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**Official Transcript of Proceedings**  
**NUCLEAR REGULATORY COMMISSION**

Title: Private Fuel Storage, LLC

Docket Number: 72-22-ISFSI; ASLBP No. 97-732-02-ISFSI

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UNITED STATES OF AMERICA  
 NUCLEAR REGULATORY COMMISSION

In the Matter of: )  
 PRIVATE FUEL STORAGE, LLC, ) Docket No. 72-22  
 (Independent Spent Fuel ) ASLBP No.  
 Storage Installation) 97-732-02-ISFSI  
 )

U. S. Nuclear Regulatory Commission  
 Sheraton Hotel, Wasatch Room  
 Salt Lake City, Utah 84114

On May 13, 2002 the above-entitled matter came  
 on for hearing, pursuant to notice, before:

MICHAEL C. FARRAR, CHAIRMAN  
 Administrative Judge  
 Atomic Safety & Licensing Board Panel

DR. JERRY R. KLINE  
 Administrative Judge  
 Atomic Safety & Licensing Board Panel

DR. PETER S. LAM  
 Administrative Judge  
 Atomic Safety & Licensing Board Panel

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## I N D E X

## E X A M I N A T I O N

Witness Panel:

Witness Panel:

John A. Stamatakos, Martin McCann, Rui Chen  
 Cross Examination by Ms. Chancellor 8131  
 Recross Examination by Mr. Gaukler 8281  
 Redirect Examination by Mr. Turk 8284  
 Recross Examination by Ms. Chancellor 8336  
 Further Redirect by Mr. Turk 8344  
 Further Recross by Ms. Chancellor 8347

Lt. Colonel Hugh Horstman  
 Cont. Cross Examination by Mr. Gaukler 8349

-oOo-

## E X H I B I T S

No.	MRKD/ADMTD
State Exhibit 185	8226/
Final Report - Volume I of III, Fault Evaluation Study and Seismic Hazard Assessment, Revision 1	
Staff Exhibit JJ --	8286/8301
Scientific Notebook 353	

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1 Monday, May 13, 2002

9:00 a.m.

2

3

P R O C E E D I N G S

4

5

JUDGE FARRAR: Good morning, everyone.

6

Hope you all enjoyed your at least a one-day

7

weekend. Back on Monday morning ready to continue

8

the State's cross-examination of the Staff panel.

9

Any preliminary matters? Then we'll get

10

started.

11

12

CROSS-EXAMINATION (CONTINUED)

13

BY MS. CHANCELLOR:

14

Q. Good morning.

15

DR. STAMATAKOS: Good morning.

16

Q. I'd like to just clarify a couple of

17

things in your testimony. On answer 19, page 25 of

18

your testimony, I guess this is you again,

19

Dr. Stamatakos. No, Dr. McCann was responsible for

20

25. Is that right? No, 19. Beg your pardon.

21

It's Dr. Stamatakos. I was right the first time.

22

Page 25.

23

In the second paragraph which begins,

24

Third, in adopting the regulations in 10 C.F.R.

25

Part 72 the Commission indicated that the design

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1 earthquake for an ISFSI should be determined on a  
2 case-by-case basis. What is your understanding of  
3 adopting regulations?

4 DR. STAMATAKOS: The adoption of  
5 regulations is to set standards for license  
6 applications. But in this instance, because of the  
7 ongoing efforts to revise Part 72 to incorporate a  
8 probabilistic approach, the Commission recognized  
9 that some work needed to be done, and I think our  
10 interpretation of that is that they wanted to look  
11 at a number of site-specific cases for coming to a  
12 complete decision on how to implement that in the  
13 regulation.

14 Q. And this regulation was enacted in 1980;  
15 is that correct?

16 DR. STAMATAKOS: I don't know the exact  
17 year. I'd have to check that.

18 Q. Is it your testimony that you can go  
19 around the regulations and not comply exactly with  
20 the regulations and use a case-by-case analysis  
21 that the regulations prescribe in a specific  
22 approach?

23 MR. TURK: Objection, your Honor. I  
24 think she's asking this witness for a legal  
25 interpretation of the regulations. He's an expert

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1 in seismology and geological matters. He's not  
2 presented to interpret NRC regulations.

3 MS. CHANCELLOR: Well, then I suggest  
4 that this paragraph be stricken: Third, in adopting  
5 the regulations, the Commission indicated a  
6 case-by-case -- to determine the DBE on a  
7 case-by-case basis. Either this is not an  
8 interpretation of the -- of a legal issue, in  
9 which, other words, then I'm entitled to ask him  
10 about it; and if this is a legal interpretation,  
11 you've just said that he's not qualified to testify  
12 about that. So I don't -- your Honor, I don't  
13 think counsel can have it both ways.

14 JUDGE FARRAR: Why don't we do this.  
15 Why don't we let this line of questioning continue  
16 but with instructions to the witness, what the  
17 state and we are looking for is not your legal  
18 interpretation but perhaps the practice that's  
19 followed under this regulation. If you're familiar  
20 with that you can testify as to that, but not as to  
21 what the legal interpretation may be. And we'll  
22 see where we get with that, and then, Mr. Turk,  
23 you're free to renew your objection if that doesn't  
24 work.

25 MR. TURK: Thank you.

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1 DR. STAMATAKOS: Could you read back the  
2 question?

3 Q. (By Ms. Chancellor) I'll rephrase it.  
4 Do you believe that it is an appropriate practice  
5 for the NRC Staff to review a design-basis  
6 earthquake on a case-by-case basis if the  
7 regulations prescribe a specific approach?

8 DR. STAMATAKOS: My interpretation in  
9 discussion with NRC Staff is that would only be  
10 appropriate in cases where an applicant has applied  
11 for a specific exemption from regulations, and then  
12 they would task us to evaluate the technical merits  
13 of that exemption if they deemed that the exemption  
14 was at least appropriate in terms of evaluation.

15 Q. Thank you. In answer 25, page 30, this  
16 one is Dr. McCann.

17 JUDGE FARRAR: Before you leave that,  
18 that statement in the middle of -- the quoted  
19 material in the middle of page 25, how could an  
20 ISFSI not involve a massive structure? It says for  
21 those which do not involve massive structures.  
22 What's an ISFSI without a massive structure?

23 DR. STAMATAKOS: I think you have to go  
24 back and look at what the Commission was deciding  
25 on it at that time. And I think when these were

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1 first envisioned they were not envisioned as cask,  
2 canister and pad, so they were envisioning a  
3 different single structure storage facility for  
4 something of that nature. That's my interpretation  
5 of what that meant. And when you look at what was  
6 written in the TMI findings, I think that there's  
7 some clarification there. And I don't remember the  
8 details, but again, I think they did not envision  
9 the changes in the technology that allowed these  
10 newer types of storage facilities.

11 JUDGE FARRAR: Okay, thank you.

12 Q. (By Ms. Chancellor) Dr. McCann, answer  
13 25, page 30, second paragraph. Are you there?

14 DR. McCANN: Yes.

15 Q. Beginning of this paragraph states that  
16 the underlying philosophy of DOE Standard 1020-94  
17 is to use a risk-graded approach. And then you go  
18 on to state that although not expressed in the same  
19 terminology, NRC relies on consideration of risk.  
20 Is that a fair summary there to that point?

21 DR. McCANN: Yes, I see it.

22 Q. And then as a rationale for that, the  
23 NRC relies on consideration of risk just like DOE  
24 does in 1020. You actually use the standard to say  
25 that the NRC is the same as the standard; is that

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1 correct? If you look at No. C on page 31.

2 MR. TURK: Are you asking if the Staff  
3 relies on the DOE standard?

4 MS. CHANCELLOR: Asking him to explain  
5 his testimony which -- the paragraph starts out,  
6 "The underlying philosophy of DOE Standard 1020-94  
7 is to use a risk-graded approach," and he says NRC  
8 relies on risk. He uses three examples, and the  
9 third one is DOE Standard 1020. Trying to  
10 understand this logic.

11 DR. McCANN: And what's the question?

12 Q. (By Ms. Chancellor) The question is,  
13 are you justifying NRC's reliance on risk to show  
14 that it's similar to DOE Standard 1020 by relying  
15 on DOE Standard 1020?

16 DR. McCANN: The question isn't entirely  
17 clear to me. If you're asking are we in this  
18 testimony attempting to justify the NRC regulation  
19 by virtue of or reference to the DOE standard, no,  
20 we're not trying to justify the NRC regulation.

21 Q. No, what I'm getting at is the reference  
22 on page 31 of your testimony where you give  
23 three -- the Staff considered (a), (b), and (c),  
24 and (c) is DOE Standard 1020, and looking at your  
25 testimony, you seem to be saying that the Staff is

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1 relying on DOE 1020 to say that it's the same as  
2 1020. I'm trying to get at why this is not a  
3 circular logic, circular reasoning. If you look at  
4 page 31, item (c), can you explain why that is not  
5 circular reasoning?

6 MR. TURK: If we could, could you allow  
7 the witness to read through that answer?

8 MS. CHANCELLOR: Oh, certainly.

9 JUDGE FARRAR: Sure.

10 DR. McCANN: The answer that's provided  
11 to question 25, which is really the in-depth  
12 response to question 24. And question 24 relates  
13 to the State's assertion that in supporting a grant  
14 of exemption based on a 2,000-year return period,  
15 the Staff relies upon the Department of Energy  
16 Standard 1020. Reading this loosely. And  
17 specifically the category-3 facility SSC  
18 performance standard that has such a return period.

19 So the answer is being given to that.  
20 We're addressing the concern of the state that we  
21 have somehow adopted DOE standard 1020. What we're  
22 attempting to do in the response in 25 is recognize  
23 what is going on with the Commission in their  
24 evolution to a risk-informed regulatory  
25 environment. And at the same time, as a point of

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1 reference in our thinking and in ultimately  
2 approving the exemption request, recognizing that  
3 DOE has gone through a similar evolutionary process  
4 in which they have, one, recognized the needs and  
5 benefits of going that direction, but more  
6 importantly, they have -- they have taken it to the  
7 level such that the practicing engineer can now  
8 utilize the specific products of a fully developed  
9 risk-informed approach.

10 And what we're attempting to do here is  
11 utilize what the Commission has given us in terms  
12 of what I'll call qualitative guidance, albeit with  
13 the foundation of what they've done on the reactor  
14 site both qualitatively and quantitatively in the  
15 sense of a risk-informed regulatory practice, we're  
16 trying to integrate those ideas together to show  
17 that this was part of our thinking, that we had a  
18 certain level of regulatory qualitative guidance,  
19 if you will, and the benefit of mature guidance as  
20 it had developed over in the DOE sector.

21 Q. Topic sentence of paragraph 2 is "The  
22 underlying philosophy of DOE Standard 1020 is to  
23 use a risk-graded approach." Then you say,  
24 although not expressed in the same terminology, the  
25 NRC relies on a consideration of risk. I still

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1 don't understand why part -- and then you use --  
2 the Commission's risk-related statement is (a); (b)  
3 is the previous approval of INEEL ISFSI; and (c) is  
4 DOE Standard 1020 itself. So maybe I'm beating a  
5 dead horse here, but you still haven't explained to  
6 me why this isn't circular reasoning. Aren't you  
7 relying on DOE Standard 1020 based on this topic  
8 sentence in paragraph 2 to say that NRC's risk  
9 approach is sort of like DOE Standard 1020 because  
10 of DOE Standard 1020?

11 MR. TURK: Excuse me. I would have to  
12 object. I don't understand why that's a circular  
13 reasoning.

14 MS. CHANCELLOR: It's fine. I'll move  
15 on.

16 JUDGE FARRAR: Before you move on, if I  
17 were the witness I would have answered, I think,  
18 this is not circular, this was how we integrated  
19 these different approaches. Is that what you wish  
20 you had said?

21 DR. McCANN: Well, I thought I was  
22 attempting to do that. And what I was going to add  
23 was that the third point, which appears to be that  
24 the point of concern is the case in point in the  
25 DOE standard that relates to the Commission's

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1 qualitative statement. So the first sentence is  
2 introductory and item (c) is the detail, if you  
3 will.

4 Q. And in that same answer you say that you  
5 did not attempt to impose DOE Standard 1020 as a  
6 regulatory standard on the proposed PFS facility,  
7 correct?

