indicated yesterday that you also had some experience with Bechtel.

A Yes.

Q And that you had conducted some type of research,

WRB/wb10

some type of studies that were to be used for nuclear plants.

Were these studies for specific nuclear plants or were they generic studies?

A Well I have done both types of work for Bechtel.

In my initial involvement with them I worked on generic studies of soil-structure interaction for nuclear powerplants. And this was for any type of nuclear power plant.

Later on I have been involved in specific projects.

Q Well were the studies you were talking about yesterday with respect to Vogtle generic studies?

A No, they are not.

Q They're specific studies?

A Yes. It is a particular plant that's being analyzed using the new soil-structure interaction methods.

End WRBloom
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Q You're talking about the CLASSI code?

A Yes.

Q The CLASSI code was used for both?

A It has been used for both.

Q Are you telling me that the CLASSI code is not a generic code, it was designed specifically for Vogtle?

A Well, you don't design a code just for a particular job. The purpose of the code is to handle a particular type of problem, and you hope it will be applicable to many plants.

What we have done in this case is to apply that general code to the specific situation of Vogtle, and we have also done that for the Japanese nuclear power plant within Bechtel.

Q What is the Japanese power plant you're talking about?

A If you'll give me a minute, I'll find the name.

(Pause.)

Well, it is a long Japanese name. I believe I gave it in the deposition.

Q Well, as I recall, you didn't spell the name.

A I gave a piece of paper with the name on it to the reporter.

Q Well, could you find the name of it for us now?

(Pause.)

A I will try.

WEL 2

MRS. BOWERS: Does anyone else have the information, the page number, to assist the witness?

BY MR. TOURTELLOTTE:

Q Is it Kashiwazaki?

A Yes, that's the name.

Q That's K-a-s-h-i-w-a-z-a-k-i.

When was Kashiwazaki built?

A I don't know when it was built.

The objective of this study was to compare the Japanese methods of analysis with the methods used in this country, and Bechtel Power Corporation was asked to do that. They used not only CLASSI, but other methods of analysis used in this country to compare with what is then in Japan.

Q When was Vogtle built?

A I understand that it has not been built yet. They are starting construction.

Q Do you know when it was designed?

A It was designed several years ago.

Q When was the CLASSI code developed?

A Well, it's still in the process of development. The first versions were ready perhaps three years ago.

Q Was that after Vogtle was designed?

A Yes.

Q So actually the CLASSI code was not used in the design of either Vogtle or the Japanese plant, isn't that

correct?

A Yes, I have not claimed that they were.

Q And in fact they were only used to compare with other analyses that were made for the actual design of those plants?

A In the case of the Japanese plant, that is the case.

In the case of the Vogtle project, it is premature to say. I don't know what use of the results obtained from CLASSI will be made in the future.

Q Do you know if the CLASSI code has been used in the design of any power plant in the world?

A The CLASSI code is a new code, and I have not been involved in all of the applications of this code. So I cannot really say.

I know that it has been used in the analysis of the dynamics of the foundation of a French plant, or a plant being designed by a French firm, and it has also been used in the analysis of the two plants that I mentioned before.

Q Those analyses were comparative analysis. I'm not asking you about comparative analyses, I'm talking about whether or not the CLASSI code has been used actually for the design of any nuclear power plant in the world, and I take if from your answer you're telling me you don't know?

MR. FLEISCHAKER: Object. First, that mis-states

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the evidence. Secondly, it's been asked and answered.

MR. TOURTELLOTTE: Well, Mrs. Bowers, we went through this yesterday and we had difficulty with this witness answering questions directly. It didn't involve me, because I wasn't crossing the witness. But it involves me right now, and I'd like to get something straight.

I'd like for this Board to request that the witness answer the question directly and concisely, and not volunteer a whole lot of other information, but at least answer the question directly and concisely.

I would cite for the Board and for the Intervenors the transcript of yesterday at 8861, where the Intervenor, himself, was asking a question and his own witness didn't answer his question directly. I indicated that I wanted a direct answer.

Now, that gave birth to a new procedural square dance about whether or not he did or did not answer the question, with counsel insisting he did and the witness insisting that he did, but never reiterating what his answer was.

In fact, if you read the transcript at 8861 and following, you'll see that we went on for many, many pages without this witness ever answering the question.

I believe that my questions are direct, they are specific, they are capable of being answered directly. He

can either say yes, no, or I don't know. He can qualify it if he wants to.

But I'm entitled to one of those three answers.

MR. FLEISCHAKER: May I respond to that? I don't think that kind of instruction is at all necessary at this point.

Mr. Tourtellotte and I have a very different interpretation as to what happened yesterday, but in any event what happened yesterday is not relevant to the issue before the Board, which is whether the witness should be instructed, given the questions asked and the answers given in the last five minutes.

I believe that Mr. Tourtellotte -- my objection is that Mr. Tourtellotte has mis-stated the evidence, the witness has given direct answers as best he could to the questions, and I think he has done so throughout this proceeding.

There is no purpose and no foundation for the kind of instruction that Mr. Tourtellotte seeks, and I have an objection to his question, which is that it's been asked and answered.

MR. FURBUSH: Were you soliciting comments from others? I would support the Staff on this.

You know, the problem is whose question is being answered? The cross-examiner's question is the question which should be answered, not the question which is thought up by

the witness to satisfy his own purposes.

Now, that's the problem here, it was the problem in the depositions, and the problem in cross-examination of this witness. I'm not saying it's conscious, but I am saying that there has to be some way of getting this witness to stick to the question that's being asked, and I fully support the Staff's position on that.

Thank you.

MRS. BOWERS: Well, we discussed yesterday evening the testimony that we heard during the day. If this witness or any other witness is going to be persuasive, then there must be a direct response to the particular question.

As Mr. Tourtellotte mentioned, opportunity to expand the answer will be given, but unless we get a definitive answer to the questions, then the witness is not being persuasive.

So we would like to ask you to proceed in that manner.

WITNESS LUCO: Yes. I have no intention to avoid any question. I was just trying to answer the best way I could. I believe that I did so. I said that this was a new code, that I have no control on who is using it and for what, so I have no way of knowing if it has been used or not.

In the cases in which I have been involved, in one case it was just a comparison and clearly it was not

used in the design. In the second case, the plant is -- the construction has started, I don't know the use that Bechtel will make of the results that come out of this CLASSI analysis. It may be used to modify the structure, it may not be used.

In the case of that French nuclear power plant, I analyzed the dynamic response of the foundation using the CLASSI code, and I don't know if they are going to use that in the design or not.

MRS. BOWERS: If I followed your answer, I believe it really is: You don't know, in each case.

WITNESS LUCO: That's quite right.

MR. TOURTELLOTTE: I want to straighten one thing out. I marked my transcript for two purposes, and I cited one place where I should have cited another. I should have cited pages 8937 through 8939, instead of 8861.

MRS. BOWERS: Dr. Luco, it will be helpful to the Board and to the record if you can proceed with a direct answer, and then an explanation. If you start out in the middle and go both ways, then it's hard for us to unravel the answer to know really what your bottom line is.

WITNESS LUCO: I will.

BY MR. TOURTELLOTTE:

Q Do you know if the CLASSI code has been approved by the NRC?

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A I don't think it has.

Q Do you know if it's even been submitted to the NRC?

A I don't know. I have not submitted it.

Q The experience that you have is in structures, rather than in the mechanical or electrical operation of the plant, isn't it?

A Yes, that's correct.

But, on the other hand, many aspects of the response of equipment fall within the same area as the response of the structure. In particular, dynamic response of mechanical equipment is obtained using similar methods as those used in the dynamic response of the structures.

Q Actually, your expertise is in certain parts of recommendations for design, is it not, of nuclear plants? It is not in the design itself of nuclear plants?

MR. FLEISCHAKER: Objection. The question is ambiguous.

MRS. BOWERS: I thought I understood it. Maybe I have an ambiguous hearing.

(Laughter.)

MR. FLEISCHAKER: I won't comment.

(Laughter.)

MR. TOURTELLOTTE: I think if the witness doesn't understand, the witness can tell me.

MRS. BOWERS: Go ahead, Dr. Luco.

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WITNESS LUCO: I answered before that design, the way I understand it, involved analysis. Analysis is a part of design.

So I have trouble in answering your question.

If you are referring to the selection of dimensions for the different members, selections of the amount of steel, and so on, I do not claim any particular expertise in that area.

BY MR. TOURTELLOTTE:

Q You've never really had the responsibility, the ultimate responsibility, for coming up with a design for any major structure, isn't that correct?

A No, I have not.

Q Are you licensed as a professional civil or structural engineer anywhere?

A I am not in California. I am entitled to do that in Chile, but you have to pay certain fees, and I have not done that.

Q Isn't it also true that Dr. Seed has analyzed Vogtle and Bechtel has used Seed's methods and other methods for comparative purposes?

A I don't know if Dr. Seed was directly involved. I know that Dr. Seed's methods have been employed also to analyze Vogtle.

Q Dr. Luco, I'm going to move on from your experience

to your testimony relative to the use of the 1.15 g value for acceleration.

So that we can make a compact little record, I will ask you a couple of introductory questions, such as:

What is the origin of the 1.15 g value?

A Well, the origin is in the recommendation of USGS, which states that -- and I believe we read that yesterday -- that a 7.5 magnitude should be assigned to the Hosgri fault, that Circular USGS 672 should be used to determine the characteristics of the motion at the site, and if you use Circular 672 for the magnitude 7.5, an epicentral distance, or distance to the fault of less than 10 kilometers, you end up with a peak acceleration of 1.15.

The USGS recommendation also gives a blank check at the end, saying that engineers -- well, yes, that engineers could use an effective acceleration for the design of the structures.

I said yesterday that it's exactly that, a blank check, because no definition has been given for that concept.

Q Do you know what effective acceleration is?

A I believe I understand how it is calculated numerically. I do not understand the physical basis for that process.

Q You mean you don't know how to calculate it?

A I said that I believe I know how to calculate it

numerically, but I do not understand the meaning of such calculations, the physical meaning for such calculations.

Q Isn't it part of the ATC code?

MR. FLEISCHAKER: Objection. Relevance. And no foundation has been laid that this witness knows what the ATC code is, and whether anything in that codes has any relevance to the questions in this proceeding.

MR. TOURTELLOTTE: I'll ask the question.

BY MR. TOURTELLOTTE:

Q Do you know what the ATC code is?

A Yes, I do.

Q Is effective acceleration in the ATC code?

A There is much more than effective acceleration. There is an effective acceleration based on an effective peak velocity, and so on.

Q So there are sources that you could go to to find out what effective acceleration means?

A No. In my view, those sources only indicate how to calculate it. But they do not explain the physical basis for that concept.

Q Well, do you know whether the calculations that were made in this case are consistent with the ATC code?

A I went through the exercise, the numerical exercise, and they are consistent.

I must add here that ATC code is a tentative code

at this time. It is purely a recommendation at this time.

Q Are you of the opinion that the accelerations set out in Table 2 of Circular 672 are figures that are to be used absolutely in the design of structures?

A I understand those values as peak accelerations on the ground surface, and if there is a physical reason why these peak accelerations on the ground could be reduced because, say, of effect of soil-structure interaction, because of the effect of the scattering, I am willing to accept that.

However, for the particular case of Diablo Canyon, it has been shown by the work of the Applicant that that's not the case, that the motion at foundation levels is essentially the same as you would have in the free field. And in that case, you should use 1.15 g as peak acceleration.

Q You have read Circular 672 haven't you?

A Yes, I have.

Q When did you read it last?

A Several months ago.

Q Was it when you prepared your testimony?

A No, I have not read it recently.

Q You haven't read it -- you didn't read it about the time you prepared your testimony?

A (Pause.)

Q I'm sorry. Not your testimony, but the reports that you made for the ACRS?

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A Yes, I read it.

Q You read it then?

A Yes.

Q Well, do you know how these figures are to be used in Table 2, according to Circular 672?

A If you'll let me review the document.

(Pause.)

MR. FLEISCHAKER: Excuse me. Again, Mrs. Bowers, if we're going to have some questioning on 672, I would move that we give the witness an opportunity to take some time to review that document. It's a pretty lengthy document.

MR. NORTON: Mrs. Bowers, I believe we reviewed that document yesterday, and I believe the witness had it, if I'm not mistaken.

MR. FLEISCHAKER: No, that's not the question.. The document that we reviewed yesterday was Dr. Seed's report.

MR. NORTON: I understand that, but I also believe he had that document, if my memory serves me correctly. It may not.

MRS. BOWERS: Let's check with the witness.

WITNESS LUCO: I just need a minute to go through the table.

MRS. BOWERS: All right.

(Pause.)

WITNESS LUCO: I'm ready.

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MR. NORTON: Excuse me. Mrs. Bowers, may we inquire of the witness? He was reviewing that paper, but marking in another book. May we inquire of the witness what the book is?

WITNESS LUCO: The ATC code.

MRS. BOWERS: Are you ready to proceed, Mr. Tourtellotte? The witness has indicated he has sufficiently reviewed 672.

BY MR. TOURTELLOTTE:

Q I believe my question was: Do you know how USGS recommended that the values in Table 2 be used?

A Well, the way I interpret this recommendation is that these values should be used as peak motion on the ground surface. And there are some notes there, and one of the notes says that the values of acceleration may be exceed if there is appreciable high-frequency, higher than 8 hertz, energy.

So it is clear that these are not the highest values that could occur.

Q Okay. When you said that you read Circular 672, did you read the whole document, or --

A Yes.

Q -- were you just referring to reading Table 2?

A Well, I had no time to read the whole document now. I did --

Q I understand that.

A -- read the whole document --

Q Originally?

A Yes.

MR. TOURTELLOTTE: I apologize to the Reporter. I know it's difficult to take two people at once.

BY MR. TOURTELLOTTE:

Q I will invite your attention to page 2, which is just before Table 2, and I'd like for you to follow along as I read, under the paragraph generally designated "Design Approach."

There it states:

"There are two common approaches to seismic design of a structure:

One utilizes a complete time history of ground motion to evaluate dynamic behavior.

The other adopted for the design of the pipeline, Alyeska Pipeline Service Company, 1971, is a quasi-static method in which seismically-induced stresses are determined from the structural response spectra for the specified levels of ground motion.

Structural response spectra for the pipeline system are calculated in a three-step process:

First, ground motion values appropriate to the design earthquakes are specified. Then design values of motion are derived by modifying the ground motion values to implicitly allow for non-linear, energy

absorbing mechanisms in the vibratory response of the structure, a step required by the assumption of a purely elastic response, although the actual response is usually inelastic and non-linear for the large ground motions.

Finally, smooth tripartite logarithmic response spectra are constructed from the design seismic motions by general procedure of Newmark and Hall, 1969, outlined in Appendix B.

The initial step in the design process discussed herein characterizes ground motion appropriate to the design earthquakes. This step is based solely on seismological data and principles, and does not incorporate factors dependent on soil-structure interaction, deformational processes with structures, or importance of the structures to be designed. It involves scientific data and interpretation, whereas the subsequent steps involve engineering, economic and social judgments relating to the nature and value of the structures.

The choice of parameters with which to specify ground motion was guided by the design approach adopted for the pipeline project. A useful set for the derivation of the tripartite structural response spectra includes acceleration, velocity, displacement and

duration of shaking."

That ends the quote.

Now, is it your view that this design approach was not followed in the case of Diablo Canyon?

MR. FLEISCHAKER: Objection. And the objection to that is that it's not relevant.

The issue here isn't whether the design approach that was utilized for the TransAlaskan pipeline was utilized at Diablo Canyon. The issue here is whether the design, regardless of the approach taken, is adequate to demonstrate that the Diablo Canyon nuclear power plant can withstand the effects of the safe shutdown earthquake, whatever that earthquake is designated to be.

So that the question of whether the design approaches used at the TransAlaskan pipeline were utilized here isn't relevant. And I believe that this witness' testimony is that he has relied on this document because the description of ground motion in the free field is set forth in table 2. And it is to that extent that he has relied on this document, and that the descriptions of ground motion in the free field set forth in Table 2 are supported by Trifunac correlations and other studies that have been performed.

MRS. BOWERS: Do you want to respond to the objection, Mr. Tourtellotte?

MR. TOURTELLOTTE: I don't know, would you like

to give the Applicant a crack first?

MRS. BOWERS: All right, Mr. Norton, Mr. Furbush?

MR. FURBUSH: Well, I'm a little bit at a loss for words, because I think that this objection has no foundation whatscever, and it's a little difficult to come to grips with something which has no relevancy to the cross-examination of the witness, who has testified that one of his primary basis for his conclusion that 1.15 should he utilized as the ground motion was the recommendation of the USGS. That's the testimony of this witness, and he's being cross-examined on the validity of this comment.

MR. FLEISCHAKER: May I make a response? Very shortly, the distinction that I'm seeking to make is between design approach and characteristics of ground motion.

The question of whether a design approach adopted for the TransAlaskan pipeline was followed in this case is not relevant.

The only thing that this witness has testified to is that the description of ground motion in the free field, as set forth in Table 2, is one that he believes is appropriate for Diablo Canyon, and is supported by other correlations, specifically the Trifunac correlations and other studies that he's performed.

MRS. BOWERS: Mr. Tourtellotte?

MR. TOURTELLOTTE: Well, the witness is testifying

wel 19

on the basis -- most of what he's saying here has its genesis in this Table 2, which is part of Circular 672, and USGS set up the table. They also told how to use that table.

You can't take anything out of context, I don't care whether it's this table or anything else. The witness is not entitled -- well, I'll retract that. He can take anything out of context he wants, but we have the right to show whether he is taking it out of context, or that he failed to properly consider how the information he is using should be used.