8 DR. McCANN: Correct.

9 Q. Isn't it true that DOE Standard 1020  
10 fundamentally couples the mean annual probability  
11 of exceedance of  $5 \times 10^{-4}$  with a target size and  
12 performance goal of  $1 \times 10^{-4}$ ? They interlink those  
13 two; is that correct?

14 DR. McCANN: Yes, they do.

15 Q. And NRC does not interlink the mean  
16 annual probability of exceedance of  $10^{-4}$  with -- I  
17 guess it's  $5 \times 10^{-4}$  with the seismic performance goal  
18 of a specific probability. Is that correct?

19 DR. McCANN: My understanding is that at  
20 this time the Commission has not established a  
21 performance goal both in terms of level of physical  
22 performance, meaning damage to the facility, and a  
23 probability of occurrence of that damage. However,  
24 in the current state of affairs, as I interpret it,  
25 the Commission does specifically have that in mind

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1 in the context of what they have done for nuclear  
2 power plants and their qualitative guidance with  
3 respect to ISFSIs, which is to say that the  
4 Commission has in mind that because the hazards are  
5 different, the radiological hazards are different  
6 at nuclear power plants and at ISFSIs, that indeed  
7 there is a difference in terms of performance  
8 goals, level of performance and likelihood of  
9 occurrence, and therefore the levels of design that  
10 would be imposed upon an ISFSI, meaning the  
11 probability of exceedance for a design-basis  
12 earthquake for an ISFSI would be different than it  
13 would be for a nuclear power plant.

14 Q. It doesn't fundamentally couple those  
15 two like DOE does; is that correct?

16 DR. McCANN: What does not?

17 Q. NRC Part 72 or the approach you've taken  
18 in granting the exemption doesn't fundamentally  
19 couple the mean annual probability of exceedance  
20 with the target size and performance?

21 MR. TURK: I object only to the compound  
22 part of that question.

23 MS. CHANCELLOR: I'm trying to compare  
24 two things.

25 MR. TURK: I understand, but you joined

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1 both the regulation and their approach here, and I  
2 have no problem with this if you're asking about  
3 the approach.

4 MS. CHANCELLOR: Okay, their approach  
5 here is fine.

6 DR. McCANN: It would be incorrect to  
7 say that our review of the seismic hazard analysis  
8 and our ultimate conclusion as to the exemption  
9 request and what is an appropriate probability of  
10 exceedance of the design-basis ground motion is  
11 totally uncoupled to the performance of the  
12 facility. And let me expand upon that.

13 Q. That's fine. If that's what you think,  
14 that's fine.

15 MR. TURK: May the witness complete his  
16 answer, please?

17 DR. McCANN: The application --

18 JUDGE FARRAR: If it bears on the  
19 question.

20 Q. (By Ms. Chancellor) Does it bear on the  
21 question?

22 DR. McCANN: It bears on the coupling  
23 issue.

24 Q. Fundamentally coupled. Not uncoupled,  
25 but I said coupled.

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1 MR. TURK: The witness stated that it  
2 would be wrong to state that the review is not  
3 totally --

4 MS. CHANCELLOR: Uncoupled.

5 MR. TURK: I'm sorry -- is totally  
6 uncoupled, but he said there is some coupling.  
7 He's going to explain that.

8 Q. (By Ms. Chancellor) Go ahead.

9 DR. McCANN: The application, as is  
10 obvious, is being submitted to the Nuclear  
11 Regulatory Commission. What is established are the  
12 engineering standards to which the facility would  
13 be designed. As, if you will, the practicing  
14 engineer among this group, that's one of the  
15 elements that I brought to this process. In  
16 recognizing that NRC standards, engineering  
17 standards were going to be imposed upon the design  
18 process, there are, therefore, levels of  
19 conservatism, seismic margin, if you will, that  
20 will be brought to bear in the design, and  
21 therefore it was recognized that that was a given.  
22 It wasn't something we had to address explicitly,  
23 but it was fully recognized as to what that meant.

24 Q. Is it a given that PFS complies with  
25 NUREG 0800 with respect to foundations? I think

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1 it's 372. Maybe it's 371.

2 DR. McCANN: I can't speak to the  
3 foundations topic.

4 Q. What about NUREG 0800, seismic design?  
5 Is it a given that PFS complies with NUREG 0800?

6 DR. McCANN: I can't speak to it  
7 specifically. What I was referring to was the fact  
8 that the design would be submitted to the  
9 Commission for their review, and the other side of  
10 the house, if you will, would review and presumably  
11 judge as to whether or not the standards have been  
12 satisfied.

13 Q. I'd like to turn to the --

14 JUDGE FARRAR: Before you turn to that,  
15 Ms. Chancellor, I hope you didn't get the  
16 impression by me supplying the witness's answer  
17 that I was trying to help one side or the other.  
18 The point I was trying to make, which I think we've  
19 discussed earlier in the case, is I know your  
20 lawyers tell, you just answer the question, and  
21 that's fine. Lawyers have been telling witnesses  
22 that from time immemorial. You've been around here  
23 long enough to know we do things in this  
24 administrative proceeding a little differently, and  
25 so if a question, if you think a question isn't

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1 exactly phrased right but you know what the  
2 questioner is getting at, we would encourage you in  
3 the interest of time to answer substantively the  
4 question, because sooner or later we'll get to  
5 that. Either counsel will ask you several times  
6 until you do understand it exactly, or lawyers will  
7 object and we'll skirmish, and 15 minutes later  
8 we'll get the answer you could have given at the  
9 beginning. I think Dr. Cornell was a good example  
10 the other day of taking the Board's questions,  
11 anybody's questions and helping us think about them  
12 correctly. So we would encourage witnesses to do  
13 that.

14 So Ms. Chancellor, that was the point I  
15 was trying to make rather than provide a helpful  
16 answer for the Staff.

17 MS. CHANCELLOR: Oh, your Honor, I would  
18 never think you were trying to put one side over  
19 the other.

20 Q. (By Ms. Chancellor) If you'd turn to  
21 answer -- on page 27, it's the carry-over of answer  
22 23. 23 starts on page 26 and carries over to page  
23 27. And you state -- who's responsible for 23?  
24 Dr. McCann, I believe. You state on page 27, the  
25 last paragraph, "Second, Reg Guide 1.165 determined

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1 the Reference Probability." Is it correct that Reg  
2 Guide 1.165 is the appropriate starting point for  
3 guidance on how to determine the reference  
4 probability or an annual probability of exceeding  
5 the safe shutdown earthquake ground motions,  
6 otherwise known as SSE, at future nuclear power  
7 plant sites?

8 DR. McCANN: I think there were two  
9 questions there. Your first one I think is wrong,  
10 and I think that question was, is 1.165 the  
11 appropriate reference to determine the reference  
12 probability. The answer to that is no. It  
13 explains how the reference probability was  
14 determined, but it is not per se a guide to  
15 determine the reference probability.

16 The second question I believe was, is it  
17 the guidance for determining the SSE given that  
18 there is a reference probability recommended in  
19 that document, and the answer to that is yes.

20 Q. And that's at future nuclear power plant  
21 sites, right?

22 DR. McCANN: After some date in January  
23 1997, yes.

24 Q. On page 27, the paragraph we're talking  
25 about through the next paragraph. From this

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1 testimony is it fair to conclude that the weight of  
2 existing NRC policy considerations indicates that  
3 future nuclear power plants licensed by the NRC in  
4 the western U.S., W.U.S, should be designed to  
5 withstand the mean seismic ground motion with a  
6 10,000-year return period?

7 DR. McCANN: Could you refer me to  
8 exactly where you're reading?

9 Q. I'm looking at paragraphs -- the last  
10 paragraph on page 27, the first paragraph on  
11 page -- through the first paragraph on page 29.  
12 That discussion there.

13 DR. McCANN: Okay.

14 Q. And from that discussion, can you  
15 conclude that the weight of existing NRC policy  
16 considerations indicates that future nuclear power  
17 plants licensed by the NRC in the West should be  
18 designed to withstand a mean seismic ground motion  
19 with a 10,000-year return period?

20 DR. McCANN: There's a reference cited  
21 there that is a paper presented by members of the  
22 NRC Staff. In that paper, and I believe the  
23 current DOE 10-20 document suggests that if you  
24 were to repeat the process that was going through  
25 in developing 1.165 in which they elected to use

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1 the median but repeated the process using the mean  
2 seismic hazard results, you would end up with a  
3 result that suggests that the reference probability  
4 would be approximately  $10^{-4}$ .

5 Your question also, though, referred to,  
6 would that be the design basis for plants located  
7 in the western United States. If 1.165 was based  
8 on the mean, the indication is both from folks in  
9 the NRC Staff who carried out the analysis that's  
10 referenced as well as by others, 10,000 years would  
11 be the starting point. 1.165 also -- and 1.165 is  
12 very explicit in that regard. 1.165 also indicates  
13 that for sites located in the western United States  
14 that an applicant might want to consider an  
15 alternative to the reference probability. But  
16 they're very clear that if nothing else is done,  
17 then the reference probability as stated in the  
18 guide would be the starting point.

19 Q. Do you know whether the Staff has any  
20 plans to submit to the Commission a proposal to use  
21 a reference probability for new nuclear power  
22 plants in the western United States that is greater  
23 than the mean annual probability of exceedance of  $1$   
24  $\times 10^{-4}$ ?

25 MR. TURK: Again, this is to his

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1 knowledge?

2 MS. CHANCELLOR: Of course, yes.

3 DR. McCANN: To my knowledge, I don't  
4 know of any plans, I just know what's documented in  
5 1.165, which is their guidance to western power  
6 plant owners or future owners that the Staff  
7 recognizes that the reference probability would  
8 likely be higher in the western United States, but  
9 the wording in the document suggests it's up to the  
10 applicant to come forth and make that case. But  
11 they haven't -- they had enough evidence at the  
12 time to make that statement.

13 Q. Dr. Stamatakos, do you know if the Staff  
14 has any plans to submit to the Commission the use  
15 of a 10,000-year earthquake for new nuclear power  
16 plants in the West?

17 DR. STAMATAKOS: I have no knowledge of  
18 that.

19 Q. Dr. Chen, do you?

20 DR. CHEN: No, I don't.

21 MR. TURK: For the record, your Honor, I  
22 think it's self-evident that these are not NRC  
23 Staff employees and they may not be familiar with  
24 whatever is going on in the Staff's thinking.  
25 Perhaps I would ask that question of the witnesses

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1 while we're here. Could I ask him to confirm that?

2 MS. CHANCELLOR: He may do that on  
3 redirect, your Honor.

4 JUDGE FARRAR: Confirm --

5 MR. TURK: That they're not familiar  
6 with what may be current Staff plans.

7 JUDGE FARRAR: We can almost take notice  
8 of that.

9 Q. (By Ms. Chancellor) Dr. McCann, are you  
10 familiar with the Yucca Mountain Topical Report 2,  
11 PFS Exhibit FFF?

12 DR. McCANN: I'm generally familiar with  
13 it, yes.

14 Q. Do you understand that in this document  
15 DOE needs to set a reference probability for  
16 frequency category-2 design events?

17 DR. McCANN: No. That category-2 -- no,  
18 the design process I'm not real familiar with.

19 Q. Dr. Stamatakos?

20 DR. STAMATAKOS: I'm a little more  
21 familiar with it because of the work we've done on  
22 Yucca Mountain. But I think the intent of topical  
23 report 2 by DOE was to establish the reference  
24 probability for seismic events for pre-closure  
25 activities at Yucca Mountain.

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1 Q. Is it true that in the topical report  
2 they distinguish between frequency category 1,  
3 which is an accident or unusual events that occur  
4 fairly regularly, and frequency category 2, which  
5 are events that occur such as 10,000-year  
6 earthquake, such as earthquakes that they are  
7 trying to distinguish between frequency category 1  
8 and frequency category 2 events?

9 DR. STAMATAKOS: I recognize that they  
10 were trying to distinguish between those two  
11 events. I don't remember all the details of that  
12 in the topical report. But I would note that that  
13 thinking has evolved a little bit because DOE is  
14 adjusting to Part 63 regulations as opposed to when  
15 that was first put forward by DOE when they were  
16 addressing things that were in Part 60 in the  
17 regulations.

18 Q. Dr. Chen, are you familiar with DOE  
19 Yucca Mountain Topical Report 2?

20 DR. CHEN: Yes, I've read that report,  
21 but that was many years ago. I was still working  
22 at the center.

23 Q. Do you understand that DOE needs to set  
24 a reference probability for frequency category 2  
25 design events?

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1 DR. CHEN: I'm not, no.

2 Q. Any of you aware that in this DOE  
3 document they, DOE refers to or develops the  
4 reference probability as a chart of the five  
5 nuclear power plants from which the reference  
6 probability was developed for the western U.S.?

7 DR. STAMATAKOS: Yes, I'm familiar with  
8 that.

9 DR. McCANN: Yes.

10 Q. Okay, you have some familiarity. Is it  
11 true that DOE's strategy to justify the probability  
12 of whatever they were trying to justify -- if you  
13 agree it's frequency category 2 events, that's  
14 fine, but whatever they were trying to justify in  
15 here, that they were comparing the mean annual  
16 exceedance of probability of seismic design basis  
17 events of nuclear power plants in the United  
18 States? Is that correct?

19 MR. TURK: I don't understand the  
20 question at this point.

21 MS. CHANCELLOR: Well, your Honor, these  
22 witnesses have testimony referring to --

23 MR. TURK: I'm not objecting to the  
24 line. I just don't understand the question as  
25 phrased.

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1 MS. CHANCELLOR: Well, the reason it's  
2 very difficult to phrase a question, Mr. Turk, is  
3 that these witnesses are not intimately familiar  
4 with the topical report for Yucca Mountain, and  
5 it's the topical report from Yucca Mountain that  
6 compares and contrasts the site of site with the  
7 western U.S. site, and DOE's struggling with how to  
8 -- design frequency, category-2 design-basis  
9 events. If the witnesses are not familiar with  
10 this document, I shall move on.

11 DR. STAMATAKOS: The --

12 MR. TURK: I don't know if there's a  
13 question pending.

14 JUDGE FARRAR: Did you understand the  
15 question?

16 DR. STAMATAKOS: I think I understood  
17 the question. I think the question was how -- what  
18 was DOE's approach in Appendix C of the topical  
19 report in establishing probability for at that time  
20 what were considered category 2 SSE's, design of  
21 category 2 SSE's.

22 MR. TURK: Is that the question?

23 MS. CHANCELLOR: Sure.

24 DR. STAMATAKOS: In doing so, they  
25 applied a methodology very similar to what was in

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1 Reg Guide 1.165 in that they looked at the safe  
2 shutdown earthquakes for five power plants in the  
3 western United States, and based on the same  
4 approach and use of combined I think spectral  
5 frequencies of 1 Hz and 5 Hz, using the very same  
6 methodology they determined what would be the  
7 corresponding probability exceedance levels for  
8 those safe shutdown earthquakes at those five  
9 nuclear power plants. And they took the - they  
10 used mean values and they took the average of those  
11 to establish what would be a starting point for the  
12 reference probability for their SSE, at that time  
13 category frequency two.

14 Q. Isn't it correct that Yucca Mountain --  
15 DOE at Yucca Mountain selected a  $1 \times 10^{-4}$  point of  
16 reference rather than a  $2 \times 10^{-4}$  to the minus four or  
17 five thousand year return period based on those  
18 five nuclear power plants in the western United  
19 States?

20 DR. STAMATAKOS: That's correct, they  
21 used 10,000 years; but the application here is  
22 different because the DOE design incorporates more,  
23 if you will, more risky parts. As was discussed I  
24 think in Dr. Cornell's testimony, the Yucca  
25 Mountain facility is not just a storage facility,

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1 that there will be fuel that has to be remixed and  
2 exposed. And I believe, my recollection is that  
3 the current design also includes a wet cell where  
4 fuel will be stored in pools similar to how fuel is  
5 stored at a nuclear power plant.

6 MR. TURK: And just for clarification,  
7 the question only had to do with PC-2 rather than  
8 PC-3? Which category?

9 DR. STAMATAKOS: No, the question was  
10 not at all related to the PC parting in 1020. The  
11 question was addressing what was done in Topical  
12 Report 2.

13 MR. TURK: Thank you.

14 Q. (By Ms. Chancellor) Just to underscore  
15 the point, DOE used a -- for point of reference  
16 they used a 10,000-year return period rather than a  
17 2,000-year return period as the point of reference?

18 DR. STAMATAKOS: In this particular  
19 instance, yes.

20 Q. In this particular instance, okay.  
21 Okay, switching gears, I'd like to talk about  
22 rulemaking plans. Who's answer 19? Oh,  
23 Dr. Stamatakos, you get it again.

24 DR. STAMATAKOS: Which page would you  
25 like?

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1 Q. Answer 19 on page 24. In the first  
2 sentence there you state that a rulemaking plan is  
3 a proposed regulatory approach, correct?

4 DR. STAMATAKOS: That's correct.

5 Q. And you say that SECY-01-0178 is NRC's  
6 favored option?

7 MR. TURK: NRC Staff?

8 MS. CHANCELLOR: Yes.

9 DR. STAMATAKOS: Well, I don't say it's  
10 the favored option. What I say there is that  
11 SECY-01-0178, I believe that's the number for the  
12 new -- for the revised rulemaking plan, supersedes  
13 the approaches that were first set forth in the  
14 98-0126 SECY document.

15 Q. The favored option, if you look at the  
16 third sentence, the favored option proposes a  
17 design methodology based on a 2,000-year return  
18 period ground motion.

19 DR. STAMATAKOS: That's correct. That's  
20 my understanding of reading option 4 in the revised  
21 SECY guide.

22 Q. As part of the rationale for adopting  
23 SECY or submitting to the Commission for approval  
24 or negative approval SECY-01-0178, and this is on  
25 Staff's Exhibit U at page 7, and it states, the

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1 rationale for the proposed mean annual probability  
2 of exceedance of a 2,000-year return earthquake for  
3 the DBE is based on several points. And the second  
4 point is, "The total probability of exceedance for  
5 a design earthquake at an ISFSI facility within an  
6 operational period of 20 years (20 years x 5.0E-04  
7 = 1.0E-02) is the same as the total probability of  
8 exceedance for an earthquake event at the proposed  
9 pre-closure facility at Yucca Mountain with an  
10 operational period of 100 years (100 years x  
11 1.0E-04 = 1.0E-02)". Do you have Exhibit U?

12 DR. STAMATAKOS: I have Exhibit U. I  
13 was trying to find the pages we were reading.

14 Q. It's page 7.

15 DR. STAMATAKOS: Okay. The second  
16 bullet?

17 Q. Second bullet.

18 DR. STAMATAKOS: Okay.

19 MR. TURK: May we go off the record for  
20 a moment?

21 JUDGE FARRAR: Yes.

22 (Discussion off the record.)

23 JUDGE FARRAR: Back on the record.

24 We've solved this problem. The witnesses have the  
25 material in front of them, and the question is?

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1           Q.        (By Ms. Chancellor) The question is,  
2 part of the rationale for adopting or proposing  
3 2,000-year return period deals with the operational  
4 period of 100 years of Yucca Mountain as contrasted  
5 to a 20-year operational life of an ISFSI; is that  
6 correct?

7                   MR. TURK: Your Honor, I'm going to  
8 object. She has not established that the witnesses  
9 were involved in the rulemaking development. If  
10 she asks them to read the document, they can do  
11 that, but until she establishes that they were part  
12 of this and they understand the rationale, I think  
13 all they can do is provide their own views which  
14 may or may not be correct with respect to the  
15 Staff's ruling on the process.

16                   MS. CHANCELLOR: I believe Exhibit U is  
17 an exhibit to these witnesses' testimony.

18                   MR. TURK: Yes, it is.

19                   MS. CHANCELLOR: Then --

20                   JUDGE FARRAR: Read back the question,  
21 if you would, please.

22                   (The record was read as follows: "The  
23 question is, part of the rationale for adopting  
24 or proposing 2,000-year return period deals  
25 with the operational period of 100 years of

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1 Yucca Mountain as contrasted to a 20-year  
2 operational life of an ISFSI; is that  
3 correct?")

4 DR. STAMATAKOS: That's --

5 MR. TURK: Excuse me. There's an  
6 objection pending. I'm asking the witness not to  
7 answer until it's resolved.

8 JUDGE FARRAR: Are you familiar with  
9 this attachment? It is -- it was part of your --  
10 admitted as part of your testimony. Whether -- are  
11 you familiar with that -- with the attachment and  
12 specifically with the statement on page 7 about  
13 what the rationale was?

14 DR. STAMATAKOS: We've all read this  
15 document and we have some familiarity with it. We  
16 did not, any of us on the panel here, participate  
17 in the rulemaking revision tasks. That was not  
18 something we were tasked to do.

19 JUDGE FARRAR: Why don't you answer the  
20 question, being careful in this instance to limit  
21 yourself to what you know as opposed to what you  
22 might speculate about.

23 DR. STAMATAKOS: If the question is are  
24 we aware of what that says, the answer is yes.

25 Q. (By Ms. Chancellor) In the second

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1 bullet does it address a 100-year operational  
2 period for Yucca Mountain and a 20-year operational  
3 period for an ISFSI?

4 DR. STAMATAKOS: Yes.

5 Q. And does it say that a 100-year  
6 operational period for Yucca Mountain and a 20-year  
7 operational period for an ISFSI has the same total  
8 probability of exceedance?

9 DR. STAMATAKOS: That's what the bullet  
10 says, yes.

11 Q. If the operational period for an ISFSI  
12 were changed from 20 years to 40 years, would you  
13 still be able -- would this statement still hold,  
14 that there's the same total probability of  
15 exceedance?

16 MR. TURK: I have to object, your Honor.  
17 I understand the math of it. They're reading the  
18 document and they say what the documents state,  
19 they can calculate how it might change. I think  
20 the witnesses have indicated they are not part of  
21 the development of this bullet.

22 JUDGE FARRAR: I thought that that was  
23 a -- given what it says here, I thought she was  
24 just asking them to apply their knowledge to what's  
25 said here, given their expertise, what would their

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1 opinion be in the 40-year situation about the total  
2 probability of exceedance.

3 DR. STAMATAKOS: Yeah, can I defer? I  
4 would defer to Dr. McCann on this issue because of  
5 his expertise.

6 DR. McCANN: This relates to one of the  
7 later questions in our testimony. I think to  
8 answer your question, if I remember it right, yes,  
9 the math would change if one put in a 40-year  
10 operating period.

11 We have submitted our testimony that the  
12 consideration of the operating period was not a  
13 direct consideration of our agreement to the  
14 exemption and the selection of the 2,000-year  
15 return period --

16 Q. And that's --

17 DR. McCANN: -- for the PFS.

18 Q. And you put that proposition forward in  
19 answer 31 on page 35, is that correct, that you  
20 look at the licensing period and not the total  
21 operation term?

22 DR. McCANN: I believe that's right.  
23 Let me check.

24 Q. Last page of your testimony.

25 DR. McCANN: Yes, that's where we make

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1 that statement, correct.

2 Q. So you disagree with this rationale and  
3 the rule, proposed rule as it relates to your  
4 review of the PFS licensing exemption -- not  
5 licensing exemption -- exemption request. You  
6 disagree with the rationale in bullet 2 where  
7 they're comparing operational periods?

8 DR. McCANN: I personally disagree with  
9 that bullet, not with respect to PFS in particular  
10 but in general. In other words, I disagree with  
11 that approach as numerically articulated.

12 Q. And what is the basis for annual risk?

13 DR. McCANN: I'm not sure I understand  
14 the question.

15 Q. Are you saying that you should -- is it  
16 your testimony that you should look at annual risk  
17 rather than the operational risk of the facility?

18 DR. McCANN: Yes.

19 Q. And what is the basis for that approach?

20 DR. McCANN: For the use of annual risk?

21 Q. Right.

22 DR. McCANN: As opposed to a lifetime  
23 risk?

24 Q. Exactly.

25 DR. McCANN: The basis for that is on a

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1 couple of levels. And let me preface it by saying,  
2 despite the fact that building codes and other  
3 guidance type documents, particularly in the  
4 conventional engineering construction industry as  
5 opposed to the nuclear, often express design-basis  
6 ground motions in terms of probabilities of  
7 exceedance over a lifetime of a facility -- 50  
8 years, 10 percent chance of exceedance, etc. My  
9 interpretation of that is that that is a more  
10 comfortable language for the non-risk articulate,  
11 if you will, meaning the engineers in practice, the  
12 owners who must decide what kind of risk they want  
13 to take, it is more convenient for them to talk in  
14 those terms.