It doesn't make any difference to me that he disregarded the rest of Circular 672. All I want to be able to do is point that out.

MRS. BOWERS: Well, the Board agrees with the Staff. I'm also reminded of prior witnesses for both Applicant and Staff in our discussion and consideration of the design approach paragraph that you read. It all ties in together. It appears that there has to be consideration of the two together.

So could you answer the question? Do you need the question again? The objection is overruled.

WITNESS LUCO: I can answer.

Well, here they have indicated that the -- the authors of Circular 672 have indicated that structural response spectra for the pipeline system is obtained, or are obtained,

wl 20

in a three-step process, and you read the three steps.

Now, the authors are very careful to indicate that this circular deals only with the first step. The initial step in the design process discussed herein characterizes ground motion appropriate to the design earthquake. This step is based solely on seismological data and principles, and does not incorporate factors dependent on soil-structure interaction, deformational processes within a structure, or the importance of the structures to be designed.

So the authors of the circular are very careful to indicate that the information they are providing here corresponds only to the first step, the characteristics of the ground motion.

Now, we, as engineers, must take that information and see -- and complete the process. The process is to -- the next step in the process is to find out what will be the motion at foundation level. And in that process we must consider soil-structure interaction, we must consider if there is a scattering effect by the foundations.

I believe that it has been shown that those effects are not significant in the case of Diablo Canyon. So I think I am absolutely consistent in the use of this circular.

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MR. NORTON: Mrs. Bowers, may I have the question back, because I heard a long answer, but I don't know whether it answered the question or not. Unfortunately the question was so long ago....

(Whereupon, the Reporter read from the record as requested.)

MR. NORTON: Mrs. Bowers, I would submit that the question was not answered. I certainly can't find the answer to that question in Dr. Luco's speech.

MRS. BOWERS: Could you be precise?

WITNESS LUCO: In here we have a description of the approach followed for the Alaskan pipeline. In general, the same approach has been used in Diablo.

BY MR. TOURTELLOTTE:

Q Are you of the view that these peak absolute values, as they were designated in Table 2, were the figures which -- were the figures used for the design of the Alaskan pipeline?

A (Witness Luco) I am not sure. I believe that lower values were used for the Alaskan pipeline.

Q And why were lower values used?

MR. FLEISCHAKER: I'm going to object to that. That's not in evidence yet. It's not in evidence that lower values were used, as the witness says that he believes that lower values were used. We don't know that for sure.

mpb2

MR. NORTON: Mrs. Bowers, I would like to comment on the objection.

It seems that as Mr. Tourtellotte hones into a sticky question Mr. Fleischaker has to object to make a little bit of a speech every time. All he's got to do is say two or three words to make his objection. We ran into this problem a lot in depositions. Every time we asked a question that Mr. Fleischaker doesn't think he's going to like the answer to he gives somewhat of a speech to his witness.

I think the objections can be made by just simply saying insufficient foundation, or whatever, without the lengthy speeches that have been going on for the last half hour.

MRS. BOWERS: Well, we expect, of course, an objection to be supported by the basis.

Mr. Tourtellotte, why is it relevant if lower values were used on the Alaskan pipeline than on Diablo?

MR. TOURTELLOTTE: Well, I am trying to just simply put Table 2 in perspective. What this witness has done is he has adopted Table 2 for a part of his analysis, and he has adopted the figures there to be used in an absolute way. That 1.15g is what the USGS says, and if USGS says 1.15g that's what they mean.

And what I'm trying to simply point out is that

mpb3

the designation of 1.15g does not mean that you have to use 1.15g in design approach. And if indeed the approach as outlined here by USGS in Circular 672 says you don't have to do that, and if in fact it wasn't done in the Alaskan pipeline, that is evidence that you don't have to do that. And if the approach is the same as it is in Diablo, then the approach that the Staff took is consistent with USGS, and Dr. Luco's interpretation of how 1.15g is to be used is wrong.

(The Board conferring.)

MR. FLEISCHAKER: Can I just make one comment on that, because I think there was a misstatement of the testimony of this witness.

I think this witness's testimony is quite clearly that 1.15, or whatever values are specified as peak values in Table 2, the witness's testimony is not that those values are absolute avalues that have to be used, but that if the circumstances permit that they can be reduced for reasons that have to do with the soil-structure interaction or the scattering and diffraction of high frequency waves.

And to that extent I think that Mr. Tourtellotte has misstated the witness's testimony.

MRS. BOWERS: Well, we've considered the matter.

The objection is overruled.

But our memory is that the witness has stated an uncertainty as to exactly what was done on the Alaskan

mpb4

pipeline. So we don't know how probative the testimony would be in this area.

WITNESS LUCO: I could still answer in general, assuming that they were lowered.

(The Board conferring.)

MRS. BOWERS: Mr. Tourtellotte, you didn't ask for an assumption. You were trying to find out what he knew--

MR. TOURTELLOTTE: Yes.

MRS. BOWERS: -- about the Alaskan pipeline.

So the witness should answer. And if you have no information on it, say so.

WITNESS LUCO: Well, I think I said that I was not sure, that I believed that lower values were used. And that may be acceptable in the case of the Alaskan pipeline. I am not sure -- I don't know about the characteristics of the structure, the characteristics of the soil. And it may have been completely appropriate to use lower values because the site conditions and the characteristics of the structure granted that that was possible.

But the real question is can we do the same thing, apply blindly the same rule as Diablo. The authors of this circular were very careful. They're saying we are providing data for just the first step. The next step depends on the particular characteristics of the site.

So I am not taking this as absolute numbers. This

mpb5

is the first input, the motion on the ground, and that's what the authors intended to do and that's what they have stated here explicitly.

The next step -- to take the next step you must consider the particular characteristics of the site.

BY MR. TOURTELLOTTE:

Q Would you anchor the 1.60 Reg Guide response spectrum to 1.15g?

A (Witness Luco) I would not do that.

What I would do is I would use the values of peak acceleration, peak velocity, and peak displacement indicated in Circular 672 and try to develop a response spectrum consistant with that. And that would be the response spectrum for the free field on the surface of the ground away from the structures. Then I would consider if there are significant soil-structure interaction effects or scattering effects that would justify the modification of that response spectrum.

I believe that in this case there is no justification for such reduction.

Q Were you aware that Dr. Newmark drew the response spectrum for the Pacoima Dam event with 1.15g and it fit the 1.60 Reg Guide response spectrum below 30 cycles per second frequency when the latter was drawn from a .75g SSE?

A I understand that he has stated that. I have not

mpb6

verified it myself.

Q When you say that the approach used for the Alaskan pipeline or the general conditions for design approach used for the Alaskan pipeline should not be adopted blindly for Diablo Canyon, are you of the opinion that that is indeed what happened, that that design approach was adopted blindly?

A I don't believe that it has been done blindly. I think that reductions have been introduced by an effective acceleration and that reductions have been introduced for tau effects. I think it is clear that the reduction for tau effect is not appropriate.

The reduction for effective acceleration, I don't understand the physical basis for that, and here I would like to refer to the ADC code. The ADC code says that, in the commentary on page 298, you find that the statement saying that effective accelerations are typically lower than peak accelerations. And it states that perhaps one of the reasons for that is that a rigid foundation tends to screen out very high frequencies in the free field motion.

So the implication in there is that effective acceleration already incorporates the tau effect. And in that case we have effective acceleration, and on top of that we have tau effect.

Q But you say you don't really understand the physical basis for effective acceleration, is that correct?

mpb7

A Yes.

Q So actually you don't really know whether the result is proper or not, do you?

A I believe it is improper. I cannot find any physical explanation for it.

Q Well, forgive me, but isn't it just as possible to come up with the conclusion that it's proper if you don't really know whether there is a basis or not? If you don't understand something isn't it possible to come up with exactly the opposite conclusion?

A I am offering my opinion, and in my opinion I cannot find any physical explanation for such reduction.

Q Can you tell me what the relationship of magnitude to acceleration is?

A I think that's a really vague question.

Q Okay. Let me be more specific.

I think you've indicated that as you increase magnitude there is an increase in acceleration, is that correct?

A Keeping our parameters constant.

Q And that at certain levels at least acceleration tends to diminish in association with advances in magnitude.

A There is an apparent saturation of peak acceleration with magnitude based on the present data.

Q If you increase magnitude from 6.5 to 7.5, what

mpb3

kind of an increase in acceleration do you get?

A I think I calculated that once. I can find it for you.

Q All right.

(Pause.)

A Well, we can use the USGS circular again, and the peak acceleration for a 6.5 magnitude earthquake given here is .9. The peak acceleration for a 7.5 magnitude earthquake is 1.15. So it goes from .9 to 1.15g.

Q Those are your calculations?

A No, no, that's the USGS circular.

If I use Trifunac's correlations for an epicentral distance of 7.5 kilometers, the peak acceleration goes from, say, .7 percent -- .7g, 70 percent g, to 1.07g.

MRS. BOWERS: Mr. Tourtellotte, if you have considerable more examination, perhaps we should take a ten minute break now.

MR. TOURTELLOTTE: I think I can be through with this in about 15 minutes, if we can hold.

MRS. BOWERS: All right, fine.

MR. TOURTELLOTTE: And then it would be a good place to break.

BY MR. TOURTELLOTTE:

Q Well, instead of using the USGS 1.15, why don't you use Trifunac's 1.07?

mpb9

A (Witness Luco) That would be acceptable to me. It's within the range of error of peak acceleration.

Q Did you establish any correlations of your own to go from magnitude to peak accelaration?

A I have not done that for the California data. I attempted to do that some time ago for the data available in Chile. Unfortunately the number of strong motion recordings was extremely small and I could not arrive at any definite correlation.

Q So the correlations you were using are basically Trifunac's?

A Yes.

Q Do you know what large events within 15 kilometers were used in developing those correlations?

A I do not recall all of the events. Of course, the San Fernando earthquake was used.

Excuse me, did you ask about distance to the fault or epicentral distance?

Q Well, take them one at a time. Take the epicentral distance first.

A That's the only one I recall.

If you talk about distance to the fault, maybe some of the Parkfield Station's would be within that range. But there might have been --

Q Some of the what?

mpb10

A Parkfield.

Q Parkfield.

That's a rather scarce amount of information on which to draw correlations, isn't it?

A The correlation is based on a large number of information. In the range of short epicentral distances the information is more scarce. But I am trying to evaluate the accuracy of the correlations by considering three large earthquakes, the San Fernando event, the Pacoima event, and the Gasli event, and compared the predictions from the correlations and the observed data and the correlations worked extremely well.

The other verification is provided by the work of Kanemori and Jennings in which they have verified that the attenuation law used by Trifunac works quite well for short epicentral distances and for the earthquakes of magnitudes perhaps lower than 6.5.

The other piece of information that gives you confidence in the use of the correlations is that the results of the correlations agreed fairly well with those obtained in Circular 672. The methods employed were completely different. However, the estimates in the near source region are consistent.

So based on these three pieces of evidence I believe that the correlations are quite adequate.

Q Well, would it be fair to say, then, if they

mpbll

reached fairly consistent results with USGS, that the design approach suggested by USGS could also be used in association with those figures, those correlations?

A Excuse me, which design approach?

Q Well, on page 2 and 3, the design approach. You remember, I read those paragraphs and you followed along. You said that the results on acceleration were fairly consistent with USGS's Table 2. And I'm asking you if the consistency in that Table 2 -- with Table 2 indicates also that the same design approach as outlined by USGS could be used in association with those figures, those correlations?

A Well, I don't see the relation between the design approach and these figures. I state that the USGS circular is addressed to the first step on the design approach, and I believe that you could use Trifunac's correlations or you could use Table 2 and you would get essentially similar results.

Q Let me ask you:

Before you design a structure, isn't it nice to know what the ground acceleration is going to be?

MR. FLEISCHAKER: Object to that question -- well, I'll withdraw the objection.

WITNESS LUCO: You asked me before you design the structure if it would be nice to know what the peak acceleration would be? Where? The peak acceleration where?

mgo12

BY MR. TOURTELLOTTE:

Q I'm sorry, I didn't understand your last word. Where?

A (Witness Luco) Yes.

Q The peak acceleration that you might expect wherever you're building the structure.

A On the ground?

Q Yes.

A Oh, yes, indeed.

Q Well, then, there is a relationship between ground motion and design approach, isn't there?

A Certainly.

Q Okay.

A little while ago you said that you didn't understand the relationship between the peak values and the design approach, and the question that I asked you -- which I don't think you've answered -- is whether or not since the figures developed by the other sources, by Trifunac and so on, are consistent with the USGS figures, if you could not also use the general design approach with USGS in association with those correlations.

MR. FLEISCHAKER: I'm going to object to that question because it assumes facts not in evidence.

The USGS has outlined a design approach in its paper, and if the question is phrased as outlined in the

mpb13

USGS paper, I have no objection.

But if the question is that as suggested by USGS -- the design approach as suggested by the USGS, I have an objection because there is no facts in evidence, and the paper does not indicate that this design approach was suggested by USGS. It's set out in its paper.

MRS. BOWERS: Mr. Fleischaker, that's what I call picky, picky.

(Laughter.)

MR. FLEISCHAKER: I don't think it's picky, picky.

USGS never professed to have expertise in the area of structural engineering. Design approach requires the expertise of a structural engineer. The USGS is exactly what it says it is, United States Geological Survey. And I believe that both their testimony in this proceeding and in this paper makes clear that they are describing ground motion, and they are making suggestions as to the appropriate levels of ground motions to be associated with certain size earthquakes. They are outlining the design approach that may well have been suggested by some structural engineer. And I think it's an important point to be made and I think it's a relevant distinction to be made, because nowhere has USGS adopted and suggested that a particular design approach --

MRS. BOWERS: Mr. Tourtellotte, when you used the word "suggested" weren't you in fact saying "as outlined here"?

mpb14

MR. TOURTELLOTTE: Yes.

MR. FLEISCHAKER: If that's the case, I have no objection, "as outlined".

MR. TOURTELLOTTE: Well, I'm not going to phrase my question the way Mr. Fleischaker wants to simply because he has a different semantic approach, because I'm sure that we have a lot of semantic differences.

MRS. BOWERS: As recited here.

MR. TOURTELLOTTE: Just the common sense of the thing would tell you that USGS has in its circular 672 certain paragraphs about design approach, and that those paragraphs are clearly limiting or at least in some way tell how Table 2 should be implemented. And I don't really care what words are used, but the question is if this witness adopts the figures in the USGS Circular, Table 2, and if he says they are consistent with figures used or arrived at by the methods of Trifunac and others, the question is can the general design approach outlined in Circular 672, or recited in Circular 672, or stated in Circular 672, be used in association with these other figures.

MRS. BOWERS: Well, the objection is overruled.

MR. FLEISCHAKER: Well, I have no quarrel that they're outlined. But what I quarrel with is that the inference is being made in the suggestion that USGS suggested that these design approaches be utilized. Those facts aren't

wpb15

in evidence. And I think it's clear from the record -- and I think what is clear from this bulletin is that there is a design approach that is outlined that was suggested by somebody, probably an engineer, in 1971, seven years ago. And it was utilized for the analysis in the design of the pipeline in Alaska.

MR. TOURTELLOTTE: Mrs. Bowers, one, it is absolutely -- and I try to keep from characterizing this, but I just don't know any other word. It's absolutely absurd to say that USGS puts out a circular which -- part of which they're endorsing and part of which they're not endorsing. It's absolutely ridiculous. That's in the first place.

In the second place, also in the record is the USGS letter which says that you use the design approach outlined in Circular 672 for Diablo Canyon. And it is very relevant to these proceedings. And if they intended to disregard or they intended to disavow the design approach set out in this circular, I would think in the first place they wouldn't have ever printed it. In the second place they wouldn't have referred to it in the letter from USGS to the Nuclear Regulatory Commission.

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MRS. BOWERS: Mr. Norton.

MR. NORTON: I would just remind Mr. Fleischaker about testifying. An objection because there is an inference in a question is a novel objection. I don't think I ever heard it before.

MR. TOURTELLOTTE: It's a proper basis for final argument or for his findings, but it doesn't have anything to do with an objection in this proceeding.

MR. FLEISCHAKER: The question suggests facts not in evidence. That was the basis. I have nothing further

MRS. BOWERS: The objection is overruled.

We have had so much testimony from prior witnesses on USGS 672, and Mr. Tourtellotte's question was proper. He's trying to hear from this witness his opinion on the matter in 672. And he gave him the multiple choice of words. So we could like to have the question answered.

WITNESS LUCO: Okay.

At this point I am totally lost. I would like to have the question again.

MR. TOURTELLOTTE: I'll try to rephrase it for you.

BY MR. TOURTELLOTTE:

Q You indicated that there was a relationship, or that there was -- the figures developed by Trifunac and

WRB/wb2

others were consistent with the figures in Table 2 of the USGS Circular 672. And I'm asking you if they are consistent with those figures, is it not possible then to use the figures of Trifunac and others in association with the design approach outlined in Circular 672?

A (Witness Luco) Well of course anything is possible. However,--

Q Let me ask you the question: Do you think it would be proper?

A No, I would not--

Q Why?

A --think it is proper.

In the first place here I must emphasize that the authors specified that they are giving values for ground motion on the surface of the soil, and they are describing how these values were used in the case of the Alaskan pipeline. And they indicate three steps. The first step is to take these values of motion on the ground surface, then modify them to allow for non-linear response and energy-absorbing mechanisms, and so on, and finally to draw some logarithmic response spectra.

I do not agree with that procedure.

In the first place, if there is soil-structure interaction you cannot do that, because in addition to translational response there is rocking response, and there

might be torsional response. So that what you have to do is to use the motion on the ground surface, the free field motion, and then go through a soil-structure interaction analysis, and then you will end up with the complete motion at foundation level. And that involves not only one response spectra but involves translational motion, a rocking motion and torsional motion.

So the approach outlined here may have been used in the Alaskan pipeline, but I would not use it in the case of Diablo Canyon, and I would not use it for other structures either.

Q In making the correlations that you discussed, do you know which was compared: the spectra or accelerations, response spectra or accelerations?

A You said in making the correlations--

Q I understood you to say two things: one, that you had relied upon Dr. Trifunac's correlations to some extent, and that you made some calculations of your own, some correlations of your own. I was speaking of your own correlations.

Did you make those calculations by using response spectra, or did you use accelerations?

A Well there are several parts to the question.

Dr. Trifunac has a number of correlations--

Q Wait a minute now. I understand about Dr. Trifunac.

NRS/wb4

I'm asking about your correlations.

Let me ask the question first: Did I understand you correctly a little while ago to say that you had, in addition to the other correlations that you had made some calculations and made some correlations of your own? If I didn't understand you correctly we'll go on to Dr.Trifunac's.

A Okay. I said that I had attempted to derive some correlations for the data in Chile, correlations between peak acceleration and magnitude. They have nothing to do with Diablo. And that given the fact we had very few data I could not arrive to an adequate correlation.

Q Okay.

A Those were for peak acceleration and--

Q So you didn't make any correlations of your own with reference to Diablo?

A No, I have not.

Q Do you know whether the correlations of Dr.Trifunac were made onthe basis of response spectra or accelerations?

A He has several correlations. There are correlations for peak acceleration with magnitude, epicentral distance and type of soil conditions. The same for peak velocity and peak displacement.

He also has correlations for response spectra as a function of magnitude, epicentral distance and soil conditions. He also has correlations for Fourier amplitude

RB/wb5

spectra --

Q For what?

A Fourier -- F-o-u-r-i-e-r -- amplitude spectra versus magnitude, epicentral distance and soil conditions.

I used the correlations for peak acceleration, peak velocity, peak displacement. And I also used the correlations that he has derived for response spectra and applied those to the situation in Diablo Canyon.

Q Are the response spectra for the large accelerations in Circular 672 greater than, equal to, or less than what would be obtained by Reg. Guide 1.60 for the accelerations specified in Circular 672, Table 2, for frequencies in the design range of less than 25 cycles per second?

MR. FLEISCHAKER: Could I have that question back, please?

MR. TOURTELLOTTE: I'll read it to you if you want.

MR. FLEISCHAKER: Okay.

BY MR. TOURTELLOTTE:

Q Are the response spectra for the large accelerations in Circular 672 greater than, equal to, or less than what would be obtained by Reg. Guide 1.60 for the accelerations specified in Ciruclar 672, Table 2, for frequencies in the design range less than 25 cycles per second?

A (Witness Luco) There is no response-- Just a

minute.

B/wb6

(Pause)

There is no response spectrum presented in Circular 672.

Q Reg. Guide 1.60 allows you to draw a spectrum by using peak acceleration only, doesn't it?

MR. FLEISCHAKER: I'd like to object to that question, because the testimony is that Reg. Guide 1.60 was not utilized in the design of---

MR. NORTON: Mrs. Bowers, I'm going to object to Mr. Fleischaker testifying as to what the testimony is. All he has to do is object. He said "I want to object. the testimony is...." and off he goes again.

Why doesn't he state the purpose of his objection and then if he wants to make a further argument after he is overruled -- if he should be overruled -- then we can get into an argument about what the testimony says.

But his continual interruption and speaking as to what the testimony is is improper.

MRS. BOWERS: Mr. Norton, haven't you done the same thing on occasion?

MR. NORTON: That does not make it proper.

(Laughter)

I didn't say do as I do, I said do as I say.

(Laughter)

MRB/wb7

MRS. BOWERS: We're going to take a recess and we'll come back to this after the recess.

(Recess)

MRS. BOWERS: We'd like to resume.

I've asked Mr. Bloom to read back the question and what follows.

(Whereupon the Reporter read from the record as requested.)

MR. FLEISCHAKER: Mrs. Bowers, may I complete my objection?

I object on the basis that the question is without foundation. The testimony is that 1.60, the shapes of 1.60 were not utilized in this case, 1.60 was not utilized in this case. And until a proper foundation has been laid there is no basis for questioning on Reg. Guide 1.60.

MRS. BOWERS: Well, Mr. Tourtellotte, do you want to respond?

MR. TOURTELLOTTE: Well there are times when objections are made like this as to relevancy and the attorney is allowed to continue on with his cross-examination and to demonstrate later on how to tie it in. And I'd like permission to do that at this time. Because if I sit here and explain exactly what I'm going to do it may affect the answer that the witness gives, and I don't want to do that.

There is a relevancy, a very definite relevancy,

RB/wb8

and I can represent as an attorney that a relevancy does exist, and I would like to assure Mr. Fleischaker of that and then go on.

MR. NORTON: Excuse me, Mrs. Bowers, but there is a proper method to approach that, and that is simply for counsel to approach the bench and argue the matter out of the earshot of the witness, and then we can get a ruling and go on.

I don't want to set up a precedent for relying on, you know, somebody saying they think it is relevant, and we're all operating in the dark. I think we ought to go up and get a ruling from the bench.

MR. FLEISCHAKER: I agree with that.

MRS. BOWERS: Well, but we've had a lot of testimony -- well, we've had testimony from time to time with reference to Reg. Guide 1.60. It certainly is a part of this record.

We'd like to proceed. The objection is overruled. And we'll stop you if we think you're going nowhere.

BY MR. TOURTELLOTTE:

Q Can you answer the question?

A (Witness Luco) I believe the question was, Is it possible to draw a response spectrum using the peak acceleration out of Circular 672 and Reg. Guide -- and the Reg. Guide shape?

B/wb9

Q Spectrum.

A Yes. Yes, it is possible.

Q Have you done that?

A I have not done it.

Q If you were to draw the peak acceleration within the response spectrum of 1.60 without tau effect and without effective acceleration and it fit within that spectrum would you say that that would indicate anything to you about the plant?

A You mentioned two spectra in your question, and I don't know what are you referring to.

Q If I used spectra-- I don't know.

What I'm asking is this: Suppose you take the 1.60 spectrum and then within that you use the 1.15g ground motion without acceleration, without tau effect, and if it fit within that spectrum under 25 cycles would that tell you anything about the design of the plant?

A I still don't understand the question. The Reg. Guide just provides the shape. You scale that shape-- Do you scale the shape with 1.15 or not?

Q Well, would the 1.15 value lie above or below, or would it be equal to the values you used for the design, if you were to do that?

You don't understand the question; is that right?

3/wb10

A Yes.

Q Okay.

Let's move on.

The correlations that you made reference to, the Trifunac correlations, what period are those correlations calculated for?

A Well it depends on the correlation you're talking about. The correlations with peak acceleration, peak velocity and peak displacement, they do not have any period associated with them. The correlations for the response spectra are given for the range of periods.

Q How about the Jennings correlation?

A Pardon?

Q The Jennings correlation.

Well, let me invite your attention to the deposition, pages 167 and 168. At the top of 168 we're talking about attenuation. And you say,

"Now recently because of the work of Kanemori and Jennings you see that attenuation is fairly good. They have strong motion records and they calculate magnitude based on those records, local magnitude based on those records, and they obtain values that agree with the magnitude determined by other types of instruments, seismology instruments. For that agreement to

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occur it must mean that the attenuation curve is correct, and it is correct at a period of one second."

Do you recall saying that?

A Yes. Well....

Q Okay. I have a question to ask you about that.

Those correlations that are at a period of one second, in the one-second range, that is in the velocity range, is it not?

A Well the work of Kanemori and Jennings does not involve any correlation. What they have done is that they used a strong motion as obtained in a strong motion instrument. Based on that information they calculated the response of a Wood-Anderson instrument, of a theoretical Wood-Anderson instrument, and based on that they calculated the local magnitude for the location at which the strong motion instrument was placed.

Now since there are many such recordings, strong motion recordings, they obtained estimates of the local magnitude for the given earthquake at different points, different epicentral distances. Those estimates of the local magnitude agreed fairly well with our estimates obtained by real Wood-Anderson instruments at larger epicentral distances.

MR. TOURTELLOTTE: Mrs. Bowers, I would like for

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you to instruct the witness to answer my question. The witness has just given me a lengthy discussion about what the work of Kanemori and Jennings is in response to a question of whether the one-second period is in the velocity range. And that isn't anywhere close to the question that was asked. And I'd appreciate it if you would instruct the witness to answer my question.

MR. FLEISCHAKER: Mrs. Bowers, I think I have to agree with the Staff in this instance. If he could restate the question perhaps the witness could give a direct answer.

MRS. BOWERS: Do you understand the question? It was rather specific.

WITNESS LUCO: Not the way I understood. The question referred to some correlations developed by Jennings, or used by Jennings. Jennings didn't use any correlations, so the rest of the question doesn't make any sesne. And that's what I was trying to bring out.

MRS. BOWERS: He'll reword it, then.

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BY MR. TOURTELLOTTE:

Q That's fine, all you have to do is tell me that the question involves something, and then you can stop there and we can go on.

Okay. The work of Kanemori and Jennings, and in this particular reference to the work of Kanemori and Jennings you refer to the period of one second.

I'm asking you: Is that period of one second in the velocity range?

A The velocity range for the response spectrum.

Q And the acceleration is in the higher ranges, is it not?

A In the higher frequency range, yes.

Q Okay. And where is the data for the acceleration?

A Well, probably frequencies higher than 2 hertz.

Q And do you know what the basis for that data is, where those data come from?

A Which data?

Q That used by Kanemori and Jennings?

A I mentioned that they used strong motion data, actual recordings, for certain earthquakes.

Q And do you know what they are?

A I have the paper with me, and I could go down the list of earthquakes they considered.

Q Can you make just -- is it very lengthy?

A Well, let me just mention a few:

The Long Beach earthquake of 1933. The Imperial Valley of 1940. The San Francisco earthquake of 1957. The Parkville earthquake of 1966. The Oxego Mountain earthquake of 1968. And, of course, the San Fernando earthquake of 1971.

Q Yesterday you discussed the Hollywood storage building, and you made reference to the Curran County earthquake and its effect in that building.

A Yes.

Q The results of another earthquake had an effect on that building, isn't that true?

A Yes.

Q What was that?

A The San Fernando earthquake.

Q And during the San Fernando earthquake did you have the same results that you had from the Curran County earthquake?

A I studied only the Curran County earthquake. I understand that Dr. Newmark has analyzed the data for the San Fernando earthquake, and found that there was a larger attenuation of the basement for the San Fernando earthquake as compared with the Curran County earthquake.

I know of a different study conducted by Krausa, and it is a Cal Tech report in which he found just the opposite, that for the San Fernando earthquake the attenuation

wel 3

effects were lower than those for the Curran County earthquake.

Maybe the difference can be explained by the fact that Dr. Newmark used response spectra as a basis for comparison, while Krausa used Fourier amplitude spectra.

Q There were instruments at the corner of the building, were there not?

A Inside the building?

Q Yes.

A Yes, the instrument in the basement was located at one of the extreme ends of the building.

Q That would reflect the torsional effect, would it not?

A It would reflect torsion if there was any, yes.

Q You also made reference to the Olive View Hospital, and suggested that that might be a test case?

A Yes.

Q You made no reference, however, of the Managua Esso Refinery case. Do you think that has any applicability to this case?

A It may have. I have not looked at that case. That is why I didn't comment on it.

Q Do you think that someone who had looked at th at case might have derived valuable information from it?

A I think it is possible to draw some conclusions if

a detailed study is made.

Q Now, you indicated yesterday that you used some figures from Bertero, et al, is that correct?

A Loosely interpreted, yes.

Q But you rejected the general thesis of the paper?

A No, I did not.

Q I thought you said that you disagreed with Bertero, et al, about parts of their paper?

A I disagree with the input motion that they used. I am not sure about this, but my impression is that they did not calculate the input motion. They used the input motion derived by Reimer, and that's reference 2 in the paper of Bertero and associates.

I may be wrong, but that's what I believe at this time.

I disagree with that particular input. I feel that the high frequencies have been completely filtered out.

Q You also indicated that you accepted part of what was in the USGS letter, but, for instance, you did not accept their statement about effective acceleration, is that correct?

A It is correct. And the reason for that is that the last statement there, in my opinion, is useless because they do not define effective acceleration. It is just giving the --

Q I understand that.

A -- engineers a blank check.

Q I understand the reason.

Believe me, these questions can be answered very quickly, and I don't really need your reasons because you stated them yesterday. Okay?

A I believe I did answer the question.

Q I'm sorry. I apologize. I should not have talked to the witness in that way. I guess I should have said to the Board that I request that the witness be directed to answer my question, but I'll just go on.

Also, apparently USGS Circular 672 -- you're using Table 2 out of Circular 672, but you also reject part of their design approach, I take it?

WITNESS LUCO: Can I address the Board?

MRS. BOWERS: Can you answer the question?

WITNESS LUCO: I can answer the question, but I would like to give an explanation. I can be very brief in saying yes or no, but then I would like to justify my answer.

Is that appropriate?

MRS. BOWERS: Go ahead.

WITNESS LUCO: Yes, I accept Table Number 2. I do not agree with your interpretation of Circular 672 in which they are prescribing or suggesting a design criteria.

They are simply stating what was done for the Alaskan pipeline, and the authors are very clear in saying that

they are addressing just the first point, the computation of the ground motion.

BY MR. TOURTELLOTTE:

Q I notice also that you're using part of what Dr. Frazier has done for the Applicant in determining vertically propagating waves as at least the direction of motion for Diablo, but you're not accepting everything that Dr. Frazier has to say. Is that correct?

A I think you have to be more specific than --

Q Well, as I recall your testimony yesterday, you were talking about Dr. Frazier's paper, and you were saying that tau effect -- that it's improper to give any credit for tau effect because there are vertically propagating waves, as indicated by Dr. Frazier's work.

So you apparently are relying on Dr. Frazier's work to the extent that they're vertically propagating waves, but not to the rest of his work.

A What is the rest of his work?

Q Well, you read it.

A Well, you see, Dr. Frazier has not presented any report to ACRS, or I have not read any report from Dr. Frazier. I am going on the basis of comments he made in front of ACRS, where he stated that the high-frequency energy would be coming in the form of nearly vertically-incident waves. And he went on to say it's coming very steep,

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with angles less than 45 degrees.

He also said that some of the low-frequency energy perhaps is coming in the form of horizontally-propagating waves.

So that's all I have to go on. There is no report that I know of.

Q At that meeting did Dr. Frazier also indicate that the use of the tau effect was proper?

MS. NORDLINGER: I think I'd like to object to that question.

MRS. BOWERS: On what basis?

MS. NORDLINGER: I think the Commission has expressed a concern that when an expert comes to testify it not be used as an occasion to probe the ACRS processes. And I think it's veering very close to that.

MRS. BOWERS: As I understood the question, it's just an attempt to reconstruct what was said. And, of course, those transcripts are available, you know.

MS. NORDLINGER: If it's a matter that's on the transcripts, then I withdraw my objection.

MRS. BOWERS: Well, I understood it as an attempt to recreate what was said, which is, as I mentioned, available in transcript form.

Am I correct?

MR. TOURTELLOTTE: Yes.

vel 8

MRS. BOWERS: All right.

MR. FLEISCHAKER: We have the transcript here. We've had this come up before, that if they're going to be questions about what was said in the ACRS transcript it would be useful to indicate the specific page and line that the question refers to.

We have a copy of the transcript that we can give to Dr. Luco, and then Mr. Tourtellotte can refer to the page and line of Dr. Frazier's statement, and then ask his question.

(Document handed to Witness Luco.)

MRS. BOWERS: Any objection, Mr. Tourtellotte? What data was this meeting? Was this the July meeting?

WITNESS LUCO: July 7, I believe. Page 553, I believe.

(Pause.)

MRS. BOWERS: What's all this shuffling around? You're trying to locate it? Do you have it, Mr. Tourtellotte?

MR. TOURTELLOTTE: No. We're two pages short.

BY MR. TOURTELLOTTE:

Q On page 555 it indicates that Dr. Frazier used the tau effect, isn't that correct? That's at the top of the page, lines 2, 3 and 4.

A There is a question there of:

"But your method of using a tau would explain the results?"

And the answer by Dr. Frazier was "Yes."

Q So he did use tau effect?

A I think that question is out of context. From my understanding, I don't think that Dr. Frazier has done any work with tau effect that I have seen.

Q Okay.

Do you think it's a proper scientific method to use part of reports and part of documents, without using the full text?

A Oh, yes. I must exercise my judgment in filtering what I consider acceptable from what is not acceptable.

I think that's entirely proper.

Q I take it, then, an appropriate scientific method is for other people, as well, who are scientists to filter information using their judgment and decide what is good and what is bad, is that correct?

A I do not decide what is good or bad. I just give my opinion.

MR. NORTON: May we have an answer to that question? That response had absolutely nothing to do with the question.

The question was: Is it appropriate for other people to use their judgment, and he says, I don't decide what's good or bad, I just give my opinion.

MR. TOURTELLOTTE: Other scientists.

MR. NORTON: I don't understand the response to

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the question at all.

MR. FLEISCHAKER: Well, I think -- may I be heard on that?

MRS. BOWERS: Yes.

MR. FLEISCHAKER: I think that Mr. Norton has mis-stated the question, and I would propose that Mr. Tourtellotte re-state the question or that we have the Reporter read it back.