15 On a technical level there are a number  
16 of aspects that they come into play, in my opinion,  
17 with regard to focusing on annual risk. One is,  
18 our seismic hazard analyses typically are computed  
19 on the basis of an annual probability of  
20 exceedance. That numeric result can be  
21 extrapolated to a future time period rather  
22 directly.

23 But what that extrapolation does not  
24 take into account is whether or not there are  
25 natural processes in place that might in fact lead

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1 to a time-dependent estimate of the rate of future  
2 earthquake occurrences. So the hazard analysis  
3 results that are readily available both for  
4 critical facilities such as nuclear power plants as  
5 well as conventional facilities as represented by  
6 the USGS studies and basically all studies  
7 typically do not produce results that are easily  
8 extrapolated if in fact a time dependence exists.

9 And on the engineering side, the  
10 facilities side, if one were to do a risk  
11 assessment, typically the risk analysis does not  
12 account for processes in place at the facility that  
13 might change over time. They tend to be snapshots  
14 in time with the understanding that these things  
15 are typically reviewed and come up for review in  
16 the regulatory sense, and that if updates are  
17 required either on the characterization of the  
18 hazard or on the condition and operation of a  
19 facility, those things are handled over the  
20 lifetime of the facility.

21 Q. Do you agree that part of the rationale  
22 for using annual risk is that spent fuel must be  
23 stored somewhere, so it doesn't matter whether it's  
24 in Utah or at a reactor or at Yucca Mountain, so  
25 you look at annual risk?

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1 MR. TURK: I have to object. Part of  
2 the rationale where? In whose behalf?

3 MS. CHANCELLOR: I believe that's in  
4 Dr. Cornell's testimony.

5 MR. TURK: Do you understand --

6 JUDGE FARRAR: Could you restate it?  
7 I'm not quite sure I got the whole essence of the  
8 question.

9 Q. (By Ms. Chancellor) I believe  
10 Dr. Cornell testified that he relies on a paper by  
11 Patte-Cornell to state that you look at the risk to  
12 the nation and that eventually, taking the spent  
13 fuel as an example, it must be stored somewhere.  
14 So you look at annual risk rather than the risk of  
15 operation of a facility. Do you agree with that  
16 concept for annual risk?

17 MR. TURK: I object to the question.  
18 I'm not familiar with that characterization.

19 MR. GAUKLER: I think it was, he would  
20 look at annual risk as opposed to the cumulative  
21 risk over the life of the facility.

22 MS. CHANCELLOR: Fine. As corrected by  
23 Mr. Gaukler, that's fine.

24 DR. McCANN: I'm generally aware of that  
25 thought, and I am aware that the issue of

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1 characterizing risk at the national level where  
2 national costs and benefits are considered, that  
3 that thought process would come into play. My  
4 answer to your prior question was more at the  
5 technical level, if you will, in which risk would  
6 be calculated for a particular facility as opposed  
7 to another level, which is a national level, which  
8 is the reference you're referring to.

9 Q. (By Ms. Chancellor) And do you agree  
10 that the issue before the Board is the risk  
11 acceptance decision specific to the PFS site and  
12 not on a national level?

13 DR. McCANN: Well, my general  
14 understanding would be that the Commission must  
15 deal with safety issues at a particular facility as  
16 it's submitted for their consideration.

17 Q. Would it be prudent to look at both  
18 annual risk and lifetime risk?

19 DR. McCANN: Not in my opinion, no.

20 Q. Getting back to the rulemaking plan --

21 JUDGE FARRAR: Ms. Chancellor, I'm going  
22 to interject something here. The last sentence of  
23 your answer on page 35 I'm having a little trouble  
24 with. If you ended with the previous sentence I  
25 would have followed it, but this seemingly

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1 introduces a new element. You weren't here or you  
2 didn't listen in to the oral arguments on Friday  
3 about the economic analysis and the 20-year versus  
4 40-year?

5 DR. McCANN: No. Not Friday, no.

6 JUDGE FARRAR: Your last sentence seems  
7 to raise the question we discussed there, which  
8 seemed to be saying here, we're looking at it based  
9 on the 20 year, and if it comes at the end of 20  
10 years that they apply for renewal, then the Staff  
11 will consider it at that point with all the facts,  
12 information and analyses.

13 The question we raised on Friday was, if  
14 you've got 4,000 casks on the pad at the end of  
15 year 20 and the Staff were to deny a request for an  
16 extension, you'd still have 4,000 casks on the pad  
17 for some appreciable length of time. Whether  
18 that's another 20 years at the same rate it came  
19 in, or whether that's shorter than 20 years  
20 additional remains to be seen. Given that view of  
21 the situation, the 4,000 casks are not going to  
22 leave at the end of year 20, does that change,  
23 given your last sentence here, does that new way of  
24 looking at things change anything you say in this  
25 paragraph?

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1 DR. McCANN: No, not from the  
2 perspective that this answer was submitted, which  
3 is a non-economic --

4 JUDGE FARRAR: Forget the economics.  
5 From a seismic standpoint, the seismic risk  
6 standpoint, does your answer -- does what you say  
7 in this paragraph change if I tell you, let's  
8 assume the casks will be there for 40 years? Do  
9 you still give the same answer that you give here?

10 DR. McCANN: Yes.

11 JUDGE FARRAR: You can follow that up,  
12 Ms. Chancellor, if you choose to, or not, or choose  
13 not.

14 Well, let me follow it up. If your  
15 answer wouldn't change, then is that last sentence  
16 surplusage?

17 MR. TURK: Your Honor, if I may help.  
18 This answer explains the basis for the answer to  
19 question 30, so maybe if the witness could look  
20 back to what the question was, he can decide  
21 whether that last sentence is needed or not.

22 MS. CHANCELLOR: Uh --

23 JUDGE FARRAR: Wait. He's thinking  
24 about answering my question.

25 MS. CHANCELLOR: Okay.

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1 DR. McCANN: That last sentence, again,  
2 from a purely technical perspective, is, you might  
3 call it surplus, but it -- I think it's also a  
4 recognition. Generally speaking, in the context of  
5 technological risk analysis in which we are  
6 calculating risk which is often referred to as a  
7 snapshot in time, it has some direct applicability  
8 in exactness, quote-unquote, if you will, to the  
9 time in which it was performed, and gives you a  
10 level of confidence as to the risk that exists for  
11 the facility as it is designed. And it does not  
12 explicitly take into account how it will operate in  
13 the future, what new advances might come along that  
14 might, say, dictate a change in the design basis.  
15 So it's a recognition that in a regulatory  
16 environment there is always the regulator whose  
17 eyes are open and paying attention to things that  
18 might occur, whether precipitated by a  
19 reapplication or just new information.

20 JUDGE FARRAR: So it's surplus in terms  
21 of today's snapshot, not surplus in terms of  
22 thinking about the future?

23 DR. McCANN: Yes.

24 Q. (By Ms. Chancellor) Dr. McCann, were  
25 you involved in all of the various iterations of

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1 the SAR relating to PFS's exemption request?

2 MR. TURK: SER?

3 MS. CHANCELLOR: Safety Evaluation  
4 Report, yes.

5 DR. McCANN: Yes.

6 Q. And the first Safety Evaluation Report  
7 came out on December 15, 1999?

8 DR. McCANN: Yes, I believe that -- I  
9 don't know the exact date, but yes, that time  
10 period.

11 Q. At about that time period. And in the  
12 preliminary SAR --

13 MR. GAUKLER: Are you saying SER?

14 MS. CHANCELLOR: Pardon?

15 MR. GAUKLER: You meant to say the SER?

16 MS. CHANCELLOR: I guess it isn't a  
17 preliminary SAR. Preliminary SER, the December '99  
18 SER, one of the rationales for, I think this is  
19 where you almost granted the license exemption  
20 request but not quite, you state that consideration  
21 of radiological safety aspects of dry spent fuel  
22 storage facility conservative peak ground  
23 acceleration values that have a 99 percent  
24 likelihood of not being exceeded in a 20-year  
25 licensing period of the facility are considered

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1 adequate for seismic design. Isn't this the first  
2 time that the -- isn't it correct in this rationale  
3 that you're considering not just the annual  
4 probability of exceedance but you're relating it to  
5 the Uniform Building Code?

6 MR. TURK: May I only note an objection  
7 to the characterization that the Staff almost  
8 granted the exemption at that time? And also to  
9 clarify, when she says this rationale, she's  
10 speaking about the 1999 document?

11 MS. CHANCELLOR: That's correct. Well,  
12 I don't know how else to characterize it, your  
13 Honor. That was -- when we filed those many  
14 contentions and amendments to contentions, maybe  
15 it's wrong to say almost granted, but I got the  
16 impression that, reading the document, it appeared  
17 that the Staff had granted or recommended the grant  
18 of the exemption, but in response to our  
19 contentions it was, well, it looks like it but not  
20 quite. That's what I was getting at.

21 MR. TURK: Your Honor, I'm only  
22 objecting to the predicate. If we can do it with  
23 predicates, we can get the question answered.

24 MS. CHANCELLOR: Fine.

25 Q. (By Ms. Chancellor) In the December

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1 1999 SER, isn't it true that you compare both the  
2 annual probability of exceedance to the Uniform  
3 Building Code which deals with the lifetime risk?

4 DR. McCANN: That -- you're correct.  
5 That document, which there were many hands involved  
6 in the preparation of that document and various  
7 bullets, does state that. Subsequently that has  
8 been removed, and I would say at this time we do  
9 not agree with that statement.

10 Q. So you've dropped that from the 1999  
11 SER -- you kept your reference to DOE Standard  
12 1020. That appears throughout all of the  
13 iterations of the SER, correct?

14 DR. McCANN: I believe so, yes.

15 Q. And also the Three Mile Island ISFSI  
16 exemption at INEEL?

17 DR. McCANN: Yes.

18 Q. You keep that reference throughout.

19 At the time PFS submitted its request  
20 for an exemption, SECY-98-071 was the guidance  
21 document, was the rulemaking plan in effect. Is  
22 that correct?

23 MR. TURK: Again, is the rulemaking plan  
24 not the guidance document? If that's the question,  
25 I don't object.

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1 Q. (By Ms. Chancellor) That was the  
2 document in -- the rulemaking plan in effect at the  
3 time PFS submitted its license application,  
4 correct?

5 DR. STAMATAKOS: That was the proposed  
6 rulemaking plan at the time.

7 Q. Proposed rulemaking plan. And  
8 SECY-98-071 had two selections, either 1,000-year  
9 design basis earthquake or a 10,000-year, depending  
10 on --

11 MR. TURK: No. 98-126.

12 MS. CHANCELLOR: It's 98 -- oh, 126.  
13 Thank you, Sherwin.

14 MR. TURK: I'm sorry to interrupt.

15 MS. CHANCELLOR: That's fine. I don't  
16 mind be corrected, when you're right.

17 Q. (By Ms. Chancellor) SECY for 1998  
18 proposed rulemaking plan gave two options, correct?  
19 1,000-year mean annual return period earthquake or  
20 a 10,000-year?

21 DR. STAMATAKOS: I believe that's  
22 correct.

23 Q. And as part of the rationale for  
24 granting the exemption request, that's based on the  
25 INEEL exemption that the Commission granted to DOE;

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1 is that correct?

2 DR. STAMATAKOS: It's the granting of  
3 exemption plus all of the statements that  
4 surrounded that statement -- or SER that supported  
5 that. I think there are a number of documents that  
6 we cite in reference to the TMI-2 exemption.

7 Q. In answer 19 on page 25 of your  
8 testimony, one of you state that the approach  
9 proposed in SECY-98-126 was not followed by the  
10 Commission in approving the TMI-2 ISFSI exemption  
11 request. Do you see that?

12 DR. STAMATAKOS: That's correct. I see  
13 it's the -- if I can count better than the lawyers,  
14 it's the fifth line down, the sentence beginning  
15 with "thus."

16 Q. And INEEL submitted its exemption  
17 request to NRC on September 15, 1997, correct? And  
18 look at I believe the staff exhibit with the INEEL  
19 exemption.