MRS. BOWERS: Could you read it back, please?

(Whereupon, the Reporter read from the record, as requested.)

WITNESS LUCO: I think it is entirely appropriate for them to decide what's right or wrong in their view.

MR. TOURTELLOTTE: No other questions.

MRS. BOWERS: You know, the Board is at a real disadvantage. Mr. Bright writes like mad, and then just crosses out lines like mad when somebody else asks his questions on cross-examination.

So he'll take what he has left.

EXAMINATION BY THE BOARD

BY MR. BRIGHT:

Q Well, it boils down, as usual, to clarifying a non-seismological mind on some of the terms that are used.

When you were talking about the Olive View Hospital, you said there would be a predicted 5 to 20 inch

wel 11

drift, and there was an actual observed drift of some 30 inches.

A Yes.

Q What is drift? And how was it measured?

A Okay. It is permanent deformation. If you consider, for instance, the columns in the first floor, initially the top and the bottom were along a vertical line. After the earthquake, the top of the columns displaced 70 inches -- sorry -- 30 inches, or 70 centimeters, with respect to the base.

That's the drift, or permanent displacement after the earthquake has ended.

Q Is this particularly appropriate for structural steel members, or what if you had a concrete block house and you were trying to do the same thing?

A Are you referring to the analysis made in this case, or the --

Q No, I mean how would you actually determine what the drift was?

A Just follow the same procedure, try to compute the difference between the present location after the earthquake, and compare that with the initial location before the earthquake. The displacement there would be the drift.

Q Then this would be a differential displacement between, say, ground level and some level above that?

wal 12

A Yes. In the case of the Olive View Hospital, it was the distance of the top of the column to a vertical line that passed through the bottom of the column after the earthquake.

Q One other thing -- and I'm not sure I'm asking the right person, and if I'm not please just say I'm not -- this foundation effect has bothered me a little bit.

I think you noted, in talking about the parking lot structure, that it had a very deep embedment, it was on pilings or something like this, and that this would be one reason why the so-called tau effect would be pronounced there, in addition to the soil being the way it was, soft.

However, the reactor structure -- and here, let me just address the containment building, and forget about the turbine building -- was not embedded very deeply, or something like that.

It looks like the bottom of that thing goes down a long way, and not only that, but you have a solid mass of concrete which is more or less bonded to the bedrock.

I guess I would just like to get a little explanation of what the --

A Yes, I understand your question.

When we talk about embedment, we are actually not talking about the depth of the foundation as compared with the ground surface. But it is a relative number that involves

that depth, compared with a dimension of the foundation in plant.

Q Oh.

A So it may be very deeply embedded in terms of depth, but if it is very wide this embedment ratio is small.

Q So it would be a relative thing?

A It's relative.

So in the case of the Hollywood Storage Building, this is a long structure and waves were essentially coming from the north, impinging on the structure in the transverse direction.

So that dimension is short, compared with the depth of the pilings. So the embedment in that case was significant.

In the case of Diablo -- and if you take the containment, I am not quite sure, but maybe the embedment was of the order of 40 feet, or something like that, and the diameter of the foundation is about 150 feet. So that ratio is small.

That's one aspect to consider.

The other is the wave lengths involved, compared with the embedment depth. And in the case of the Hollywood Storage Building, where we have a softer soil, the wave lengths are short and they are comparable to the depth of the foundation.

In the case of Diablo Canyon, the soil is hard, the wave lengths are much longer, and when you compare that wave length with the depth of embedment you find a much lower ratio.

I think that explains the results obtained, that there is less tau effect in Diablo as compared with the Hollywood Storage Building.

MR. BRIGHT: Thank you.

MRS. BOWERS: I have a couple of questions.

BY MRS. BOWERS:

Q You mentioned, Dr. Luco, that you have served as a consultant to Bechtel. Am I correct in assuming that that relationship ended when you became a consultant to ACRS?

A No, it did not. I am excluded to review any project in which Bechtel is involved.

Q I see. Well, you know the basis of my question. I felt there'd be a conflict of interest if --

A No, that's why I am excluded from being involved.

Q Yes.

Well, then, I'm puzzled, as a lawyer listening to -- this is our seventh week of evidentiary hearing on the seismic issue, and our in-residence cat is now full grown.

(Laughter.)

In December he was a kitten. We used to evict him when he came in, and we learned that if we left him alone he'd wander

out again.

Dr. Frazier, I believe, was here the second week as a seismologist. I'm looking at your resume, and of course you start out with the Doctorate in Civil Engineering, and then your scientific research includes a lot of studies dealing with soil-structure, and the evaluation of earthquake damage, and those sorts of things.

My question goes to: In listening to your testimony -- well, let me back up a minute.

The first week we heard geologists. Then seismologists. And then ground-motion people.

And we were hearing from them, particularly the ground-motion people, that they accepted from the other disciplines what the situation was, as far as the magnitude, how far it was, and that sort of thing.

Now, my puzzlement is that Dr. Frazier is telling the ACRS something about tau. Is that his discipline, or your discipline, or both?

A I believe that we have very similar preparation, Dr. Frazier and myself. Perhaps I should go a little bit into that.

While I was a student in engineering in Chile, at the third year I became research assistant in the Department of Geophysics. In that work I studied wave propagation, and actually my thesis in Chile was in the problem of

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wave propagation in the earth. I studied the response of a spherical earth with many layers.

When I came to this country, although my major field was structures and applied mechanics, I continued taking courses in wave propagation and seismology.

I do not classify myself as a seismologist, but I have some knowledge about certain things, particularly wave propagation.

Recently I have done research work on that area, and at the present time one of the research projects involves the computation of strong motion at a point a mile from a fault.

So my preparation involves a mixture of some of the ingredients of seismology and some of the ingradients of structural engineering.

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Q Well, I'm glad I asked for the explanation because we'd had a little clearer dividing line from some of the earlier panels, although there was some overlapping.

A And if I may add something, I have written certain papers dealing with the tau effect in particular.

Q Fine.

MRS. BOWERS: Well, let's check with the parties. Mr. Fleischaker?

MR. FLEISCHAKER: I have a couple of questions which are primarily an effort to seek some definitions and further explanation. They'll be very short, I think.

REDIRECT EXAMINATION

BY MR. FLEISCHAKER:

Q First of all, you mentioned in discussing or responding to questions regarding the Trifunac correlations, you indicated that he had done correlations for individual parameters, that is acceleration, velocity, displacement. Then you indicated that he had done correlations for response spectra and that he had done correlations for Fourier amplitude spectrum.

We've had a lot of discussion about the first two, that is response spectrum and individual parameters, velocity, displacement, acceleration. I'm not sure, however, that there is a description in the record of the Fourier amplitude spectrum.

mpb7

Could you define for us what a Fourier amplitude spectrum is?

A (Witness Luco) It is hard to do it in words. It's very simple if I could write an equation on the board.

A description would be something like this:

You have a signal in time. Then you break down that signal into a large number of components. Each one of those components corresponds to an harmonic motion, say a sine, a cosine, something that repeats itself in time, so that you break that signal in time into a superposition of harmonic motions, each one characterized by a frequency and characterized by an amplitude.

Now for each frequency you have an amplitude associated with it. Then you can construct a plot, if you want, having in the horizontal axis the frequency and having on the vertical axis the amplitude of that particular component. And in that way you construct Fourier amplitude spectrum.

This would be a loose verbal interpretation.

Q What's the relation between the Fourier amplitude spectrum and a response spectrum?

A They are different functions. The response spectrum reflects the peak response of a family of one degree of freedom oscillators. So in that sense there is some physics involved there, that we actually have an input motion

mpb3

in time and we obtain the response of a family of one degree of freedom oscillators. We choose the peak for each oscillator and we plot that, and that would be your response spectrum.

In the Fourier amplitude spectrum you do not have that oscillator connecting the input and the result. But it also has its own physical interpretation.

Q There has been some testimony about the CLASSI program, and I wonder if you could briefly tell us what the CLASSI program is.

A Well, I would be glad to do it. I don't see how it relates to Diablo, though.

Q Well, let me ask you this:

What is the CLASSI program?

A Okay.

First let me explain the name of the program. CLASSI, it stands for Continuing Linear Analysis of Soil-Structure Interaction. And it is a group of programs designed to calculate the response of the structures including the effects of soil-structure interaction.

Q Is it a three-dimensional soil-structure -- is it what has been referred to as a three-dimensional soil-structure interaction analysis?

A Yes, it is.

Q Why did you say it wasn't applicable to Diablo?

A Well, it has not been used.

mpb4

Q Do you have an opinion as to whether it could have been used?

A You have to specify the time. We are releasing portions of this program, and if you're talking about three years ago it could not have been used because the programs were not readily available.

Q How about within the last year?

A Yes, they could have been used.

MR. FLEISCHAKER: I don't have any further questions.

MRS. BOWERS: Mr. Furbush?

MR. FURBUSH: Yes, Mrs. Bowers, I just have one item to try to clear up the transcript, rather than waiting for a transcript change later on.

RECROSS-EXAMINATION

BY MR. FURBUSH:

Q Dr. Luco, yesterday when we were talking about close in rather large magnitude earthquakes and you mentioned the Pacoima Dam record, and then the transcript at 9079 puts the Pacoima Earthquake was for a magnitude of 6.5 and peak acceleration was 63 percent of g, and that should have been Koyna, should it not?

A (Witness Luco) Yes, I believe that's -- I don't have a copy of the transcript, but I can --

Q Let me show it to you.

(Handing document to the witness.)

A Yes, that is Koyna.

Maybe I can repeat the numbers just to be sure.

The peak acceleration for the Pacoima Dam record was 1.25g and this corresponds to a magnitude -- in the report I indicate 6.5, but actually it's 6.3, and I believe that's what I said for the record.

The Koyna record, the number I have here is a peak acceleration --

Q How do you spell that?

A K-o-y-n-a.

The number I have here is a peak acceleration of .63g, but I am not sure. There is another component and it may have been slightly higher. That was an earthquake with a magnitude of 6.5.

And then I had the Gazli earthquake with a surface wave magnitude of 7.2 and a peak vertical acceleration of 1.3g and a peak horizontal acceleration of .8g.

Q Thank you. That clears it up.

MRS. BOWERS: So it's really on line 2, the second word needs to be changed. Fine.

MR. FURBUSH: Thank you.

I have no further questions.

MRS. BOWERS: Mr. Tourtellotte?

BY MR. TOURTELLOTTE:

Q Questions were asked about the CLASSI code and I wanted to ask, Dr. Luco, are all the parameters in CLASSI assumed, or can they be measured at the site with a reasonable degree of accuracy?

A (Witness Luco) Well, the model -- to use CLASSI you need a number of pieces of information; some information comes from the soil, and that typically is measured at the site.

You also need the properties of the structure in terms of mass and stiffness, and so on, and those are typically not measured but calculated. This is not part of CLASSI, that's information that has to be provided for CLASSI to work.

Q As input for CLASSI?

A Right.

Q All right.

And in coming up with a great deal of that information you are required to use your judgment, your engineering judgment, isn't that correct?

A Of course.

Q And so what you come out with is a program that is a product of partially the information that is observed and partially information which is judgmental?

A Yes, but it is the same type of information that's used for any other type of analysis.

mgb7

Q Well, I understand how analyses are used. But the point is that here there is a great deal of judgment involved in how to come up with the input for CLASSI, as well as observed information.

A Yes, there is some observed information from the soil and some judgment is required to provide the data about the structure.

MR. TOURTELLOTTE: I haven't any other questions.

MRS. BOWERS: Well, the Board has no further questions.

We'd like to recess earlier. You know the situation we ran into yesterday. Everybody from San Luis Obispo came to San Luis Bay Inn to have lunch.

But try to be back in an hour.

MR. TOURTELLOTTE: 12:30?

MRS. BOWERS: Fine.

(Whereupon, at 11:40 a.m., the hearing in the above-entitled matter was recessed, to reconvene at 12:30 p.m., this same day.)

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AFTERNOON SESSION

(12:40 p.m.)

MRS. BOWERS: We'd like to begin.

Now we're ready for cross-examination of Dr. Trifunac; is that correct?

Whereupon,

MIHAILO D. TRIFUNAC

and

J. ENRIQUE LUCO

resumed the stand as witnesses and, having been previously duly sworn, were examined and testified further as follows:

CROSS-EXAMINATION (Resumed)

BY MR. NORTON:

Q Dr. Trifunac, I want to ask yousome questions about your role as a consultant. And I want to be very careful that I don't get into the collegial process of the ACRS. That's not my intent at all.

MRS. BOWERS: You don't need to worry. There's someone here watching you every minute.

(Laughter)

MR. NORTON: I understand that.

BY MR. NORTON:

Q If I ask a question that you in any way think gets into that, please let us know. I don't think I'm headed that way at all, but it might be construed, or it might

WRB/wb2

be possible to answer a question that way, and that's not what I'm after.

You were one of approximately eleven consultants retained by the ACRS to review the Diablo Canyon analysis, or re-analysis for the Hosgri event; is that correct?

A (Witness Trifunac) Yes.

Q And what was your role as a consultant? In other words, what were you to do as a consult? What was your charge, if you will?

A I don't think I was ever told that very precisely. My role, as I understood it, has been to participate in those hearings that I was invited to. It was to review those documents that I was offered to examine. And then I was asked to comment on a variety of questions and to participate in the meetings.

Q All right.

Now I know there were submissions from all of the consultants at varying times throughout these proceedings in the past several years. For example, have all of your written submittals to the ACRS regarding Diablo Canyon been put into evidence in these proceedings?

A Into these proceedings here?

Q Yes.

A I'm not entirely sure.

Q In other words, there may be other writings that

IRB/wb3

you submitted that were not produced here?

A It is possible.

Q Do you know what you submitted and what-- I mean, are you able to -- right now we are dealing in possibilities. Are you able to give us any definitive listing of the documents you submitted; or is that an impossible thing for you to do?

A I'm afraid I couldn't do this at this point. It has been a long period of time, and I have a lot of documents at my house. But it is quite possible that maybe a letter or a comment in written form that I had would not be included.

Q Okay.

I'm not trying to-- Let me make perfectly clear, I'm not trying to trick you. I don't have a document and I'm not going to say "Aha! How about this one?" I'm just trying to find out if indeed those are all the documents. I think they are, but I don't know that. That's all.

A I think for practical purposes you could say that if something is omitted that in the best judgment that I have that it probably wouldn't enlighten anything any further in addition, or in excess of what is already contained in what you have.

Q All right.

Now, as I understand these documents that are

WRB/wb4

submitted by the various consultants are then passed around to all the consultants.

If I'm not mistaken, when you would submit something they might wait a couple of weeks until they get a bunch of submittals from whoever they were going to get them from, they would put up a package and then send it out to everybody. Is that basically correct?

A That is not necessarily how it works. On occasion I would get comments from other consultants. But that certainly is not the rule. In many instances I wouldn't know what other people had submitted.

Q Okay.

Joint Intervenors' Exhibit 58, which was the Seed paper submitted I think in July of '78; it could be June, I think it was July; that Dr. Luco discussed yesterday, Soil-Structure Interaction Analysis for the Diablo Canyon site, I believe in your deposition you testified you never reviewed that; is that correct?

A I may have received it, but I don't remember going through that in detail, yes.

Q All right.

So it would serve little purpose for me to ask you questions about, you know, your opinion about the results and what he did, and so on and so forth, because you haven't reviewed it?

WRB/wb5

A You are welcome to ask the questions and I will answer everything I can.

I remember hearing about this from Harry Seed himself, so if you're--

Q Okay, you haven't reviewed the paper itself?

A I have not reviewed it in detail, correct.

Q Dr. Trifunac, is it your opinion that the structures within the complex of the Diablo Canyon plant are reasonably designed to withstand a reasonable earthquake on the Hosgri Fault?

Let me be fair and tell you I'm reading a quote from your deposition.

MR. FLEISCHAKER: Then I have two bases for objection.

The first one goes to relevance. Because the question here is whether the Diablo Canyon structures can withstand the safe shutdown earthquake, not a reasonable earthquake. "Reasonable earthquake" hasn't been defined.

So the first objection goes to relevance.

The second basis for the objection -- we've been through this before, and let me state it fully for the record, is that I believe this use of the deposition is inappropriate. While the rules themselves do not specifically speak to this question -- that is, 2.740(a) -- it is quite clear that the Appeal Board has ruled that the Rules of

WRB/wb6

Practice are to be construed as consistent with the Federal Rules of Civil Procedure.

Rule 32 of the Federal Rules of Civil Procedure sets forth the circumstances under which depositions may be used in court proceedings. And it's quite clear that as to a non-party witness depositions can be used only under certain circumstances, and generally those circumstances are to impeach a witness, to refresh recollection after the witness has demonstrated that he doesn't recall prior testimony, and then Rule 32(a)(3) sets out circumstances in which a deposition can be used for a non-party witness, and generally those circumstances are when the witness is dead or not there.

The bottom line is that the use of the deposition as counsel for the applicant is using it at this point, is contrary to the specific language of Rule 32 of the Federal Rules of Civil Procedure, and I think contrary to the Appeal Board decisions which indicate that the NRC rules are to be construed consistent with the Federal Rules of Civil Procedure unless there is a specific departure from those rules. And there is no specific departure.

All that is stated in the Rules under 2.748(g) is that a deposition will not become a part of the record of the hearing unless received in evidence. And if some part of a deposition is offered into evidence, all of the deposition

WRB/wb7

may be introduced by another party

MR. NORTON: Mrs. Bowers, if Mr. Fleischaker is arguing that I cannot ask any questions that I asked in the deposition, then I guess I had better go home. Because I took his deposition for about five or six hours and I only intend to be here about twenty minutes asking questions this afternoon.