20 DR. STAMATAKOS: Dr. Chen, who worked on  
21 that, the INEEL project, says yes.

22 MR. TURK: And this would be Staff  
23 Exhibit S for the TMI-2 exemption.

24 Q. (By Ms. Chancellor) And the 1998  
25 rulemaking plan was adopted on -- the Commission

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1 approved the INEEL exemption request on April 8,  
2 1998; is that correct? SECY-98-071, Staff Exhibit  
3 S; is that correct? You have the first page of  
4 Exhibit S?

5 MR. TURK: For clarification, you may  
6 want to look at the SRM rather than the SECY paper  
7 in terms of whether the Commission finally approved  
8 it.

9 MS. CHANCELLOR: Which one is the SRM?

10 Q. (By Ms. Chancellor) On April 8th, 1998  
11 it states, two requests by negative consent  
12 Commission approval of the Staff's intent. So that  
13 was when the request went up to the Commission; is  
14 that correct?

15 DR. STAMATAKOS: I believe so.

16 Q. And the rulemaking plan was -- a  
17 negative consent of the rulemaking plan was  
18 obtained on April 4th, 1998; is that correct?

19 MR. TURK: If I may. In the same  
20 exhibit, I believe it's either the ninth or tenth  
21 page, you'll see the SRM.

22 Q. (By Ms. Chancellor) What I'm trying to  
23 establish is that you say that SECY-98-126 was not  
24 followed by the Commission's approval of the TMI-2  
25 ISFSI. Isn't it correct that the Three Mile Island

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1 exemption request came well before the Commission  
2 approved the 1998 proposed rulemaking plan? To any  
3 of the three of you.

4 DR. STAMATAKOS: Without having to piece  
5 through all the dates, if your calculation of those  
6 dates is correct, I would agree.

7 MR. TURK: I think it may be relevant to  
8 get the exact dates on the record rather than have  
9 the witnesses assume you're correct. If you would  
10 turn to the tenth page of this exhibit, I think  
11 you'll see the date the Commission issued its  
12 approval.

13 DR. STAMATAKOS: This is Exhibit T?

14 MR. TURK: Exhibit S.

15 JUDGE FARRAR: Since, Mr. Turk, the  
16 pages are not numbered sequentially in the exhibit,  
17 what document are you referring to?

18 MR. TURK: It's the tenth sheet of paper  
19 in Exhibit S which is titled Staff Requirements.

20 JUDGE FARRAR: The May 20th?

21 MR. TURK: May 20th, 1998.

22 JUDGE FARRAR: Okay.

23 Q. (By Ms. Chancellor) I'll rephrase my  
24 question. Is it correct that the INEEL exemption  
25 request, that the recommendation by the Staff

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1 through the Commission for approval of that  
2 exemption request came prior to the Commission's  
3 negative consent of the 1998 rulemaking plan?

4 DR. STAMATAKOS: If I'm reading this now  
5 correctly, it looks like the page that Mr. Turk  
6 pointed us to is May 28th, 1998 for the exemption  
7 request, and the SECY rulemaking memorandum in  
8 Exhibit T is June 24th, 1998.

9 Q. That was my previous question. My new  
10 question is, didn't the Staff recommend approval of  
11 the INEEL exemption request to the Commission on  
12 April 8th, 1998? What's the cover page of Exhibit  
13 S?

14 MR. TURK: He's answered that question.  
15 He's confirmed that that's the date.

16 MS. CHANCELLOR: Okay.

17 JUDGE FARRAR: We're taking too long to  
18 get some basic information. Can somebody go  
19 through a time line for us, establish the dates,  
20 and then we'll talk about the significance of them.

21 MS. CHANCELLOR: That's fine, your  
22 Honor. I think that's about all that I need to get  
23 out of this.

24 JUDGE FARRAR: I mean, to some extent  
25 the documents speak for themselves, but to another

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1 extent it may be important to know how things  
2 progressed and what was going on behind the scenes  
3 in between these -- the actual documents being  
4 issued. But we seem -- we don't seem to be getting  
5 what we need here.

6 MS. CHANCELLOR: Do you want me to go  
7 through a chronology?

8 JUDGE FARRAR: Yeah, somebody should,  
9 and then you could ask the question.

10 Q. (By Ms. Chancellor) INEEL submitted its  
11 exemption request to NRC on September 15th, 1997;  
12 is that correct?

13 MR. TURK: It's been asked and answered.  
14 They said yes.

15 MS. CHANCELLOR: Your Honor, I think  
16 I'll just --

17 JUDGE FARRAR: No, we're starting again.  
18 We're going to get this down. If Ms. Chancellor  
19 wants to --

20 MS. CHANCELLOR: Will you take my  
21 representation that INEEL submitted -- your Honor,  
22 I think I'm just wasting too much time. I'll just  
23 move on. It's just fine.

24 JUDGE FARRAR: Wait. We won't take your  
25 representation. Cite a document and we'll see what

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1 it says.

2 MR. SILBERG: It's all in Exhibit S.

3 MS. CHANCELLOR: It's all in Exhibit S.

4 JUDGE FARRAR: Well, if it's in there,  
5 then we don't need to ask questions about it.

6 MS. CHANCELLOR: I'll move on.

7 MR. TURK: She's correct about the  
8 dates, your Honor.

9 MS. CHANCELLOR: I'll move on, your  
10 Honor.

11 Q. (By Ms. Chancellor) Just to establish a  
12 general framework of when PFS submitted its  
13 exemption request, is it -- PFS's first exemption  
14 request, they requested a 1,000-year return period  
15 earthquake; is that correct?

16 DR. STAMATAKOS: In their first  
17 exemption request, that's correct.

18 Q. And that was April 2 of 1999? Does that  
19 sound about right?

20 DR. STAMATAKOS: That sounds about  
21 right.

22 Q. And then PFS on a commitment resolution  
23 around about August 6th, 1999 changed their request  
24 to request a 2,000-year mean return interval?

25 DR. STAMATAKOS: Yeah, that's correct;

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1 but I would also point out that in the original --  
2 or in the 1999 Geomatrix document all references in  
3 there were for a 2,000 year as well.

4 Q. And then in December 1999 the Staff  
5 issued the first version of the Safety Evaluation  
6 Report?

7 DR. STAMATAKOS: That sounds right.

8 MR. TURK: Well, is the witness sure of  
9 the date?

10 MS. CHANCELLOR: I'm just trying to get  
11 a general chronology. We agreed before with  
12 Dr. McCann that that was the date.

13 MR. TURK: I think there's good reason  
14 to move expeditiously, but I don't think the  
15 witness should be asked to speculate if he's not  
16 sure of the date himself.

17 Q. (By Ms. Chancellor) Do you recall  
18 whether it was around about Christmas of 1999?

19 DR. STAMATAKOS: That's my recollection.

20 Q. And then the SER final -- what was then  
21 termed the final SER came out in the fall of 2000?

22 DR. STAMATAKOS: That's correct.

23 Q. And then in November of 2001 the new  
24 rulemaking SECY-01-0178 came out for the  
25 Commission?

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1 DR. STAMATAKOS: I don't know. I wasn't  
2 involved in that revised rulemaking, so I don't  
3 know the exact date. I'd have to check that, but  
4 if that's what the exhibit says.

5 Q. Okay. Well, that's fine. We'll just  
6 move on in the exhibit.

7 MR. TURK: Well, may I note, your Honor,  
8 it was September of 2000 when the rulemaking plan  
9 was submitted to the Commission, not November.

10 MS. CHANCELLOR: No, I said was granted  
11 negative approval. I didn't say sent up.

12 Q. (By Ms. Chancellor) And that the final  
13 SER supplement 2 that addressed PFS's revised  
14 seismic investigation came out in -- around about  
15 near Christmas of 2001?

16 DR. STAMATAKOS: Yeah. Ruined  
17 Christmas, yeah.

18 Q. Sure did. Thank you.

19 Dr. Chen, I can't have you sitting there  
20 silent. If you would turn to answer 29. This  
21 deals with the INEEL exemption request that Staff  
22 relied on in part for granting the exemption. And  
23 I understand that you're responsible for answering  
24 questions 28 and 29 that relate to INEEL. Is that  
25 correct?

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1 DR. CHEN: Correct.

2 Q. And you were involved in the review of  
3 the INEEL TMI-2 exemption request by DOE; is that  
4 correct?

5 DR. CHEN: Correct.

6 Q. And in your testimony you refer to the  
7 Idaho chemical processing plant site. That's where  
8 the Three-Mile Island 2 ISFSI was located, correct?

9 DR. CHEN: Yes.

10 Q. And it's referred to as ICPP?

11 DR. CHEN: Correct.

12 Q. And is the ICPP licensed by NRC?

13 DR. CHEN: Yes, to my knowledge.

14 Q. But you're not sure?

15 DR. CHEN: Just my recollection.

16 Q. And the ground motions, the peak  
17 design-basis horizontal acceleration for the IPP  
18 was established as 0.36 g; is that correct?

19 DR. CHEN: For ICPP, yes.

20 MR. TURK: Could I hear the question  
21 again, please?

22 (The record was read as follows: "And  
23 the ground motions, the peak design-basis  
24 horizontal acceleration for the IPP was  
25 established as 0.36 g; is that correct?")

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1 MR. TURK: I'm sorry. May have it one  
2 more time?

3 (The record was read as follows: "And  
4 the ground motions, the peak design-basis  
5 horizontal acceleration for the IPP was  
6 established as 0.36 g; is that correct?")

7 Q. (By Ms. Chancellor) And the Three Mile  
8 Island ISFSI, the design basis to which that was  
9 designed to was .36 g ground motion; is that  
10 correct?

11 DR. CHEN: Yes. That was DOE's  
12 decision.

13 Q. And a .36 design-basis earthquake would  
14 be greater than a 2,000-year return period  
15 earthquake; is that correct?

16 DR. CHEN: Yes. It enveloped the  
17 2,000-year return period earthquake, the ground  
18 motion.

19 Q. .36 ground motion earthquake -- let me  
20 back up. The peak horizontal acceleration for a  
21 10,000-year earthquake at the ICPP site is .47 g;  
22 is that correct?

23 DR. CHEN: Yes.

24 Q. Could you estimate where between -- let  
25 me ask one more question. The peak ground

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1 acceleration for a 2,000-year return period  
2 earthquake of the ICPP site is .30 g; is that  
3 correct?

4 DR. CHEN: That's correct.

5 Q. What is the return period for the .36 g  
6 ground motion?

7 DR. CHEN: We did not at that time  
8 attempt to estimate the return period of a .36 g  
9 ground motion. And the reason was because the  
10 approval was granted for 2,000-year return period  
11 earthquake. But we did not do a calculation, and I  
12 do not think the Applicant did a calculation,  
13 either, but to speculate because .36 g fall in  
14 between 2,000 earthquake ground motion and 10,000  
15 earthquake ground motion, so I would suspect  
16 somewhere between 3,000 to 4,000 years.

17 Q. Thank you, Dr. Chen. You state in your  
18 testimony that the TMI-2 ISFSIs show that the  
19 consequences were bounded by a canister drop onto a  
20 concrete pad. And the INEEL site, you visited that  
21 site?

22 DR. CHEN: Yes, I did.

23 Q. Have you visited the PFS site?

24 DR. CHEN: No, I did not.

25 Q. Have you seen diagrams showing where the

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1 PFS site is and the configuration of the facility?

2 DR. CHEN: Yes, I did.

3 Q. The INEEL site is on a federal  
4 reservation, correct?

5 DR. CHEN: Correct.

6 Q. And that's about 800, 900 square miles,  
7 that reservation? Do you know?

8 DR. CHEN: I believe so.

9 MR. TURK: What was the number given?

10 MS. CHANCELLOR: About 800 or 900 square  
11 miles.

12 MR. TURK: May I ask if Dr. Chen is  
13 aware of that?

14 DR. CHEN: That sounds about right, but  
15 I can't give you the exact number.

16 MS. CHANCELLOR: Eight hundred, nine  
17 hundred square miles --

18 DR. CHEN: Okay.

19 (Interruption.)

20 JUDGE FARRAR: Is Counsel instructing  
21 the witness?

22 MR. TURK: Yes. I told her if she  
23 doesn't know the answer, she should not assume that  
24 the questioner is correct that she knows the  
25 answer.

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1 Q. (By Ms. Chancellor) What are the total  
2 number of casks to be stored at the TMI-2 ISFSI?

3 DR. CHEN: 30 at HSMS. HMS is a  
4 horizontal storage -- they use horizontal storage  
5 module, and it's 30, I believe, according to my  
6 record.

7 Q. And then these storage modules,  
8 approximately what size are they?

9 DR. CHEN: I can't recall right now.

10 Q. Are they big, square, rectangular  
11 concrete modules? Have you seen them?

12 DR. CHEN: Yes, I have, but many years  
13 ago.

14 Q. Could you describe them in general?

15 DR. CHEN: I was not involved in the  
16 design, so I did not pay a lot of attention on the  
17 design details. I'm aware there are concrete,  
18 reinforced concrete containers, but I can't tell  
19 you the other specifics.

20 Q. The NUHOMs is a different design concept  
21 than the HI-STORM storage cask; is that correct?

22 DR. CHEN: That's correct.

23 Q. These modules join together?

24 DR. CHEN: I can't tell. I don't  
25 believe so. I do recall they are horizontally

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1 placed on the concrete pads.

2 Q. And is there a hole in the center which  
3 the canister sits into?

4 DR. CHEN: Yes.

5 Q. And at INEEL, are those modules allowed  
6 to slide during an earthquake?

7 MR. TURK: Objection.

8 Q. If you know.

9 MR. TURK: Objection to characterization  
10 of they're allowed to slide.

11 Q. In any of INEEL's design to meet seismic  
12 design, is there anywhere where you have seen in  
13 your review of the INEEL exemption where under  
14 certain earthquake conditions the NUHOMS storage  
15 modules may slide?

16 DR. CHEN: I do not believe so. As I  
17 said, I was not involved in the design but I do  
18 recall reading the relevant documents, and I recall  
19 from the accident analysis that accidents due to  
20 earthquake ground motion, the accident consequence  
21 was bounded by cask drop on the concrete pad. I do  
22 not recall that they would slide.

23 Q. And the nearest resident to the INEEL  
24 federal reservation, do you know if that would be  
25 about 15 to 20 kilometers away?

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1 DR. CHEN: I believe it's 50 miles.

2 Q. Fifty, okay.

3 DR. CHEN: I could be wrong.

4 Q. That's fine, just to the best of your  
5 recollection.

6 MR. TURK: Again, I would ask the  
7 witness if she doesn't recall not to speculate. If  
8 she doesn't know, not to guess.

9 JUDGE FARRAR: If you recall generally  
10 you can give us a range, but if you don't recall,  
11 don't, you know, kind of make it up. You said, I  
12 thought, 50, five-zero miles, but how well do you  
13 remember that?

14 DR. CHEN: Not very well. Only based on  
15 the field trip that I went.

16 JUDGE FARRAR: Okay. So based -- okay,  
17 based on the field trip, that's your sense of how  
18 far you went?

19 DR. CHEN: Yes.

20 Q. (By Ms. Chancellor) And do you know how  
21 far the nearest resident is from the PFS ISFSI  
22 site?

23 DR. CHEN: No.

24 Q. Do you know, is it true that the INEEL  
25 ISFSI will take labialized fuel debris from the

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1 Three Mile Island Unit 2 reactor?

2 DR. CHEN: Yes.

3 Q. And is that about 3,000 pounds of core  
4 debris -- 300,000 pounds?

5 DR. CHEN: I do not remember the weight  
6 of the fuel.

7 Q. That's fine. And do you know how many  
8 casks there are that PFS will store?

9 DR. CHEN: Could you repeat that?

10 Q. How many casks will PFS store at its  
11 facility?

12 DR. CHEN: How many --

13 Q. Casks.

14 DR. CHEN: Casks. How many casks --

15 Q. Storage casks?

16 DR. CHEN: For TMI-2?

17 Q. No. You stated that there are about 30  
18 casks for TMI-2.

19 DR. CHEN: Right.

20 Q. And PFS will be permitted to store how  
21 many casks?

22 DR. CHEN: I guess people here probably  
23 know better than I do, but 4,000.

24 Q. Right. Thank you.

25 JUDGE FARRAR: Ms. Chancellor, if you're

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1 moving to a new subject, why don't we take a break.  
2 If whoever is in the room when the sound technician  
3 shows up, please tell him about your problem. I  
4 summoned him to tell him about the problem we're  
5 having. Thanks. Let's come back at ten of.

6 (A recess was taken.)

7 JUDGE FARRAR: All right, we're back on  
8 the record and the sound technician is here to try  
9 to fix the static problem as we proceed.  
10 Ms. Chancellor?

11 MR. TURK: Your Honor, may I tend to a  
12 minor matter first?

13 JUDGE FARRAR: Yes.

14 MR. TURK: I'd like to mention that  
15 we're joined this morning by Mr. John Greeves,  
16 G-r-e-e-v-e-s, who is director of the Division of  
17 Waste Management at NRC, and included within his  
18 jurisdiction is the Yucca Mountain proposed  
19 facility.

20 JUDGE FARRAR: All right. Glad to have  
21 you here. We had noticed the new face and wondered  
22 who it was. Thank you for the introduction.

23 Q. (By Ms. Chancellor) Dr. Stamatakos, our  
24 discussion the other day about slip tendency, was  
25 your analysis of that, the sensitivity analysis

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1 that you referred to, was that conducted after you  
2 prepared Staff's Exhibit Q in September of 1999?

3 DR. STAMATAKOS: Yes.

4 Q. And you testified on Friday that you had  
5 analyzed the sensitivity of the slip tendency  
6 analysis results to variations in your assumption  
7 about stress field, correct?

8 DR. STAMATAKOS: We tuned -- in doing  
9 the slip tendency analysis, it's an interactive  
10 program that you can easily modify those  
11 parameters, and so we tuned the slip tendency, as I  
12 said, so that we would attempt to reach some  
13 critical value of .67 for known active faults like  
14 parts of the Wasatch Fault.

15 Q. And you say that the sensitivity  
16 analysis was tuned to give a high that is greater  
17 than .65 slip tendencies on faults in the Skull  
18 Valley area?

19 DR. STAMATAKOS: No.

20 Q. Which are not to slip from  
21 paleoseismological studies.

22 DR. STAMATAKOS: For parts of faults I  
23 think we used the Wasatch as a better example of  
24 tuning the slip tendency directions.

25 Q. I don't want to get into that analysis,

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1 but where is this analysis document, the  
2 sensitivity analysis?

3 DR. STAMATAKOS: As I say, it's an  
4 iterative approach to doing it. What we documented  
5 was the final assumptions that we used in the slip  
6 tendency analysis.

7 Q. Do you know if the sensitivity analysis  
8 for the slip tendencies was -- your analysis was  
9 turned over to the state?

10 DR. STAMATAKOS: The analysis as we used  
11 it to draw a conclusion was turned over to the  
12 state.

13 Q. Or turned over to Mr. Turk, I should  
14 say.

15 DR. STAMATAKOS: Turned over to  
16 Mr. Turk. Whatever happens to it beyond that is  
17 out of my control.

18 Q. Is it documented in your scientific  
19 notebook?

20 DR. STAMATAKOS: What's documented in my  
21 scientific notebook is was what were the bases for  
22 what we were going to write, what we wrote in the  
23 supplemental SER. So what I referred to as doing  
24 some assessment of sensitivity was done just  
25 iteratively as we established the parameters in the

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1 program. What we're showing you there is the final  
2 result.

3 But you can look at that, I mean, you  
4 can easily judge yourself. If you look in the  
5 submittal there are some plots of the -- screen  
6 plots of what the program looks like as you're  
7 performing the tasks. And if you look at the  
8 fields for the high-slip tendency, you can see that  
9 what you asked me about, a small change in the  
10 principal direction for sigma 3 would not change  
11 the results very much at all.

12 Q. I'd like to turn to seismic hazard  
13 curves. And in simple terms, can you describe how  
14 you, just in generic terms, how do you develop a  
15 seismic hazard curve? What goes into it?

16 DR. STAMATAKOS: Probabilistic seismic  
17 hazard curve, or --

18 Q. Yes, probabilistic.

19 DR. STAMATAKOS: Well, we provided some  
20 discussion of that at length when we were asked  
21 those questions by the Board a lifetime ago or two  
22 weeks ago. I'm not sure which.

23 Q. But can you just categorize in sort of  
24 gross general terms what actually goes into the  
25 development of a probabilistic assessment?

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1 DR. STAMATAKOS: You look at all  
2 potential seismic sources, both fault sources and  
3 what were defined by Dr. Cornell as aerial sources.  
4 You decide on parameter distributions for the size  
5 of the earthquake that can be generated by those  
6 faults or in those areas. You make a distinction  
7 about the rate of activity or the slip rate that  
8 can -- that those sources can produce, how often  
9 those earthquakes might occur to make parameters  
10 that describe the distribution of the different  
11 sizes of earthquakes up to what you've deemed to be  
12 the maximum earthquake for that particular source  
13 and characteristics of what the shape of that  
14 frequency distribution of earthquakes looks like.  
15 You make some estimates about the distance, the  
16 rupture of that earthquake is from the site based  
17 on some modeling of ruptures on what you've  
18 considered to be the fault sources are, within the  
19 area sources.

20 All of those are parameter distributions  
21 that then get, if you will, sampled in many, as  
22 Dr. McCann explained in his testimony several weeks  
23 ago, many iterations. You develop many possible  
24 hazard curves and you put those all together to  
25 come up with a distribution of the hazard with a

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1 mean and some estimate of the uncertainty about  
2 that mean.

3 Q. And I believe Dr. McCann also mentioned  
4 site response. Does that also go into the  
5 hazard --

6 DR. STAMATAKOS: That's on the other  
7 side of the -- you have to evaluate how the  
8 earthquake energy is propagated through the rock  
9 and then through the soil, and there are various  
10 methods for doing that probabilistically, as well.

11 Q. And that goes into the --

12 DR. STAMATAKOS: That goes into  
13 estimating the ground motions, yes.

14 Q. In the hazard curve?

15 DR. STAMATAKOS: In the hazard curve,  
16 that's correct.

17 Q. Okay. Are you aware of the site soil  
18 conditions at PFS?

19 DR. STAMATAKOS: Somewhat, yes.

20 Q. Would you call it a subsoil site?

21 DR. STAMATAKOS: I call it a soil site.  
22 I don't know when the relative terms when soft and  
23 hard soil are used.

24 Q. And there are two faults that dip under  
25 the PFS site; is that correct? The east fault and

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1 the west fault?

2 DR. STAMATAKOS: I believe the east  
3 fault dips under the site. I thought the west  
4 fault was also west of the fault and its trace was  
5 west of the site.

6 Q. Maybe a kilometer or two away?

7 DR. STAMATAKOS: It's close, yes.

8 Q. And the Stansbury fault, the Stansbury  
9 fault is -- how far is that from the site?

10 DR. STAMATAKOS: Roughly ten kilometers.  
11 I'd have to look at the map to be sure.

12 Q. And what would you consider to be the  
13 controlling fault at the PFS site?

14 DR. STAMATAKOS: Well, based on what was  
15 done at Geomatrix, I would say the two controlling  
16 faults were the east fault and the Stansbury fault.

17 Q. And what are the -- what magnitude of  
18 earthquake could be predicted for the Stansbury?

19 DR. STAMATAKOS: I'd have to again defer  
20 to what was done in the Geomatrix '99 study. My  
21 recollection based on assumptions about the  
22 dimensions of that fault is upwards of magnitude 7.

23 Q. Maybe 7.5?

24 DR. STAMATAKOS: I would say that if  
25 there's a 7.5, that would be at an extreme end of

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1 the distribution of magnitudes.

2 DR. McCANN: Can I just clarify  
3 something there? Your question wasn't clear. You  
4 asked what magnitudes were considered.  
5 Dr. Stamatakos's answer referred to maximum  
6 magnitude, but in fact magnitudes from a lower  
7 bound of 5 to whatever the maximum magnitude was  
8 was considered. So a full range of magnitudes were  
9 considered in the analysis.