I simply was trying to be fair with the witness by -- I was asking a question that had been asked in the deposition, and I was framing the question in terms of his response.

I think I'm being overly fair with the witness by explaining to him that that's where I got the question, is from his testimony, so that he doesn't contradict himself, so that I don't have to impeach him.

And I'm using his words in my question. That's a totally proper thing. And Mr. Fleischaker's argument, I don't really understand the purpose of it. That's this witness' testimony.

What's he trying to do? --other than his usual speechmaking. I don't understand what he's about, what the purpose of the objection is. It doesn't make any sense. It's not relevant to the question at all.

MRS. BOWERS: Mr. Fleischaker, I have Rule 32 in front of me. What's this business about a non-party

WRB/wb8

witness? Are you putting these witnesses in a very special category?

MR. FLEISCHAKER: No, I'm saying that if a party-- Under the Federal Rules of Civil Procedure if a party takes the witness stand his deposition can be introduced into evidence regardless of whether there are circumstances which would permit his impeachment or refreshment of recollection. And that is distinguished from a non-party witness. And these are non-party witnesses. Neither Dr. Luco nor Dr. Trifunac are parties to the proceeding. So when you have a non-party witness then you have only a limited number of circumstances under which a deposition can be utilized. And those limited circumstances are set forth in Rule 32.

Rule 32(a) states that they can be utilized to impeach or to refresh recollection. Rule 32(a)(3) indicates that a deposition can be used when the non-party witness isn't in attendance under certain circumstances.

Let me address the point that was made by Mr. Norton. I have no problems with Mr. Norton asking precisely the same questions that he asked during the course of the deposition. He can ask any question he wants. The problem is the use of the deposition where, you know, the foundation hasn't been laid. He can ask that same question without reference to the deposition at all, and if

WRB/wb9

Dr. Trifunac's answer departed from the answer that he gave during the deposition then Mr. Norton can lay the foundation to impeach the witness.

MRS. BOWERS: Mr. Tourtellotte?

MR. TOURTELLOTTE: My initial impression is that I find it very interesting that the Intervenor who has felt for some time, and has urged for some time that it's very important for Drs. Trifunac and Luco to come here to state fully their views as reflected in the ACRS report, is now trying to employ some legal nicety about the rules, the Federal Rules, in order to limit what this witness has to say about what his opinions are.

I don't really believe that that rule need be applied in this case. The general purpose for such rule is that if a party is actually there then they can testify about what it is they have to testify about, and they don't need a deposition to get that straight.

But that really isn't what we're-- We're not concerned about parties and about the credibility of the witness and that sort of thing in this kind of examination; what we're interested in is getting out of the witness as quickly and efficiently as possible the accurate information. And the manner in which the question is posed, with reference to the deposition, in no way -- in no way -- could be construed as violating that rule. He's making a general

WRB/wb10

reference to the deposition and he's summarizing what he believes Dr. Trifunac said. And if Dr. Trifunac agrees or disagrees he certainly possesses the intellect to say so. And, in my opinion, based upon past relationships with Dr. Trifunac, he will say so.

MR. FLEISCHAKER: I'd like to respond to that.

The purpose here is not to limit the information to be obtained from this witness. Mr. Norton can ask the question without reference to the deposition and get the answer to his question, and then we go to the second objection, which is relevance. But that doesn't raise the question of impermissible use of the deposition.

But I want to point out here, depositions are taken with an understanding between the parties that they will be taken --There's an agreement, a stipulation, at the beginning of each deposition that they will be taken in accordance with the Federal Rules of Civil Procedure and the rules of the Commission, and the understanding is that a deposition is a far-ranging inquiry and that you can inquire into a lot of things that aren't necessarily relevant or appropriate to bring up at the proceeding. And that is permitted at the deposition stage.

But because the inquiry is so far-ranging, because you've got this problem that you may be getting into matters which are totally beyond theproper scope of evidence at the

WRB/wb11

proceeding, you have rules that limit the use of the deposition at the evidentiary hearing. And there was an understanding and a stipulation between me and Mr. Tourtellotte and Mr. Norton that we would conduct those depositions consistent with the Federal Rules of Civil Procedure and the rules of the Commission. And I think it is not fair-- It's a legal-- I'm going to make that objection.

MR. TOURTELLOTTE: Mrs. Bowers, I can only say that if indeed the question turns out to be irelevant, if it turns out to be beyond the scope of the hearing and is therefore not material, or if it is for some reason incompetent, then that can be the basis for the objection. But the objection is not well taken when it's based on a sort of a broadside attack using the federal rules in a way that I've never zeally understood them to be used before.

MRS. BOWERS: Well, we have had in prior segments of this proceeding, and I think back two years ago when we had several weeks of hearing on the environmental issues when, Mr. Fleischaker, you were notwith us: there was prior counsel at that time. And the depositions were used by all parties refreshing recollection and clarifying points that were made in the deposition that it was felt hadn't fully covered the particular subject. And certainly there was no objection at that time.

I was trying to find out if you felt Dr. Trifunac

WRB/wb12

and Dr. Luco were in some sort of an unusual situation so that the usual practice could not be followed.

MR. FLEISCHAKER: They're not in an unusual situation. They are non-party witnesses. And so I think that the rules that are set forth on non-party witnesses in Rule 32 of the Federal Rules of Civil Procedure are applicable to them.

But I think it is not-- The prior practice in the evidentiary hearing I would argue was contrary to the rules of federal procedure. The fact that a former counsel may have agreed to that doesn't bind me, and I don't think that it binds this Board's ruling at this time.

MRS. BOWERS: Excuse me a minute.

I understand Mr. Baldwin is on the phone and wants to have a discussion. Did anyone communicate to him what happened this morning?

MR. KRISTOVICH: I called his office in San Francisco. He was out and I left a message.

MRS. BOWERS: Then this is your phone call.

MR. KRISTOVICH: I want to point out I didn't leave the number here.

(Laughter)

MRS. BOWERS: Well, while Mr. Kristovich is taking of that--

MR. NORTON: Mrs. Bowers, I have no intention of

WRB/wb13

using the deposition. I simply for the witness' benefit wanted to point out to him that that's where I was taking the question from, to refresh his recollection, and so on. I don't have to-- I just asked the question, and if he says something different then I'll impeach him. If that's what they want us to do, impeach the witnesses, fine, let's get on with it. This is ridiculous.

MR. FLEISCHAKER: Okay. That'll resolve that issue.

Then we go to the second, and let me make that objection again since it may have gotten lost.

The basis of the objection is that the question is irrelevant. There has been no demonstration here that the plant has to be built to withstand a reasonable earthquake. The plant has to be built to withstand the effects of a safe shutdown earthquake which is based -- the safe shutdown earthquake reflects the maximum credible earthquake potential in the region in which the site is located.

If he has a specific value in mind, fine. But I think to ask the question, Will it withstand a reasonable earthquake? is irrelevant and vague.

MRS. BOWERS: Well the first objection has disappeared in the fact that Mr. Norton is going to withdraw and restate the question without reference to the deposition.

As far as the second objection, I don't think

WRB/wb14

that counsel has to state it in the way you suggested. But we do have a problem with the use of the word "reasonable," a reasonable earthquake. What's a reasonable earthquake?

MR. NORTON: I'll ask the witness that. That's the next question. And this is the witness' question, incidentally. And so I will ask him what he means by "reasonable earthquake," and then I guess we can rule on that objection.

MRS. BOWERS: Well before we go any further I just want to mention that we think Mr. Tourtellotte stated very well the purpose of the witnesses appearing here and our interest in hearing from them whatever they can tell us, their opinions and their judgment in this matter.

Now as you know, we had an interpretative opinion from the Commission as to whether it was appropriate to subpoena consultants to the ACRS. And we felt, under that interpretative Commission document, that we did not have a basis for the subpoena of the ACRS consultants. We were reversed by the Appeal Board.

We just want to say how glad we are that you are here, and we were interested in hearing from you but felt we did not have a basis to issue the subpoenas.

So let's get back to Mr. Norton and proceed with the questioning.

WRB/wb15

BY MR. NORTON:

Q Well, Dr. Trifunac, in light of the relevancy objection I guess I'm going to have to refer you to the deposition.

You will recall that I asked you some questions, and I will read you the question I asked you. I could say I'm not reading it but I think I will say that I am because that's what I'm doing.

The question was:

"In your opinion are the Diablo Canyon structures with modifications currently being implemented sufficiently strong to withstand any earthquake that could reasonably occur on the Hosgri?"

And I said "withstand any earthquake that could reasonably occur on the Hosgri."

And you said something to the effect that you could help me out by restating the question to be:

"Is it my opinion that the structures within the complex of the plant are reasonably designed to withstand a reasonable earthquake on the Hosgri Fault?"

So what is meant by the term "reasonable earthquake?"

A (Witness Trifunac) By the term "reasonable

WRB/wb16

earthquake" I wanted to imply that I wanted to look a little bit beyond a specific number and a specific spectrum, because this merely reflects a basis for an engineering judgment.

So by "reasonable" I wanted to say that I'm talking about a spectrum of possible events which are physically capable of happening there.

Q All right.

The so-called maximum capable earthquake; right?

A No. The so-called maximum capable earthquake is a little bit more specific situation. I meant to say the reasonable type of earthquake within the framework of the physics and geometry problem, and so forth.

Q Excuse me; let me change that to "maximum credible earthquake," not "possible."

A I don't like that word either; I'm sorry.

Q Well we're going to have a very difficult time being relevant with Mr. Fleischaker then. Because he insists that we use those words, but you don't like them. So I have a problem in asking you the question. You refuse Mr. Fleischaker's words and Mr. Fleischaker refuses my words.

So let me ask you my original question and see if you can answer it:

In your opinion are the Diablo Canyon structures

WRB/wol7

with the modifications that are being currently implemented sufficiently strong to withstand any earthquake that could reasonably occur on the Hosgri?

A Why don't you read my answer? Because my answer is good enough as it was there.

Q Okay. Your answer is:

"The structures within the complex of the plant are reasonably designed to withstand a reasonable earthquake on the Hosgri Fault."

Do you agree with that answer?

A Yes; as long as you don't take it out of context later on; as long as you refer to structures only.

Q I understand that. The word is "structures."

Let me ask you if you are aware of any studies or data from studies that show when you place instruments within, say, 100 feet or less or one another, instruments for the purpose of recording acceleration, that record the same accelerations for the same source at the same time?

A I'm not aware of any intentional studies. I'm aware of instances where the data that was gathered through other experiments or other types of recording might enlighten this particular question. But I'm not aware of a specific study to do that type of measurement.

Q All right.

Now if I can understand your direct testimony, you

WRB/wb18

felt that rather than the approach which was used, the standard approach I believe you called it, that was used in this case of taking a magnitude and then fitting a response spectra, or coming up with a response spectra based on that magnitude, you would use a couple of other approaches; is that correct?

A Yes.

Q All right.

And those other approaches, if I'm not mistaken, were source mechanism, looking at the source mechanism to see what you would get in the near field as a result of an earthquake. And then the second one was an area, looking at the seismicity in an area. And those are just kind of labels as opposed to descriptions of what would be done.

A They're labels, I would agree.

Q Okay.

Let me ask you this: Are you aware of any nuclear power plants in the United States that have been designed or analyzed on the basis of approach No. 2? You gave these approaches, 1, 2 and 3; the first one being what was done, the magnitude and response spectra; 2 being the mechanism, source mechanism label, and the third one being the area seismicity approach.

Are you aware of any nuclear power plants in the United States that have been designed or analyzed on the

MRS/mb19

basis of Approach No. 2? --you know, as the basis for the design?

A Let me say again Approach No. 1 was the one that is essentially being employed here, and Approach No. 2 was the source theory or the seismicity risk study?

Could we just label them by name instead of numbers?

Q Okay. Let's label them by name.

No. 1 is magnitude. What's the name for No. 2?

MRS. BOWERS: Let him answer one at a time.

MR. NORTON: We're trying to get clear which ones we're talking about.

BY MR. NORTON:

Q No. 1 is magnitude. No. 2, what would be a good label for it?

A (Witness Trifunac) I don't remember which one it was.

Q Source mechanism.

A Good enough.

Q A good name?

A As long as it's labeled I'm happy with it.

Q Okay.

And No. 3 would be area seismicity, regional, or something like that?

A Yes, I accept it.

WRB/wb20

Q Okay.

Now I'm asking you: are you aware of any nuclear power plants that have been designed as a result of the analysis of your so-called source mechanism, the label source mechanism?

A I am not.

Q How about No. 3, area seismicity?

A As well, not.

Q Okay.

Would you then say that those two approaches are deviations from standard procedures?

A Inasmuch as they haven't been used in design, yes.

Q Okay.

And yet you would deviate from standard procedures and would prefer those two approaches over the approach that has been used heretofore?

A I don't think I said that.

Q I didn't ask you what you said; I'm asking you a question.

A I would prefer to use all of them together.

Q Has that ever been done before?

A No.

Q So that's a deviation from standard procedure?

A It you use the words "typical procedures" I would

WEB/wb21

prefer that. Because "standard" implies a little bit more than "typical."

We have procedures which are the consequence of a certain minimum set of requirements, and I would hate to be in the position that I accept some standardswhich I myself am not aware of. There are typical procedures.

Q Okay. I'll substitute "typical" for "standard." I was using your word "standard," I believe. If you want to now change it to "typical," that's fine.

A I would prefer it.

Q Fine.

So then you would recommend a deviation from typical procedures in this case?

A Yes.

Q Is it your testimony that Dr. Newmark deviated from typical procedures in this case; or is it your opinion? Strike the word "testimony."

Is it your opinion that Dr. Newmark deviated from typical procedures in this case?

A Yes.

Q Did Dr. Blume deviate from typical procedures in this case?

A Yes.

Q And you would deviate from typical procedures in this case?

WRB/wb22

A They deviated--

Q Excuse me; could you answer that yes or no?

A Can I comment afterwards?

Q After you've answered the question, yes.

A Yes.

Q You would?

A The answer is yes.

Q Okay.

Now you can give a speech.

A It's not going to be a speech.

Deviation of Drs. Newmark and Blume are in the framework of the typical procedures, with modification applied on top of typical procedures.

My recommendation has been that in the light of the circumstances we have here it would be a wise engineering judgment to broaden the platform on which decisions and judgments are made.

Q I'd like to go back for a moment, if I could, to talk a little bit about the purpose of the consultant, and, specifically, your role as an ACRS consultant. Because I think you can only talk about your purpose, and I think it might be difficult to talk about someone else's purpose unless they specifically told you what it was.

I think you told me, or told us, that your purpose was to review things that were sent to you, to attend

WRB/wb23

meetings and listen and comment, and to submit written comments after reviewing materials. Is that basically what you said?

A Yes.

Q I'm not sure how to ask these next few questions, and so please listen carefully, and if you don't understand exactly what I'm driving at I'll try again.

Does a consultant only comment in the negative? I mean, is he hired only to say -- to look at everything and say, Well you're wrong here, you're wrong here and you're wrong here, and you're wrong there. Very truly yours. Or is he hired to say, Well this approach is good and this approach is fine, but within that approach you've got a problem here, and then what you're doing here is very good but, gee, I'm not sure about this?

In other words, is it just to be negative, or is it to evaluate and say something is positive, on the one hand, and you're doing the right thing here, or is it just to be negative?

How do you perceive your role as a consultant in that context?

A Certainly not to be negative.

Q All right.

I would like you, then, to look at every single document you submitted that is here in evidence and find one

WRB/wb24

positive comment for me.

MR. FLEISCHAKER: I'm going to object to that request on the basis that it's -- the information that is being sought is irrelevant to any issue before this Board. The question isn't-- There's no issue before this Board as to what is the role of the consultant to the ACRS. The issue before this Board is whether the seismic design of the Diablo Canyon facility is adequate. And the kinds of remarks that Dr. Trifunac made, positive or negative, are not the issue here. That is, what kind of consultant he was isn't the issue here. It doesn't matter.

We're going to be wasting a lot of time while he reads umpteen pages of documents to pull out hundreds of positive suggestions that he's made over the course of the last two years.

MR. NORTON: Well I'd like to see one of them.

MR. FLEISCHAKER: Let me amend that.

MRS. BOWERS: Hundreds or less?

MR. FLEISCHAKER: Yes, hundreds or less.

(Laughter)

MR. NORTON: I think Mr. Fleischaker's attenuation curves are a little strange.

(Laughter)

MR. FLEISCHAKER: But, you know, it doesn't matter: it is still irrelevant. The question here isn't

WRB/wb25

the nature of Dr. Trifunac's comments, whether they have been positive or negative, and--

MR. NORTON: Mrs. Bowers,--

MRS. BOWERS: Let him continue.

MR. FLEISCHAKER: Wait a second.

We're not here for Mr. Norton to make some points about the nature of his advice to the ACRS and the comments the ACRS -- the nature of the advice and comments to ACRS, whether they're positive or negative, we're here to obtain his expert opinion on matters that he is intimately familiar with.

So I think that the question is irrelevant.

MR. NORTON: Mrs. Bowers, that's precisely what I'm exploring, is the nature of his comments. That's exactly what I'm after.

MRS. BOWERS: Mr. Tourtellotte?

MR. TOURTELLOTTE: Well I'm about to render a split decision.

(Laughter)

In one respect I can see how perhaps the question may be designed to arrive at a potential bias of the witness. On the other hand, I don't really know, in the first place, in the balance, whether making a positive statement or not making a positive statement has anything to do with the assurance of public health and safety. And, moreover, I'm not

WRB/wb26

really sure that one can get very far asking the question of Show me a positive statement. Because what may be positive in Dr. Trifunac's mind may be negative in mine. So I have difficulty with that.