10 JUDGE FARRAR: And that's magnitude on  
11 what scale?

12 DR. McCANN: I believe they used moment  
13 magnitude.

14 JUDGE FARRAR: How does that tie in with  
15 Richter and Mercalli?

16 DR. McCANN: Mercalli is a subjective  
17 intensity scale based on the effects of the  
18 earthquake shaking. The Richter magnitude, which  
19 sort of has made it into the general vernacular, is  
20 a particular magnitude scale originally developed  
21 by Dr. Richter. The moment magnitude scale has,  
22 relatively speaking, been developed and represents,  
23 if you will, a truer measure of the actual size of  
24 the earthquake. The other scales that you hear,  
25 Richter magnitude, surface wave magnitude, all have

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1 I'll say accuracy or saturation problems with  
2 regard to measuring the size of earthquakes as they  
3 get larger and larger. And moment magnitude is a  
4 bit truer.

5 JUDGE FARRAR: And it's a fairly recent  
6 development?

7 DR. McCANN: Fairly recent, yes.

8 JUDGE FARRAR: What years?

9 DR. McCANN: Maybe the late 80's.

10 JUDGE FARRAR: That's close enough.

11 Q. (By Ms. Chancellor) Dr. Stamatakos, do  
12 you have your report, Staff Exhibit Q?

13 DR. STAMATAKOS: Yes.

14 Q. Seismic Ground Motion and Faulting,  
15 etc., dated September 1999 --

16 DR. STAMATAKOS: Yes.

17 Q. -- for the PFS site?

18 DR. STAMATAKOS: Yes, I do.

19 Q. You look on page 2-3, isn't it correct  
20 that PFS is located in the northeastern edge of the  
21 Basin and Range Province?

22 DR. STAMATAKOS: I believe that's  
23 correct, yes.

24 Q. And does Basin and Range -- seismicity  
25 in the Basin and Range include significant

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1 historical earthquakes of 1950 and a magnitude  
2 7.58; '54, another 7.5; also in '83. Is that  
3 correct?

4 DR. STAMATAKOS: Yeah. Except that to  
5 be absolutely correct, note that what was denoted  
6 there and what I took from the record that those  
7 are surface wave magnitudes, not moment magnitudes.  
8 So that's a moment magnitudes that correspond with  
9 earthquakes I would expect to be smaller than the  
10 surface wave magnitudes.

11 Q. On page 10 you state that the east, west  
12 and -- you state that the probability of activity  
13 is -- that Geomatrix basically ranked certain  
14 faults within -- near PFS and gave a 1 to the east,  
15 west, and Stansbury fault. Is that correct, at the  
16 bottom of --

17 DR. STAMATAKOS: You're talking about a  
18 parameter that goes into the probabilistic seismic  
19 hazard assessment?

20 Q. Right.

21 DR. STAMATAKOS: You can assign a  
22 probability of faulting occurrence on specific  
23 faults, and this goes back even to a question that  
24 Judge Farrar had about faults, definitions of  
25 capability. And see, what Geomatrix did, if I

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1 remember correctly, is that for any fault surface  
2 that indicated evidence in the lake quaternary less  
3 780,000 years, they gave a probability weight of 1  
4 to that fault; and for faults that had suspected  
5 activity within the last two million years, I  
6 think, if I remember this correctly, they gave a  
7 probability activity of .8 or .7 weight probability  
8 for the East Cedar Mountain faults. And a .7  
9 for -- .7 for the East Cedar Mountain fault and a  
10 .8 for the Springline fault. And the .7 activity  
11 on the East Cedar Mountain fault was assigned even  
12 though there was no direct evidence presented, I  
13 believe that there was quaternary displacement,  
14 just suspected quaternary displacement on that  
15 particular fault.

16 MR. GAUKLER: Your Honor, I just want to  
17 raise a concern that we're getting again to the  
18 issues that were part of the second investigation  
19 which really aren't at issue here any more. I  
20 understand this report isn't stuff that  
21 Mr. Stamatakos has, and there's testimony of this  
22 for background for the curves that appear on Staff  
23 Exhibit R. And I don't mind some probing in that  
24 context, but I do not want to go beyond and to  
25 raise the issues that should not be raised, that

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1 the parties agreed were not to be raised in this  
2 proceedings.

3 JUDGE FARRAR: So far I think we're  
4 just, as you said, probing into some background  
5 without going too deeply into it. We'll bear that  
6 in mind, Mr. Gaukler.

7 Q. (By Ms. Chancellor) And on page 2-14  
8 you state -- before Section 2.5-2 you state,  
9 "Especially critical are the possibilities that the  
10 West fault is an active, independent source and  
11 that the East and Springline faults are linked to  
12 form a single fault source." Correct?

13 MR. TURK: May I ask where you're  
14 reading from, where on that page?

15 MS. CHANCELLOR: 2-14 directly above  
16 section 2.1.5.2. See "Stansbury Fault," sentence  
17 immediately above that.

18 DR. STAMATAKOS: That's correct.

19 Q. (By Ms. Chancellor) Is it fair to say  
20 that the PFS site is a seismically active site?

21 DR. STAMATAKOS: In relative terms, yes.

22 Q. And in the consolidated SER on page 241  
23 you state that revisions to the -- revisions to the  
24 ground motion led to the development of a  
25 nine-layer shear wave soil velocity profile and

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1 that this model led to a significant increase in  
2 estimated ground motions.

3 MR. TURK: I'm sorry. May we have a  
4 moment to find the document?

5 MS. CHANCELLOR: Sure. Consolidated SER  
6 at page 241.

7 MR. TURK: Give us a moment to get the  
8 document out.

9 JUDGE FARRAR: Is that an exhibit?

10 MS. CHANCELLOR: Yes. It's Staff  
11 Exhibit C.

12 JUDGE FARRAR: The great, big --

13 MR. TURK: It's been submitted with  
14 aircraft.

15 MS. CHANCELLOR: Consolidated SER.

16 Page --

17 MR. TURK: I'm sorry. Could you re-ask  
18 the question?

19 MS. CHANCELLOR: Right.

20 Q. (By Ms. Chancellor) Do you see the top  
21 sentence?

22 DR. STAMATAKOS: Yes.

23 Q. At the beginning of 241. And the  
24 revisions that are referred to on page 241 come  
25 from the revisions of PFS's re-evaluation of its

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1 seismic analysis?

2 DR. STAMATAKOS: The component of the  
3 seismic analysis that has to do with how the energy  
4 is propagated in the upper part of the soil column,  
5 upper 30 feet I believe is one of the primary  
6 issues that they developed a different model for  
7 the site response.

8 Q. And is this because there was a conflict  
9 between the CPT data and the seismic lines?

10 DR. STAMATAKOS: I thought that it was  
11 also because of additional borehole geophysical  
12 data that they'd acquired.

13 MR. TURK: Sorry. Could I ask the  
14 witness to bring the microphone a little closer and  
15 perhaps to speak a little more slowly for the  
16 reporter's sake?

17 MS. CHANCELLOR: Did you say hostility,  
18 speak with a little more hostility?

19 MR. TURK: Speak a little more slowly.  
20 But words, like anything else, are in the ears of  
21 the beholder.

22 MS. CHANCELLOR: That's true.

23 Q. (By Ms. Chancellor) And the change that  
24 is referred to here in this shear wave model  
25 profile, this led Geomatrix to conclude that there

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1 was a 35 percent increase in ground motions of the  
2 PFS site; that is correct?

3 DR. STAMATAKOS: No, it's not exactly  
4 correct. The revisions led to a large increase in  
5 the peak ground accelerations, but if you look at  
6 the entire set of the spectral velocities -- or  
7 spectral accelerations, excuse me, the changes as  
8 you go towards other frequencies in that spectrum  
9 are much smaller.

10 Q. But there was a 35 percent increase in  
11 peak ground acceleration from the .53 g in the  
12 earlier analysis to the approximately .7 g in the  
13 new analysis?

14 DR. STAMATAKOS: That's correct. There  
15 was a large increase in peak ground acceleration.

16 Q. So site response is important with  
17 respect to the analyzing the seismicity at the  
18 site?

19 DR. STAMATAKOS: Site response can be  
20 important, that's correct.

21 Q. I'd like to hand out but not have marked  
22 a copy from your notebook.

23 I don't want it marked at this stage,  
24 your Honor.

25 MR. TURK: May I note, in light of the

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1 questioning on Friday, I've now copied off the  
2 entire notebook and I intend to introduce it as a  
3 Staff exhibit.

4 MS. CHANCELLOR: Well, I beat you to it.

5 MR. TURK: Well, looks like you're  
6 proposing the first six pages. I intend to  
7 introduce all 12 pages.

8 MS. CHANCELLOR: Well, at the moment all  
9 we have before us are the first -- before us is the  
10 cover page of Dr. Stamatakos's notebook, scientific  
11 notebook 353, initial entry John Stamatakos, August  
12 1, 2000. Pages 1, 2, 3, 4, 5, and 6 -- six pages.  
13 Do you have that, Dr. Stamatakos?

14 DR. STAMATAKOS: I do.

15 MR. TURK: May I note also this is the  
16 document, part of the document that Dr. Stamatakos  
17 referred to today and on Saturday in terms of a  
18 document in his analysis, and this was turned over  
19 to you in discovery.

20 MS. CHANCELLOR: Yes, I retrieved this  
21 from our discovery responses, as I stated at the  
22 end of the testimony on Saturday, that I would  
23 review this.

24 Q. (By Ms. Chancellor) Dr. Stamatakos, on  
25 page 2 of your notebook, data and procedure, the

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1 next to last sentence, it says, a set of seven  
2 hazard curves were provided to me by Dr. M.  
3 McCann -- I guess that should be "on" September 30,  
4 2001. Dr. McCann indicated that the data were from  
5 1993. Is that correct?

6 DR. STAMATAKOS: That's what the  
7 document states.

8 Q. And did you use this data from  
9 Dr. McCann to derive the plot, State's Exhibit S?  
10 Beg your pardon, Staff's Exhibit R?

11 DR. STAMATAKOS: Some of the data on  
12 Staff's Exhibit R were derived from that data, yes.

13 Q. Okay, I'd like to go through this piece  
14 by piece. On page 3 of your notebook there looks  
15 like a spreadsheet with peak ground accelerations  
16 of seven western U.S. sites.

17 DR. STAMATAKOS: That's correct.

18 Q. Is this the seven plots of data that you  
19 received from Dr. McCann?

20 DR. STAMATAKOS: Yes.

21 Q. And you state on page 3 that Dr. McCann  
22 told you that the data were from 1993. If you'd  
23 look at the Diablo Canyon reference, it states that  
24 that's dated July 1988.

25 DR. STAMATAKOS: That -- okay.

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1 Q. Have you reconciled the fact that  
2 Dr. McCann says that the data are from 1993 yet  
3 your reference to Diablo Canyon is for July of  
4 1988?

5 DR. McCANN: Maybe I can --

6 Q. No, I'd like to ask Dr. Stamatakos this.

7 DR. STAMATAKOS: Okay. I would ask -- I  
8 would ask the same question of Dr. McCann. I  
9 presume that the Diablo Canyon report comes from a  
10 very long and rigorous study that was performed at  
11 the Diablo Canyon called the long-term seismic  
12 program, and perhaps, if I remember correctly, 1993  
13 was when he might have assimilated all that data  
14 together into that spreadsheet which he provided  
15 me. But I would ask him to elaborate.

16 Q. First of all, I want to establish what  
17 you relied on in producing Staff's Exhibit R. And  
18 I'd be happy to follow up later with Dr. McCann,  
19 but let's first establish where you got your  
20 information from.

21 DR. STAMATAKOS: Okay.

22 Q. The list of references, the San  
23 Francisco Bay Bridge, Geomatrix -- first of all,  
24 the seven references here, are these the seven  
25 references -- on page 3, are these the seven

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1 references you relied upon to develop the plots in  
2 Staff's Exhibit R?

3 DR. STAMATAKOS: Well, certainly not  
4 wholly. These are the references for the curves as  
5 they're titled. I added to that plot the Geomatrix  
6 data from PFS which was provided to us by PFS in  
7 the whole review process. I added the Yucca  
8 Mountain data which is published in the Yucca  
9 Mountain studies and also published in a paper that  
10 came out on earthquake spectra.

11 Q. Let's just stick with the San Francisco  
12 Bay Bridge, Diablo Canyon, Los Alamos site 1,  
13 Hanford site A, INEEL 1, INEEL 2, and Palos Verde.  
14 These seven references are part of the curves that  
15 you derived on Staff's Exhibit R, correct?