Those are my comments. I'm not going to take a position, however.

MR. NORTON: Mrs. Bowers, let me respond a little bit.

I think that a witness, or an expert, or a consultant -- and in this case we have all three: an expert witness consultant. I think his approach, his attitude is very important in terms of assessing his opinions. And I would like to be able to proceed in attempting to show that. And I think it is relevant to be able to show the basis for one's opinions.

It's a perfectly proper line of questioning.

MR. FLEISCHAKER: I would like to comment on that.

Bias. You can inquire into bias. You can inquire into the merit of the substantive comments. And if Mr. Norton wishes to do that, that's fine. If he is wishing to probe the merit of recommendations that have been made over the course of the last two years, then he can question Dr. Trifunac on the recommendations that are listed in particular documents that are now in evidence.

WRB/wb27

But I think it is a fruitless and irrelevant exercise for him to direct this witness to go over a mass of documents and say, Find one positive statement.

That was the request, and I object to it.

(The Board conferring.)

MRS. BOWERS: Well the Board is interested in knowing just exactly what requests were made and in what form to the ACRS consultant. Because it puts the documents that have been received in evidence in some sort of a perspective. If you were asked to do a particular approach or a particular study of a matter and your response is in front of us but not the way the problem was presented to you, why, then, we don't have the whole story when we just have the response, unless it happens to recite exactly what the parameters were of the question.

You, of course, stated that your approach was not to just be negative. But if the circumstances, I assume, warranted it, there would be positive statements made.

I think, Mr. Norton, that your question of asking the witness to point to one positive statement is overly broad. If you can approach it differently we may be able to get what we're after.

MR. NORTON: All right. It's not only overly broad, it's impossible.

MRS. BOWERS: Let's make sure that we're under-

WRB/wb28

standing. We can conceive of a situation where it would be impossible, depending on the sinstructions, for a consultant to--

MR. NORTON: Let me continue.

MRS. BOWERS: Okay.

BY MR. NORTON:

Q Dr. Trifunac, Mr. Williamson has handed you a document which we will have marked at this point in time, if we might, as Applicant's Exhibit No. 38.

xxxxxxx

(Whereupon, the document referred to was marked for identification as Applicant's Exhibit No. 38.)

I ask you if you have seen this? I'm not so concerned about the cover letter dated June 7th, which was simply a circulatory memo from McKinley to Seiss, but the letter dated May 31st, 1978 which is attached thereto from T. W. Pickle, and ask you if you have seen that before?

A (Witness Trifunac) I don't remember.

Q You don't remember seeing it?

A I don't remember seeing it. I may have.

Q You don't remember a discussion of this at the ACRS Committee meeting?

A Oh, yes. But I mean I don't remember seeing this piece of paper.

Q But it was in front of you at the ACRS Committee

WRB/wb29

meeting when it was discussed, was it not? Wasn't it passed out in a package and discussed?

A I don't remember.

Q Well let's try the next one.

MR. FLEISCHAKER: Excuse me. Can I ask the Board to inquire whether there is going to be any more questions on this piece of paper? Because, if so, I'd like to have just a few moments to read it.

MR. NORTON: If he has not read it I have problems asking him questions on it until he has had an opportunity to read it and refresh his recollection. So at this moment I don't intend to ask any more questions on it.

MR. FLEISCHAKER: Thank you.

Do you want us to take time out to read this at any time, so we don't slow down the proceeding later today?

MR. NORTON: You can read it any time you want, yes.

MR. FLEISCHAKER: Well I won't read it now, then. But before you ask any questions I want to request time to read it.

MR. NORTON: Well I would submit that this letter has been in Mr. Fleischaker's possession and in the intervenors' possession ever since it was circulated, as it has been in ours. That's how we got it. It went out to a general mailing list.

WRB/wb30

MR. FLEISCHAKER: I've never read this before and I'm not sure I've ever seen it before.

MR. NORTON: That's not my problem.

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BY MR. NORTON:

Q All right.

I've handed you now a report dated November 21st, 1977, over the signatures of George Thompson, geophysicist, and I ask you if you have seen that report before?

MR. FLEISCHAKER: Excuse me.

Can we have this marked?

MR. NORTON: Yes, Applicant's Exhibit 39.

(Whereupon, the document referred to was marked as Applicant's Exhibit 39 for identification.)

MR. FLEISCHAKER: I'm sorry, was the previous one 38? I just missed that.

MR. NORTON: Yes.

MR. FLEISCHAKER: Okay. Thank you.

BY MR. NORTON:

Q Dr. Trifunac?

A (Witness Trifunac) I don't believe so.

Q Well, are you telling me when the consultants to ACRS would submit comments on the same subject matter that nobody saw what the other one was doing?

A I thought I answered that before. I told you that the distribution system was not regular and occasionally we would get other people's reports, occasionally we wouldn't.

mpb3

Q Okay.

Well, I'm trying to find the one that you did get, so we'll go to the next one.

MR. NORTON: We'd ask that this one be marked as Applicant's Exhibit 40.

(Whereupon, the document referred to was marked as Applicant's Exhibit 40 for identification.)

BY MR. NORTON:

Q Dr. Trifunac, this is being passed out. It's marked as Applicant's Exhibit 40. It's a report dated November 29, 1977.

(Distributing documents.)

It is over the signature of Benjamin M. Page.

Incidentally, these three documents that I have marked 38, 39, and 40, that were offered by different people, they were other consultants to the ACRS, were they not, Dr. Trifunac?

Dr. Trifunac?

A (Witness Trifunac) I'm sorry, I was reading this.

Q Okay.

My question was, these three Exhibits, 38, 39, and 40, were offered by other consultants to ACRS?

A I recognize this, yes.

mpb3

Q Now, have you seen this one before?

A I don't believe so.

Q Let's try the next one.

MR. FLEISCHAKER: Mrs. Bowers, I'm going to object to this continued presentation of papers from people who apparently consulted to the ACRS. I don't think that this line of cross-examination is relevant to probing this witness's opinion.

I'm just not sure at all where we're going with this. We can hand out, you know, hundreds of pieces of paper from people that were submitted to ACRS, but it's not clear that foundation has been laid -- any adequate legal foundation has been laid to ask this witness questions about the words that are written on these pieces of paper.

I'm just not sure what we're doing here.

MRS. BOWERS: I'm not sure what we're doing either. But I'm guessing that we're going to eventually see a piece of paper that has a positive approach.

Is that correct?

MR. NORTON: Well, if anyone wants to take the time to read these, they all do. But that's a part of where I'm going, yes.

MR. FLEISCHAKER: Well, wait a second.

Let's put the words clear here. We may be seeing pieces of paper that agree with the Applicant's and Staff's

mpb4

position in part. If that's -- I'm not sure what that means. Does that mean it's a positive approach? Is it appropriate to say that it is a positive approach to the determination of whether this plant is safe, to agree with the Applicant's and Staff's position?

Is that the series of definitions that we're working under here?

MR. NORTON: Mrs. Bowers, I'd like to explain to Mr. Fleischaker what I'm doing. If he's got an objection let him state it succinctly and get a ruling and let's move on.

MR. FLEISCHAKER: The basis of the objection is that no adequate foundation has been laid for the continuous passing around of these papers.

If it's Mr. Norton's point that there were consultants to the ACRS that endorsed the Applicant and Staff approach, fine. Nobody argues with that.

These pieces of papers, they may be endorsements of the Applicant and Staff approach. That's fine. Nobody argues that that was not the case.

But I'm not sure what he's questioning these witnesses about by passing around these pieces of paper, and I object to labeling as a positive approach the endorsement of a particular position.

One can have a positive approach to the determination of safety of this facility and still be critical of

mgb5

the Staff and Applicant position.

MR. NORTON: Mrs. Bowers, I'm not labeling anything. I am simply asking this witness if he has seen these documents. And that's my first question about these documents. And I'd like to proceed.

MRS. BOWERS: Mr. Tourtellotte?

MR. TOURTELLOTTE: I can see relevancy in it because Dr. Trifunac is here today to tell what his opinion is. And he has recited in his direct testimony what the basis of his opinion was. And it seems to me that there are other opinions which he may or may not have taken into consideration.

If he has not seen these and has not considered these in his deliberation, I think that's important to the record.

Now how important it is to the record is a matter for argument later on. But it is important to the record. And we're interested here in developing a full and complete record, and not excluding documents simply because they're inconvenient or present an unfavorable picture to one party or the other.

MR. FLEISCHAKER: Well, if I can reply to that, it's not a question of their being inconvenient, but the Rules of Procedure require that there be an adequate foundation laid for the introduction of these exhibits -- not the

mpo5

introduction into evidence, but the marking of them and the questioning of this witness on them.

It seems to me that we're involved in an inordinate waste of time. And it's not clear that these pieces of paper are at all probative in asking this witness what the basis for his scientific opinion is. That's what we're here for, not for taking popularity polls demonstrating that other consultants to the ACRS may have endorsed Staff and Applicant positions or labeling one approach or another one as positive or negative.

MR. NORTON: Mrs. Bowers, I can mark my necktie as an exhibit if I want.

MR. FLEISCHAKER: It would have more use than this.

MR. NORTON: I can understand that from your position because it runs 100 percent against your position, and my necktie doesn't.

(Laughter.)

MR. NORTON: I don't understand the basis of his objection at all. I'm simply having exhibits marked and he's objecting to having exhibits marked. It's an incredible objection, and we've wasted 15 minutes on it.

MRS. BOWERS: Well, the objection is overruled.

We see no reason that any document can't be marked for identification.

I tried to explain a little earlier, and I may not

mpb7

have gone far enough. The parties here may have seen all these documents and may have been intimately involved with the consultants' performance at ACRS meetings and other things. The Board has not.

We need to have a better understanding of the way ACRS consultants proceed or can proceed. And so we think it's relevant.

And we'd like for you to go ahead, Mr. Norton.

MR. FLEISCHAKER: Mrs. Bowers, I just want to make one comment on that for the record.

No, I'll withdraw that.

BY MR. NORTON:

Q We're marking Applicant's Exhibit 41, which is a letter from George A. Thompson, Chairman Geophysics Department, Stanford University, to McKinley, a letter dated July 22, 1977.

(Whereupon, the document referred to was marked as Applicant's Exhibit 41 for identification.)

Have you reviewed that letter and attachment before you?

A (Witness Trifunac) This one I am sure I have never seen.

Q You've never seen this one either. Okay.

mpb8

Now these letters, Exhibits 39 and 41 -- 39, 40, and 41, excuse me, are fairly short. 38 happens to be a little bit longer. It's about three and a half pages.

How long would it take you to quickly review these, Dr. Trifunac?

A I have glanced over them already. So if you're not asking for something detailed I don't need any time.

Q Okay.

Now, then, let's look at Exhibit 38.

A Could you refer to the date?

Q Yes, I'm sorry, yours weren't marked. It's the first one that I gave you. It's the cover letter of June 7, 1978, and the second page is the letter dated May 31, 1978, from Dr. Pickel, P-i-c-k-e-l.

Now would you say that that report and review is a mixture of comments from the consultant pointing out things that the Applicant had done right and perhaps things that the Applicant should do differently or in another way. It's a mixture, so to speak, of the two approaches?

A I would agree with you.

Q All right.

And looking at Exhibit number 39, which is very short, it's just two little paragraphs of Dr. Thompson, does he also have a mixed approach, so to speak, of positive -- and when I say "positive" I'm saying positive in the sense that

mpb9

somebody did something right, and "negative", somebody did something wrong, or we need more information or it isn't satisfactory at this point or something. That's what I mean by "negative".

And would you say that Exhibit 39, which is the Thompson letter, two paragraphs, dated November 21, 1977, is a mixture again?

A I would agree.

Q Okay.

And Exhibit number 40, which is again just one page from Dr. Page, dated November 29, 1977, again is that a mixture of positive and negative?

A Yes.

Q All right.

And Exhibit 41 the same question, and that's the last one. It's from Dr. Thompson dated July 22, 1977.

A Yes.

Q All right.

Now, my question to you is did Dr. Blume and the other Applicant consultants ever do anything right in your opinion in the reanalysis of the Diablo Canyon Plant for the Hosgri event?

MR. FLEISCHAKER: Can I have that back?

BY MR. NORTON:

Q Did Dr. Blume and all the other consultants to the

mpb10

Applicant ever do anything right in their reanalysis of Diablo Canyon for the Hosgri event?

Dr. Trifunac, could you answer the question?

A (Witness Trifunac) Yes.

Q What?

A The complete addition to the sets that I have not addressed and may other things that I have addressed.

The important thing to understand is that selecting the data can be biased and unbiased, and to clarify your own question, I think that it's worthwhile to mention that many times you are not asked to write everything that you think. Sometimes you don't want to because you don't have time. And more often, you are asked to comment on those difficult problems that don't seem to be resolved or those problems that you comment on during the meetings. And I think there is ample evidence to the fact that I have on many occasions supported a position of various parties involved -- not just in this case but in many other cases.

I think you would also find if you did some further research that I very rarely submit anything in writing to ACRS because I'm very busy. And what I have to do, I usually have to discuss a difficult problem when something is not clear or where I have to suggest an approach, or something like that. And so the examples that you picked come from -- except for Mr. Pickel's comment -- are geological

mpoll

considerations, and those are summaries which relate to the stage where we had enough data and a lot of evidence was presented and we were ready to proceed further.

So I would invite you to perhaps to through a much more detailed data base and look at everything I have said to perhaps judge a positive or negative.

Q Well, I have already accepted your invitation and spent several hours doing just that.

And I would again ask you to point out anyplace in any of the submittals which consist of tens of pages where there is anything -- wherever it is stated therein that the Applicant or the Staff did something right in their reanalysis. And I would ask you again if you could direct me to some place in your writings where such a positive statement occurs.

MR. FLEISCHAKER: I again am going to object.

It seems to me to be totally irrelevant. The questions that he's asking and the information he's seeking is totally irrelevant to the issues before this Board.

The question is is whether again the issue before this Board is whether the design of that facility is adequate, not the nature or the tenor of the comments that were submitted by Dr. Trifunac.

And I don't care whether in every piece of paper that he submitted he says X, Y, and Z of the Staff's and the

mpb12

Applicant's analysis is lousey and ought to be done over again. So what? I mean, big deal. What kind of a finding of fact are you going to base on that? The question is whether or not his comments or criticisms are valid.

So where are we going? What's the use of all this? What kind of finding of fact is going to be based on that, that Dr. Trifunac criticised the Staff and Applicant's approach. Big deal.

The question is is whether the criticisms have any merit in science, and in fact, and in the scientific basis, and that's what counts, not that he wrote criticism.

So what's the Applicant going after? That this man had the temerity over three years to write criticisms of the Staff and Applicant approach? Who cares?

MRS. BOWERS: Well, Mr. Norton, the witness testified that a lot of his communication was oral. I assume comments at meetings, perhaps telephone calls. And so, you know, aren't you limiting it to a few documents here where, as his testimony shows, there were many other comments?

MR. NORTON: Well, Mrs. Bowers, I would submit that there aren't any positive comments. But that's all right. I'll move on.

BY MR. NORTON:

Q I would like to go back to these exhibits. Let's take out Applicant's Exhibit 38.

mpb13

I believe you mentioned Dr. Pickel. You've reviewed this one, the letter dated May 31, 1978, from Dr. Pickel?

A (Witness Trifunac) I didn't say I reviewed it, I said I didn't remember whether I had it or not. I don't have it now.

Q And you've reviewed it here?

A I sort of glanced over it, yes.

MRS. BOWERS: Well, we started this early this afternoon. Let's take a ten minute break now, and that will give the witness a chance to review it.

BY MR. NORTON:

Q Dr. Trifunac, would you look at all four of these, or five, I think there were only four, during the break. They're very short.

A (Witness Trifunac) What do you want me to do with them?

Q Read them.

A Fine.

MRS. BOWERS: Ten minutes.

(Recess.)

MRS. BOWERS: We'd like to resume.

BY MR. NORTON:

Q Dr. Trifunac, have you had an opportunity to review those exhibits now?

mpb14

A (Witness Trifunac) Yes.

Q All right.

And in reviewing them, have you seen any of them before? In reviewing them did it ring any bells that you had seen any of them before?

A The only one I may have seen -- but I'm still not sure -- is Mr. Pickel's. And the other three I'm pretty sure I have never seen before.

Q Dr. Trifunac, you have, of course, reviewed all of Dr. Luco's submittals, have you not?

A I don't think so. I think I reviewed most of them, but I'm not sure I reviewed all of them.

Q The ones that are in evidence here?

A I would probably want to look at them to see. I think that he submitted one review which is the most recent one which I don't believe I have seen.

Q Okay.

A But I may be wrong.

Q That was a page, a page and a half. But you reviewed the other ones that he has submitted except for the most recent one?

A Yes.

Q All right.

And in the same light, is there anything in Dr. Luco's that is positive, using the term "positive" as we have

mpb15

used it before?

MR. FLEISCHAKER: I'm going to object.

I don't think there's any definition in the record as to what "positive" means.

MRS. BOWERS: Well, there was a definition given by Mr. Norton. He said "negative" means unfavorable to Applicant and Staff, and "positive" means favorable.

MR. NORTON: In the sense that they did something right.

MRS. BOWERS: He defined the term as he was using it in his questions.

MR. FLEISCHAKER: Okay. We now have a definition of "positive".

BY MR. NORTON:

Q All right.

Now, Dr. Trifunac, is there anything that you recall in those reports that is positive?

A (Witness Trifunac) I have to admit very frankly that I never read them with that in mind. I have looked at them concentrating on the substance and the technical merit, and I have really not read them from the semantical point of view whether a sentence is written in a positive or negative form.

A sentence can be negative and still mean something positive, and vice versa. I never really looked at them in

mpb16

that light.

Q Dr. Trifunac, I'm not going to be on this much longer, but that's not what I'm talking about, whether a sentence is in the positive or in the negative from a grammatical sense.

What I'm talking about is are there any comments in there that said that the Applicant did something right here or the Applicant's consultants did something right.

A Okay.

Q And in that context, there are no such comments, are there, Dr. Trifunac?

MR. FLEISCHAKER: Objection.

No, I'll withdraw the objection.

MRS. BOWERS: Can you answer the question?

WITNESS TRIFUNAC: Yes, I can.

I think that Dr. Luco can answer for himself. But to the best of my knowledge he has participated in those aspects of the problem which were not clear and where there was some difficulty, probably, and so both of us have addressed those primarily.

Very often we were sitting at a table and asked Do you think this is all right, Do you have any problems with that, and just a shake of the head that we don't have any problem was all there was to it. I think if you look at it from a very practical point of view, the time that we have

mpb17

spent viewing all the positive things and all the negative things together would have been enormous. And we have concentrated on things where we saw there was possibly a difficulty.

BY MR. NORTON:

Q Well, what is the difficulty, then, between you two and the other consultants whose reports you reviewed and you admit had positive comments, and, you know, along with a mix of suggestions? Why is your role somehow different from the role of the other consultants is my primary question?

MR. FLEISCHAKER: Objection.

There's been no foundation for that, and it's irrelevant. We keep going around the same circle. It doesn't seem that we're getting anywhere.

We've gotten four pieces of paper from some consultants; parts of the comments here or maybe all of the comments endorse the Applicant's position and the Staff's position. I'm not even sure that that's the case since I looked at the papers on geology, and, you know, it seems to me that there is no founding effect that can be reflected in inquiring into why did Consultant A address his comments in this aspect and Consultant B address his comments in another aspect.

MRS. BOWERS: Well, let's cut through this.

Perhaps the use of the term "role", how was your

mpb13

role different from the others, was an unfortunate term.

The witness has testified in reviewing the other documents, 38 through 41, that there are in his opinion statements that would fall within Mr. Norton's definition of "positive". And so now he's trying to find out if this witness has an explanation.

But the word "role" is --

MR. FLEISCHAKER: So what's relevant about that? I don't understand what's relevant about that. Who cares?

I mean, what's the legal relevance of that that somebody has a role and they say my role is to write both positive and negative, and another person says my role is to write -- to address questions that are unresolved. So what? Who cares?

MRS. BOWERS: Well, Mr. Fleischaker, we care. We're trying to find out in this proceeding -- which happens to be the first proceeding where ACRS consultants have appeared -- as much as we can about the way the consultants proceed, and the significance of their comments, and comments by others as to how they consider them.

So we do think it's relevant.

MR. FLEISCHAKER: Well, Mrs. Bowers, with all respect, that doesn't matter. The way the consultants perceive their role.

What matters is that these two gentlemen as experts

mpb19

have to say about the substantive issues that face this Board, not what the role of the ACRS consultants is. That's getting very close to the question of how the ACRS deliberates and how they utilize their consultants.

But these two gentlemen are here to present opinions, and it doesn't seem to me that we're here to inquire into the way in which the ACRS uses consultants. That doesn't seem to me to be relevant to the substantive issues that are before this Board.

MRS. BOWERS: Well, Mr. Fleischaker, you wanted into the record of this proceeding certain documents that had been prepared by Dr. Luco and Dr. Trifunac.

MR. FLEISCHAKER: Not because they say anything about the way in which the ACRS uses consultants, but because they express the opinions and the views of these two experts, period.

MRS. BOWERS: Go ahead, Mr. Tourtellotte.

MR. TOURTELLOTTE: But that's just the point. The point of Mr. Norton's questions is, it seems to me, is that is not the entire view of these consultants. That's at least one possibility of making the kind of inquiry that Mr. Norton is making. That is that if the witness -- as the witnesses have indicated, they are writing only from one angle. They're only addressing issues which they have trouble with. That does not mean that that is their full view.

mpb20

MRS. BOWERS: Well, I don't want to repeat what I said earlier, but we would like the -- the objection is overruled.

And what we'd like, Mr. Norton, for you to do is to pursue this briefly with the witnesses as to whether they have an explanation as to why some of the statements in the documents that you've identified differ from theirs, and then also give Dr. Trifunac an opportunity to explain what has been labeled positive statements in oral communication.

MR. NORTON: I would love to give Dr. Trifunac the opportunity, if I can just ask him several questions.

MRS. BOWERS: Go ahead.

BY MR. NORTON:

Q Dr. Trifunac, the Exhibits 38 through 41 that you reviewed, do have, as you agreed earlier and testified earlier, a mixed-bag, so to speak, of the positive and negative. Your comments and Dr. Luco's comments do not have that mixed-bag. The written comments are all of the negative nature.

You explained to us why your comments are negative. You explained that you are a busy man. You explained that you nodded in agreement and didn't find it necessary to put them in writing.

My question is:

For the other consultants -- why did they put their

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positive comments in writing? Were they not busy, or what? I just don't understand the distinction between the other nine consultants who have a mixed-bag of comments and your and Dr. Luco, who have a negative comment only, and that's what I'm trying to get at.

A (Witness Trifunac) I'm not sure I see the question, but I'll try to respond to whatever I hear.

First of all, you have a very small sample of consultants here.

Q Believe me, I can bring out more and more and more. But I thought that would be a waste of time.

A I agree with you.

The point is that typically a question is asked when there is a problem. Many times a question is asked, Do you see a problem with this. Many times I would receive this much paper, or this much paper --

MRS. BOWERS: Indicating one foot or two feet.

WITNESS TRIFUNAC: -- several feet of paper asking me to review this particular case, and I would hardly ever submit anything in writing because I would find the case to be all right.

And I think it is quite true that my typical involvement has been associated with the questions which were difficult to resolve or where somebody felt there may be a problem, and a critical opinion was looked for. There were

mpb22

many instances I believe in the Diablo sessions where a question went around the table, Do you have a problem with this, or do you have a problem with that? And I didn't have any problem.

But I think that taking my written commentary out of context to present that I have a negative attitude to a whole spectrum of things is just inappropriate.

Q The ultimate conclusion of fact is the Board's, and I'm not making that ultimate conclusion.

A I apologize.

Q I'm dealing with what I see in front of me, which are your comments and the other consultants' written comments. I don't believe -- you have very adequately explained your written comments, and, you know, why they are what they are.

What I still don't understand is why that isn't true of the other nine consultants.

MR. TOURTELLOTTE: Mrs. Bowers --

MR. FLEISCHAKER: He's asking the wrong person the question.

MR. TOURTELLOTTE: -- I would have to object, because I don't think he can testify as to what's in the minds of the other members of the ACRS.

MR. NORTON: Okay.

I'm not asking him that. I'm asking him if he knows the reason, if he knows why that is not true of the

mpb23

other nine consultants. If he doesn't, fine, that's the answer to the question, he doesn't know.

MR. FLEISCHAKER: I also want to point out one other thing here, and that is that Dr. Trifunac endorsed the selection of the OBE, and that seems to have escaped Mr. Norton's recitation of the facts.

MR. NORTON: Is Mr. Fleischaker under oath and testifying, because I'd like to cross-examine him.

MRS. BOWERS: Well, now, let's just back up here a minute.

MR. FLEISCHAKER: Fire away.

(Laughter.)

MRS. BOWERS: We agree with Mr. Tourtellotte that this witness cannot testify as to what's in the minds of other consultants. We do think a question can be phrased that can permit this witness to explain differences in his approach as in some of the documents that have been submitted.

We would really like to have the witness have the opportunity when he mentioned a minute or so ago that this or that and he had no problem, we'd like to have some of those areas identified.

If you can recall?

WITNESS TRIFUNAC: What would you like me to identify?

MRS. BOWERS: Well, you mentioned in considering

mpb24

Diablo Canyon that there were matters that you had no problem with, and round table discussions and that sort of thing. Can you recall any specifics?

WITNESS TRIFUNAC: Well, I have gone through many lengthy sessions, a hearing about geology, where I think very thorough work was done. I have seen a lot of and heard a lot of discussions dealing with structural design which were quite all right.

I think I can just go on and on and on. A lot of things were done quite appropriately, and the confidence I have gotten there is the main reason why I said during my deposition that I believed that engineering was done well and that I don't think that for engineering structures, civil engineering structures would have major difficulties during a reasonable earthquake.

But I have never taken time to ennumerate those. Those would be many.

BY MR. NORTON:

Q Okay.

Dr. Trifunac, in response to your last statement that you don't think there would be any problem, any major difficulty -- I think your quote was there would be no major difficulties during a reasonable earthquake.

Mr. Fleischaker doesn't like your term "reasonable" earthquake, it doesn't have any meaning to him. What do you

mpb25

mean "reasonable" earthquake again? Let's pin that down.

A (Witness Trifunac) By "reasonable" earthquake I mean something in the vicinity of 6-plus that might occur right opposite the site that would have the properties of stress drop, soil dimensions that I can imagine Hosgri to have.

Q 6.5; you said 6-plus. 6 to 6.5?

A There is no need to be that specific. I am simply looking at the whole picture and imagining what might happen in the sense of the whole picture.

If you have to have some numbers, yes, 6, 6.5 would be there amongst all other numbers.

Q All right.

Now I'll try once again to ask this question, and I hope it doesn't engender another 15 minute debate.

Are you aware of any reasons why the other consultants' written submitted comments to the ACRS were a mixed-bag of the positive and negative as opposed to your written comments and Dr. Luco's written comments which were of the negative nature? And if you're aware of it, say yes, and then I'll ask another question. If you're not aware of any of the reasons for that, say that, and I'll get off it.

A I don't think I'm aware of a complete set that I could define for you.

Q All right.

I have one last question, and this is the same

mph26

question I asked of Dr. Blume and the other consultants to the Applicant.

Are you aware of anything correct that Dr. Newmark did in this case, anything that he did that was right?

A Yes.

Q And what are those?

A I think I would agree with him on the way he approached the problem in trying to avoid naming magnitude as explicitly as other approaches have tried. I think I would agree with his approach in utilizing a particular record and not trying to force the issue of a peak, trying to put some free-hand lines to the record, I think that was a good idea.

Q Would it be fair to say, then, that the only thing you disagree -- in terms of what Dr. Newmark did, the only thing you disagree with is the reduction of .75g for tau?

A Yes.

Q All right.

MR. NORTON: I have no further questions.

MRS. BOWERS: Mr. Tourtellotte?

BY MR. TOURTELLOTTE:

Q I think you also -- to correct that last answer, you also had some difficulty with the seven percent damping, isn't that correct, the reduction?

mpb27

A (Witness Trifunac) Yes, but it wasn't clear to me where that came from. Dr. Newmark did support that, I understood, but it wasn't clear to me whether it was just his number or....

Q But assume for a moment that you exclude those factors, the tau effect and the seven percent damping, and you use instead, say, five percent damping.

In your general opinion would the structure still be safe if you included the use of those two items?

A You mean --

MR. FLEISCHAKER: Could we have a definition of which structure? There are several structures.

BY MR. TOURTELLOTTE:

Q Well, I'm really only interested in the containment structure.

A (Witness Trifunac) I'm not sure I understand your question.

Are you asking me if you were to excite the base of the containment with spectra that represent Dr. Newmark's spectra, which happen to have .75 amplitude at the high frequency and a five percent damping in the structure, do I think that the structure would be still all right, is that what you're asking?

Q No.

What I'm saying is in your own view, if whatever

mpb28

approach that you take -- you indicated yesterday that if you had to take a conventional approach and you took -- the first approach I think was the magnitude approach, which was the typical approach, or I think we've called it typical today --

A Yes.

Q -- if you took the typical approach and did the approach your own way, I assume that you would not use the tau effect, and I assume that you would use five percent damping.

And the question I'm asking is:

If you take that typical approach doing it your way, would you come out with an opinion that the structure was safe?

A If we can strike the word "safe" and replace it with something else, I would say that I believe that under those conditions the structure would still go through the earthquake without any major difficulty.

MR. TOURTELLOTTE: I don't have any other questions.

EXAMINATION BY THE BOARD

BY MR. BRIGHT:

Q I've heard the number of eleven consultants to the ACRS bandied about quite a bit. Are all of these consultants with essentially the same expertise as you and Dr. Luco?

A (Witness Trifunac) To the best of my knowledge,

mpb29

no. In fact, I don't know whether I could name the eleven myself.

Q Well, let's see now. If they don't have roughly the same qualifications as you do, then you shouldn't be called eleven consultants, you should be called a lesser number?

A That would be correct.

Q Could you put a number on that? I assume there's more than just you and Dr. Luco.

A My understanding has been, although there is a considerable degree of overlap in what we comment and discuss, that there are two to three consultants that discuss or are invited to participate in geological considerations. There are three to four consultants, of which not all of them are always present, that can address earthquake engineering or engineering aspects of the problem, various parts.

I have been participating in most geological considerations, most seismological, and civil engineering, earthquake engineering aspects of the problem. And depending on the issues that were discussed at the time, there would be maybe just one geological consultant, or maybe just one strictly civil engineering consultant, or just one seismological consultant.

Q Well, I guess what I really should have asked:

How many consultants does ACRS have who would be asked to comment upon the same subjects that you have been asked

wpb30

to comment upon?

A If you are addressing the whole spectrum of the questions that I have received, I don't know anybody that has operated in so many spheres. I think the only other person that has approached that number of disciplines is Dr. Luco. Most other consultants, now typically, not in an absolute sense, but typically would address a narrower field, geology or seismology or civil engineering.

MR. NORTON: Excuse me, Dr. Bright.

Before we leave that -- I'm not going to have any other recross, but I think there's a miscommunication going on here. I'm very confused by your questions and his responses, and I don't know whether Dr. Trifunac is talking about specifically this case or ACRS consultants in general.

MR. BRIGHT: This case.

WITNESS TRIFUNAC: This case, yes.

MR. NORTON: Well, would it help if I read the names of the consultants, Dr. Trifunac?

WITNESS TRIFUNAC: Please.

MR. NORTON: Would it bring back -- maybe help you answer the questions?

I believe Dr. Wilson is now deceased, is that correct?

WITNESS TRIFUNAC: Yes.

MR. NORTON: And he was one of the consultants.

mpb31

Dr. White, Dr. Thompson, Dr. Pickel, Dr. Scavuzzo, Dr. Catton ---

WITNESS TRIFUNAC: Could you go a little slower, so that I can write them down in case you have other questions?

MR. NORTON: Dr. White and Dr. Thompson ---

WITNESS TRIFUNAC: Dr. Wilson, Dr. White, Dr. Thompson.

MR. NORTON: Dr. Pickel.

WITNESS TRIFUNAC: Yes.

MR. NORTON: Dr. Scavuzzo.

WITNESS TRIFUNAC: Dr. Catton, C-a-t-t-o-n.

WITNESS TRIFUNAC: Okay.

MR. NORTON: Dr. Page.

WITNESS TRIFUNAC: Yes.

MR. NORTON: Dr. Filbrick.

WITNESS TRIFUNAC: Yes.

MR. NORTON: Dr. Maxwell.

WITNESS TRIFUNAC: Yes.

MR. NORTON: And Trifunac and Luco.

WITNESS TRIFUNAC: Yes.

Thank you.

MR. NORTON: That's eleven.

BY MR. BRIGHT:

Q My only question is how many would be asked to

mpb32

make the same kind of evaluation that you and Dr. Luco made in this particular matter, the evidence that is before us?

A (Witness Trifunac) Which particular matter? Ground motion, or -- could you be more specific? The whole question of Diablo, or....

MR. NORTON: Dr. Bright, the problem is is that they were not asked specifically, they were given -- they were asked to attend and then comment on what happened, or they were given submissions and asked to review and submit comments, I believe is the testimony. So that's where I think the miscommunication comes. I don't think they ever said You are to respond only in this area sort of a thing.

MR. BRIGHT: No, that certainly wasn't my question either.

BY MR. BRIGHT:

Q The real question is:

If you're going to talk about the soil-structure interaction and from the point of view of a structural engineer, that you would not ask a geologist to do this.

A (Witness Trifunac) Yes.

Q Now my question is:

How many of the people on that list are qualified to respond to the same things that you and Dr. Luco did, and is in the evidence before us?

A I am embarrassed to talk of other people's

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qualifications. I can do my -- I can give you my best judgment, my best understanding, with the understanding that I am not trying to impose on anybody's background.

Q It just seemed like eleven consultants is a tremendous number of consultants.

MS. NORDLINGER: Excuse me, Madam Chairman. Perhaps I'm out of turn, but I have some concern that the witness is being asked to comment -- or to be an expert on the ACRS process rather than to present expert testimony.

MR. BRIGHT: Oh, no, no. If I'm getting close to that, give me the eleven foot pole.

MS. NORDLINGER: Just so there is that....

MRS. BOWERS: Well, there may be another communication thing here.

I don't think you were being asked to evaluate the qualifications, but just to identify the various disciplines, which would not be going beyond --

WITNESS TRIFUNAC: I'll be glad to do that.

Dr. Wilson, who is deceased now, could be called a geophysicist, and he discussed questions of seismology in general, but he did address geology as well.

Mr. White is a civil engineer, and he would address questions on dynamics and on damping typically.

Dr. Thompson is a geophysicist. He addressed questions dealing with geology and geophysics, up to the point

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of studying how much the fold could move and questions like this.

Mr. Pickel is an engineer, and he did not participate in all the meetings. In many meetings, as I remember, he addressed various questions that deal with equipment.

Mr. Scavuzzo, I didn't know that he was a consultant to ACRS, and I have seen him only during several of our meetings, once that I remember related to this case. I wasn't aware that he was a consultant to the ACRS.

Mr. Catton, I don't know him. He may have been at a meeting, but I was not aware that he is a consultant.

Dr. Page is a professor of geology and geophysics at Stanford. He addressed questions of geology.

Dr. Filbrick is a geologist.

Dr. Maxwell is a geologist. He addressed, as well as Dr. Filbrick, only questions on geology.

Then comes my name, and I addressed to a limited extent questions on geology and addressed questions in seismology and earthquake engineering, down to dynamic response of structures.

And Prof. Luco, who is here, did not participate in early geological considerations. He may have participated, to the best of my recollection, in some seismological considerations, but to a very limited extent. And he has really

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addressed primarily questions that deal with soil-structure interaction and dynamic response of structures.

MR. NORTON: Excuse me, Dr. Bright. The witness stated Dr. Scavuzzo, but I don't believe he gave his qualifications. I have in front of me a report by Dr. Scavuzzo that was submitted to the ACRS, entitled, "Comments and Recommendations for the Proposed Seismic Design Criteria for the Reevaluation of the Diablo Canyon Site."

As you can see, it's a rather lengthy report, and I think his qualifications --

WITNESS TRIFUNAC: I didn't mean to question his qualifications. All I said is that, to the best of my knowledge, I did not know that he is a consultant to ACRS. And, to the best of my recollection, he participated only in one of the meetings that I attended.

That's all I wanted to say. I'm not questioning his qualifications at all.

MR. NORTON: Or that he indeed worked on it?

WITNESS TRIFUNAC: He may have done a lot of work I don't know about.

MR. FLEISCHAKER: Let me ask, are his qualifications there? I still don't know that we have in the record what his --

MR. NORTON: The word "qualifications" was the wrong word. Specialty, field or specialty, is what --

MR. FLEISCHAKER: Do we have that yet? Do we know what his field is? I don't think that's in the record

yet.

MR. NORTON: Well, I'm not going to say what they are. It's up to Dr. Trifunac. Maybe he doesn't know Dr. Scavuzzo and doesn't know what his field of expertise is. But he certainly did work on Diablo Canyon and submitted a report to the ACRS, a rather lengthy one, that I just showed the witness -- or held up to show him.

MR. FLEISCHAKER: Could you give me the date of that report?

MR. NORTON: It's 1976. If you'll hang on, I can give you the exact date.

(Pause.)

November 13, 1976, at the same time these people submitted their comments to the ACRS.

MR. FLEISCHAKER: Thank you.

MR. BRIGHT: I think that answered that question.

BY MR. BRIGHT:

Q I have another --

MRS. BOWERS: Before you leave this, was this a special proceeding where only the seismic question at Diablo was discussed, and what should be done? Was it a Committee or Subcommittee meeting of ACRS?

WITNESS TRIFUNAC: The meetings I participated in were -- a majority of them -- were subcommittee meetings, and a number of them were full Committee meetings. I don't

remember how many of which, but a majority were subcommittee meetings and I was only there when there was a question related to seismic design to be addressed. I was not there on any other issues.

MRS. BOWERS: Well, we had one segment of our hearing on non-seismic-related issues, so I was trying to find out if this was a specialty group, and apparently it was, that you were involved in.

WITNESS TRIFUNAC: Yes.

BY MR. BRIGHT:

Q My other sort of inquiry is qualitative at best, on what Mr. Norton was trying to determine just recently about saying positive and negative things.

I only have my own experience in my particular field to go on, and I wonder if it might not be the same in seismology, geology or different disciplines. But I like to think of brothers under the skin, and this sort of thing.

MRS. BOWERS: Are you going to tell them what you are?

(Laughter.)

MR. BRIGHT: Anything but a nuclear physicist, Beth.

(Laughter.)

MRS. BOWERS: I haven't introduced you as a nuclear physicist for several years.

MR. BRIGHT: Since I screamed about it.

(Laughter.)

BY MR. BRIGET:

Q On the occasion of peer review, which we're all called upon to do, and this is roughly what a consultant does, if your principal concern was determining if something was wrong, if it was all right, well, then there's no problem.

So you are intent upon that, is that a fair statement?

A I think that a fair statement is that I wouldn't even be there if there is no problem.

Q I think that answers the question.

To continue on that, obviously if you are reviewing something, you are reviewing a document or documents which are laid before you, fully elucidating the situation and the method of procedure, and all of that. So there is much less need to say something like, "Hey, boy, great job."

Instead, the way it works -- with my colleagues, anyway -- if you really said nothing about it, you tacitly implied it's all right.

Would this extend to the --

A That is quite correct.

Q And on the mixed review business, if you had to write a memorandum to somebody, whether you wanted to or not, and you really couldn't find anything very wrong, and you found a number of things that were pretty good, you would probably dash off a short memo saying, "Well, I looked at

this, and although I may have a little reservation over here, this looks good, that looks good." You wouldn't just send in something saying, "Okay." Signed.

A I would typically not do anything about it. I would just express this orally, and that would be the end of it.

Q Oh. Well, all right. But one way or another, this is probably what you would do?

A Yes.

MR. BRIGHT: Thank you.

MRS. BOWERS: Well, let's go back to the parties, based on the Board questions.

Mr. Fleischaker?

MR. FLEISCHAKER: May I have one moment, please?

(Pause.)

CROSS-EXAMINATION ON BOARD QUESTIONS

BY MR. FLEISCHAKER:

Q Dr. Trifunac, you were asked some questions by the Staff as to your opinion as to the structural response of the containment subjected to the strong ground motion associated with an approximately 6.5 earthquake.

My question is: Do you have an opinion as to the structural response of the turbine building if subjected to the strong ground motion of a 6.5 magnitude earthquake on the Hosgri within 10 kilometers of the site?

A It's much more difficult for me to comment on the turbine building. It's a more complicated structure, and it's a very difficult structure from the dynamics point of view to assess with that degree of confidence that I have expressed about the containment.

I have some doubts about it, but I couldn't put them on a specific scale.

Q Do you feel confident about the abilities of the containment, is that correct?

A I am reasonably confident about the containment.

Q Would additional analysis help resolve the doubts that you have about the turbine building?

A I doubt it.

Q Well, do you have an opinion as to whether additional modifications should be made to the turbine building in order to resolve the doubts that you have about the ability of that building -- or about the performance of that building, assuming the occurrence of a 6.5 magnitude earthquake?

A You see, the difficulty and the doubt that I expressed is related to the overall system of that building as it is, and when I look at it it has a lot of shear walls combined with steel structure, and it is very difficult for me to see how it would act in an integral way, and how strains would be distributed, and so forth.

And so the whole concept is difficult for me to judge on.

So additional study that would add something here and there would not necessarily change my inability to assess it as to what would happen if very strong shaking were to take place.

Q You have expressed some doubt as to the nature of the response of the structure given the shaking associated with a 6.5 magnitude earthquake.

Let me ask you this question:

Do you believe that the inelastic analysis that Dr. Luco has recommended would assist in your understanding of the nature of that response ?

A I think it would help.

Q Do you have an opinion as to whether that analysis should be performed on the turbine building?

MR. NORTON: Object. "Should be performed?" For what purpose? Before an operating license issues? Tomorrow? What?

I don't understand the context of that question. Should be performed for scientific purposes, for research purposes?

I don't understand.

MRS. BOWERS: Could you be more specific, Mr. Fleischaker?

MR. FLEISCHAKER: Let me withdraw the question.

I don't have any further questions.

MRS. BOWERS: Mr. Norton, do you have any questions?

MR. NORTON: Yes, I have a question or two.

I'm going to use the depositions, Mr. Fleischaker, I'll warn you. Page 49, on the question you asked regarding the turbine building.

BY MR. NORTON:

Q I'm going to read you your response in that deposition and ask you if that is, indeed, the same thing you're saying today, because the words are different but I interpret it the same, and I understood this but I'm not sure I understood what you said today.

"In other words..." --

MR. FLEISCHAKER: Can you hold on one second, Mr. Norton, before you read from page 49? I'd like to look at page 49.

MR. NORTON: Go ahead and look.

BY MR. NORTON:

Q "In other words, modifications..." --

MR. FLEISCHAKER: No, no. The request is for you to stay reading it until I have an opportunity to take a look at it. As I recall it, he said several things about the turbine building throughout the course of the deposition.

MR. NORTON: That's fine. You can do anymore

redirect you want. This is one of them.

May I proceed, Mrs. Bowers?

MRS. BOWERS: Wait a minute. They can't find the deposition.

(Pause.)

Did you find it? Let him get to the page.

(Pause.)

MR. FLEISCHAKER: Fine.

BY MR. NORTON:

Q On page 49 you say:

"In other words, modifications have satisfied, as best as I could judge, looking at very simplified pictures, basically ACRS proceedings..."

I presume you meant you were looking at the pictures at the ACRS proceeding --

"...they have satisfied greater forces than result from the Hosgri. But I hope you appreciate there's ample evidence in our practice that satisfying the forces alone doesn't necessarily produce a good design."

So it seems to me there that you said that the structure as modified satisfies greater forces than result from the Hosgri. Is that correct?

MR. FLEISCHAKER: I'd like to provide a copy of the transcript to this witness.

WITNESS TRIFUNAC: I remember what I said. Yes,

this is what I said, but can I clarify, so that this is not taken out of context, what was meant then and what is meant today is that the structure was originally designed without Hosgri, so greater forces refers to Hosgri.

I'm not saying forces greater than Hosgri.

Q Okay.

A Is that what you understand?

Q Hosgri forces, then?

A Right. Right. Because you didn't read beforehand, and so this might be taken out of context.

Yes, that is what I said, and this is what I mean today.

Q Okay. If you don't like the design of the building that's not the same as saying that when the Hosgri happens it's going to fall down, is it?

A That's correct.

Q I've got one last question, and I know you're not going to want to answer it, but I hope the Board will make you.

(Laughter.)

MR. FLEISCHAKER: Before we go on to the next question, since we're on this and we're reading from this deposition, I'd like to ask a question here about what Dr. Trifunac said, because we're getting into this whole question of how you utilize a deposition. I think this is one of the problems with depositions. And as long as we're on this

particular point, and at this point in the record, I'd like to read another answer that he gave to this same series of questions.

MR. NORTON: Mrs. Bowers, that is totally improper. If he wants to do some proper redirect when it's his turn, fine. He's already had the opportunity to ask all the questions he wanted to on the turbine building, and I'll let him have yet another bite.

But I'd like to have Mr. Fleischaker quit stalling, because that's what I think he's up to now. I don't know whether he wants to keep Dr. Newmark off the stand this afternoon, or what. But this is ridiculous. I can't ask one question without getting interrupted by Mr. Fleischaker.

MRS. BOWERS: Mr. Fleischaker, we'll come back to you. I think Dr. Trifunac has a copy of the deposition. Is that what I'm looking at there?

WITNESS TRIFUNAC: Yes.

MRS. BOWERS: So, you know, he has a copy. You can come back to it.

Go ahead, Mr. Norton.

BY MR. NORTON:

Q Dr. Trifunac, before we move on to my last question, I haven't misconstrued or misled, or anything, what your feelings are about the turbine building, have I?

A No, what you did I thought was clear to me.

Q And you understand the question, and you fully stated your position on the turbine building, is that right?

A I think so.

Q Thank you.

My last question:

Can you state within a reasonable degree of engineering certainty that the operation of Diablo Canyon, as modified -- as the construction modifications have been completed -- would present an undue risk to the health and safety of the public?

Now, would you like me to read it again to make sure you got the right wording?

A I think the answer to that question asks of me more than I know.

Q Okay. So the answer is: You cannot state within a reasonable degree of engineering certainty that the operation would result in an undue risk to the public health and safety. For whatever reason, you can't state that?

A Yes.

MR. NORTON: Thank you. I have nothing further.

MRS. BOWERS: Mr. Tourtellotte?

MR. TOURTELLOTTE: I have a couple questions.

BY MR. TOURTELLOTTE:

Q Dr. Trifunac, some questions were asked about your experience or, actually, your expertise, and it brought to

mind a couple of questions that I meant to ask and I didn't.

It has to do with whether you have been primarily responsible for arriving at design values for any major structures.

A Could you be more specific? Earthquake design, or other design?

Q Well, in general what I'm trying to get at is:

I take it that people in your profession with an engineering background and seismic background might potentially be engaged in the business of coming up with design values for major structures, but not just coming up with design values to give to somebody else. I'm talking about actually being responsible for the designing of a major structure.

It seems like I recall -- I don't know whether it was at the deposition or whether we were talking, or what it was -- that you indicated that you had participated in the design of a couple of structures, a bridge and a silo, or something like that.

But I don't believe it's in this record, and I wanted to get that into the record.

A I was not responsible for the ultimate result.

Q You did have some input into two structures, though, as I recall?

A I did work on the design. I did the analysis, I did proportioning, I put the steel in, and so forth. But I

did not have the responsibility of carrying the whole thing through. I was not the principal engineer. I was not responsible for the final result.

Q And those two structures that you worked on, one was a bridge?

A Yes.

Q And one was a grain silo?

A A silo for wheat grain.

Q For wheat?

A Yes.

MR. TOURTELLOTTE: Those were the only questions I had.

MRS. BOWERS: Mr. Fleischaker?

MR. FLEISCHAKER: I have two questions of Dr. Trifunac, short ones.

BY MR. FLEISCHAKER:

Q The first has to do with your opinion as to the response of the turbine building, and my question is:

Have you offered the opinion in the past that if a 6.5 magnitude earthquake occurred on the Hosgri that you're not sure what would happen to the building, primarily because the design didn't look clean to you?

A If I used those very words, I didn't mean to say that.

What I meant to say was that the structural system

didn't look clean to me. The design is probably quite adequate. Carrying out the concept is probably quite adequate. Calculating the forces is probably quite adequate.

But I look at the picture of the whole thing together, and I used those words that the picture didn't look clean to me.

Q Okay. Putting aside, or substituting the words "structural system" for "design," is it your current opinion that should a 6.5 occur that you're not sure what would happen to the building?

MR. NORTON: Object. That's been asked and answered. I'll withdraw the objection and let him answer again, but I think he wants to listen to the question very carefully, because when I said it had been asked and answered, I realized that he's turned two words around in there. So it hasn't been asked before. It's been answered, but it hasn't been asked.

(Laughter.)

MR. FLEISCHAKER: May I have the question back?

(Laughter.)

(Whereupon, the Reporter read from the record, as requested.)

WITNESS TRIFUNAC: Let me explain what I mean, all right? Questions were asked whether structures will be going through an earthquake of 6.5. I hope it is clear from

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some of my written testimony, from my written comments to ACRS -- not testimony -- from what I have said the other day and today, that I have some reservations about the final design spectrum as used for calculations of what buildings will do.

Now, all the analyses that I have seen are linear analysas, and so the discussion and the question of whether buildings will survive excitation of a 6.5 earthquake are based on a considerable degree of judgment, and that judgment varies. And degree of certainty is a function of the structural system.

What I meant to say before, and what I'm trying to say again is this:

That the containment, as opposed to the turbine building as a structural system, is such that, based on my observation and the studying and past experience, that I am reasonably confident that that structural system has more energy capacity in it to go into a non-linear range, and, therefore, not be as seriously affected by excitation of a 6.5 magnitude earthquake.

I'm not saying that it would be seriously damaged. I'm not saying it would not be slightly damaged. I'm saying that it is difficult to judge about it, because a structural system is complicated. It's difficult to use my feelings that I have on the basis of past experience in looking

at what happened to other structures to judge about it.

I said that it was looked at on the basis of additional forces that result from Hosgri, and my understanding has been that those have been taken care of.

Q Let me ask you, then, for the last question, sort of the flip side of the Applicant's question:

Limiting this to your area of expertise, have the Applicant and the Staff demonstrated that the Diablo Canyon Nuclear Power Plant can be operated without undue risk to the public health and safety?

A I think this is the question I already answered.

MRS. BOWERS: Well, you answered it from the Applicant. Mr. Fleischaker is repeating it.

BY MR. FLEISCHAKER:

Q Have Applicant and Staff demonstrated that the Diablo Canyon Nuclear Power Plant can be operated without undue risk to the public health and safety?

A I don't think I can answer the question. That deals with safety. That stretches way beyond my expertise.

MR. FLEISCHAKER: No further questions.

MRS. BOWERS: I assume there are no further questions from the parties. Is that true, Mr. Tourtellotte? No further questions?

MR. TOURTELLOTTE: No, ma'am.

MR. NORTON: May we take a five-minute recess

before Dr. Newmark goes on?

MRS. BOWERS: Yes. First, I want to mention, soon after the luncheon break I mentioned the situation as to why you witnesses are here, and I just want to repeat that we find your testimony very valuable, and we're glad that our record will contain it.

Is there any reason why these witnesses cannot be excused?

(No response.)

Well, I would like to thank you for coming, but I realize you didn't do it voluntarily, that there were subpoenaes issued. But I'd like to thank you for coming, and have a safe journey home.

Thank you.

(Witnesses Luco and Trifunac excused.)

MR. TOURTELLOTTE: May we have a bench conference?

MRS. BOWERS: Yes.

(Whereupon, a conference at the bench was held.)

MRS. BOWERS: We will be in recess until 8:30 Monday morning.

(Whereupon, at 3:10 p.m., the hearing was recessed, to reconvene at 8:30 a.m., Monday, 12 February 1979.)