16 DR. STAMATAKOS: That's correct.

17 Q. These seven -- are these the seven  
18 references that you rely upon for developing the  
19 seven curves that relate to those sites on Staff's  
20 Exhibit R?

21 DR. STAMATAKOS: Yes, as given to me by  
22 Dr. McCann.

23 Q. Okay. San Francisco Bay Bridge,  
24 Geomatrix prepared by California Department of  
25 Transportation. Is there a date on this?

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1 DR. STAMATAKOS: Well, I would again  
2 defer the specific questions about references to  
3 Dr. McCann. He supplied the hazard curves as he  
4 put them together from his extensive experience in  
5 doing seismic hazard analysis.

6 Q. And San Francisco Bay Bridge, that's not  
7 in the Basin and Range province, correct?

8 DR. STAMATAKOS: That's correct. It's  
9 in California.

10 Q. And do you know whether that's -- what  
11 the soil conditions, how would you characterize the  
12 San Francisco Bay site?

13 DR. STAMATAKOS: That's a rock site, I  
14 believe.

15 Q. And what is the distance to soils of  
16 controlling earthquakes at the San Francisco Bay  
17 bridge?

18 DR. STAMATAKOS: I don't know the  
19 particulars.

20 Q. And --

21 DR. STAMATAKOS: But I would imagine  
22 that they're quite close, given the San Andreas  
23 fault and the other faults in San Francisco.

24 Q. What is the site response of the San  
25 Francisco Bay bridge site to earthquakes?

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1 DR. STAMATAKOS: I don't know the  
2 particulars. Again, I'm using a reference, hazard  
3 curve from another study. And I think what's  
4 important is to understand the impetus for the  
5 curves. We didn't rely on this analysis for  
6 site-specific hazard. What we did was just to  
7 prepare a comparison for a sort of first order  
8 understanding of how the PFS hazard curves fit into  
9 a set of other established hazard curves,  
10 including, you know, ones derived by the USGS, by  
11 DOE, by Geomatrix at other sites, other nuclear  
12 facilities.

13 Q. Isn't it correct that the curves that  
14 you display on Staff's Exhibit R are only as good  
15 as the studies from which they come?

16 DR. STAMATAKOS: That's correct.

17 Q. As a scientist, there is -- nobody could  
18 reproduce these results if there isn't a correct --  
19 if there isn't a full and accurate reference to  
20 where the data came from. Is that correct?

21 DR. STAMATAKOS: Well, I would agree  
22 with that, but I would point to Dr. McCann, and he  
23 can provide the complete references if you so  
24 desire.

25 Q. But you relied totally on Dr. McCann to

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1 develop these curves, correct?

2 DR. STAMATAKOS: I relied on the data  
3 that he supplied me, yes, and his extensive  
4 experience in performing seismic hazard sets at  
5 many nuclear facilities over many years. So I  
6 assume that he's very familiar with the hazard  
7 studies that have been performed.

8 Q. Diablo Canyon, that's not in Basin and  
9 Range, is it?

10 DR. STAMATAKOS: No.

11 Q. Los Alamos site 1, is that in Basin and  
12 Range?

13 DR. STAMATAKOS: I would say no.

14 Q. Do you have any idea when the study was  
15 done? Again, it's got date on none.

16 DR. STAMATAKOS: No, I don't. I would  
17 again ask Dr. McCann to clarify.

18 Q. Hanford site is in Washington, right?

19 DR. STAMATAKOS: That's correct.

20 Q. That's not Basin and Range, is it?

21 DR. STAMATAKOS: No.

22 Q. You don't know the distance to the  
23 controlling faults, do you?

24 DR. STAMATAKOS: I don't know the  
25 particulars, no.

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1 Q. You don't know the site response,  
2 correct?

3 DR. STAMATAKOS: That's correct.

4 Q. If you look on page 24 of Exhibit Q,  
5 your report.

6 JUDGE FARRAR: Ms. Chancellor, before we  
7 leave Staff Exhibit R --

8 MS. CHANCELLOR: Oh, we're still going  
9 on with that, your Honor, but go ahead.

10 JUDGE FARRAR: Why are Los Alamos and  
11 Palo Verde not displayed on the Exhibit R?

12 DR. STAMATAKOS: I guess I plotted, what  
13 I plotted was a subset of the information that was  
14 provided in the table. I thought perhaps I was  
15 running out of clarity of if we superimposed any  
16 more hazard curves on the plot, but I would argue  
17 that the most relevant information can be derived  
18 from looking at Skull Valley and Salt Lake City  
19 curves. Again, it was just for us to get a first  
20 order of sense of where the hazards fell with  
21 respect to these other facilities.

22 JUDGE FARRAR: Looking at this 7 on page  
23 3 of your notebook, if you did plot Los Alamos and  
24 Palo Verde, would they fall somewhere between Yucca  
25 Mountain and everything below that? Would they

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1 fall above Yucca Mountain?

2 DR. STAMATAKOS: Well, I think the Los  
3 Alamos would fall well below the Yucca Mountain.  
4 Palo Verde would as well.

5 JUDGE FARRAR: Okay.

6 MR. GAUKLER: I would ask counsel how  
7 much more they think they have left in terms of  
8 trying to make sure we can start aircraft crashes  
9 this afternoon.

10 MS. CHANCELLOR: I'm going as fast as I  
11 can, Mr. Gaukler. It depends how on far we get on  
12 this.

13 JUDGE FARRAR: When is Col. Horstman due  
14 in town?

15 MS. NAKAHARA: He's here now, your  
16 Honor.

17 JUDGE FARRAR: And he leaves when?

18 MS. NAKAHARA: Wednesday around noon.

19 JUDGE FARRAR: Ms. Chancellor, I don't  
20 think Mr. Gaukler was accusing you of not going as  
21 fast as you can; he was looking for information, as  
22 we are.

23 MS. CHANCELLOR: I should be done --  
24 I've just got this -- I've just got to go through,  
25 establish basis for Exhibit R and one other area

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1 which will take a couple of questions.

2 JUDGE FARRAR: Okay, fine.

3 MS. CHANCELLOR: So I think I'm pretty  
4 much on track.

5 JUDGE FARRAR: Thank you.

6 Q. (By Ms. Chancellor) On Figure 2-2 on  
7 Page 2-4 of your report, Staff's Exhibit Q, there's  
8 a historical earthquake map. And INEEL would be in  
9 the Snake River plain, correct?

10 DR. STAMATAKOS: That's correct.

11 Q. And that's a fairly aseismic area, isn't  
12 it?

13 DR. STAMATAKOS: That's correct.

14 Q. There doesn't appear to be a reference  
15 for the Yucca Mountain hazard curve. Where was  
16 that obtained from?

17 DR. STAMATAKOS: That was obtained from  
18 the DOE document that documented the probabilistic  
19 seismic hazard assessment, and it's also provided  
20 in a paper by Carl Steppe and many co-authors  
21 including Dr. Arabasz that was published in 2001, I  
22 believe, in earthquake spectra. I don't know the  
23 details, but that comes from our data that was  
24 provided to us by DOE in their Yucca Mountain  
25 hazard study. And to try to anticipate questions,

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1 that was for a generic hard rock site and no soil  
2 considerations were yet added into that Yucca  
3 Mountain curve. It's a rock site.

4 Q. Appreciate that. Thank you. With  
5 respect to the Salt Lake City curves on this map,  
6 you went to a USGS web site and found some data  
7 there; is that correct?

8 DR. STAMATAKOS: I found a paper that  
9 was published on a web site by the USGS, that's  
10 correct.

11 Q. And this paper published by the USGS  
12 doesn't specify where in Salt Lake City these  
13 ground motions --

14 DR. STAMATAKOS: No. If you'll allow  
15 me, I have a copy of a paper that could refresh my  
16 memory on the specifics of, some of the specifics,  
17 questions you may ask.

18 Q. Sure, that's fine.

19 JUDGE FARRAR: While he's doing that,  
20 let's go off the record to find out about the sound  
21 system.

22 (Discussion off the record.)

23 MS. CHANCELLOR: Okay, Dr. Stamatakos,  
24 do you have that paper?

25 DR. STAMATAKOS: Yes, I do. And they

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1 don't give a specific location for this particular  
2 hazard curve, only to say that the site spacings  
3 for these were in approximately 1 degree  
4 latitude -- 10th of a degree latitude, excuse me,  
5 and a 10th of a degree longitude, and that would  
6 correspond to roughly an area about 11 kilometers  
7 by 11 kilometers.

8 Q. And it doesn't state the distance to the  
9 Wasatch Fault or the West Valley fault; is that  
10 correct?

11 DR. STAMATAKOS: It doesn't state the  
12 exact distance to the Wasatch Fault, but I would  
13 assume that Wasatch Fault is quite close to Salt  
14 Lake City.

15 Q. Five kilometers?

16 DR. STAMATAKOS: Okay.

17 Q. No, is it five kilometers?

18 DR. STAMATAKOS: I don't know.

19 MR. TURK: And also, what point in Salt  
20 Lake City are you measuring from? The center of  
21 the city? Edge of the city?

22 MS. CHANCELLOR: I don't know, because  
23 that's precisely the point, Mr. Turk. There's  
24 nowhere in the USGS document that states where it  
25 is.

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1 Q. (By Ms. Chancellor) In earlier  
2 testimony you stated that the rock site hazard  
3 curve for the Skull Valley site on Exhibit R was --  
4 did you say that was from Geomatrix?

5 DR. STAMATAKOS: That's correct.

6 Q. Is that before or after the ground  
7 motions increased, the rock site?

8 DR. STAMATAKOS: I believe it's after.

9 Q. Is there anything in the SAR that  
10 references a rock site?

11 DR. STAMATAKOS: The SAR?

12 Q. SAR?

13 DR. STAMATAKOS: Safety Analysis Report.

14 Q. Safety Analysis Report.

15 DR. STAMATAKOS: I can't recall what's  
16 in the SAR. I just recall what was provided --  
17 these data were actually provided to us in April,  
18 was it a year ago, when we -- 2001, April 2001 when  
19 we met with the Applicant and asked them for some  
20 additional requests for information when they  
21 presented the new results. And in that package of  
22 information they provided us digital hazard curves,  
23 including the Skull Valley rock and Skull Valley  
24 soil curves for a range of frequencies, PGA  
25 included, and that's where I derived this data

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1 from.

2 Q. Now, I think we established the hazard  
3 curves depend on the location of the site relative  
4 to the sources such as active faults, right?

5 DR. STAMATAKOS: That's one  
6 consideration.

7 Q. And do hazard curves depend on the  
8 thickness and type of material underlying the site?

9 DR. STAMATAKOS: It depends whether the  
10 hazard curves are incorporating effects of soil or  
11 whether they're derived for rock sites. Many of  
12 the hazard curves that are presented here, the  
13 Yucca Mountain site and the Salt Lake City site,  
14 are for sites assuming rock conditions. So there's  
15 no additional information about how the hazard  
16 might change if there were additional factors such  
17 as the soil on top of the rock and what would  
18 happen to the seismic energy as it propagates  
19 through that soil. So comparisons can be made  
20 between the Skull Valley rock and the Salt Lake  
21 City rock in this case.

22 Q. You say there can be?

23 DR. STAMATAKOS: Well, the comparison  
24 that I made in my discussion was between the hazard  
25 curve for Salt Lake City, assuming rock conditions,

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1 and the hazard curve for Skull Valley assuming rock  
2 conditions.

3 Q. But you don't know where the Salt Lake  
4 City data came from. You don't know a  
5 site-specific location where the Salt Lake City --

6 DR. STAMATAKOS: No, but it does say in  
7 the paper that the reference conditions were for a  
8 firm rock site with an average shear wave velocity  
9 of 760 meters per second.

10 THE REPORTER: Of what?

11 DR. STAMATAKOS: The reference site  
12 conditions for the Salt Lake City hazard curve that  
13 were presented by the USGS --

14 JUDGE FARRAR: Wait, wait. All she  
15 needs is what were your last few words.

16 DR. STAMATAKOS: 760 meters per second.

17 Q. (By Ms. Chancellor) Aren't near-surface  
18 site materials different for older sites on the  
19 hazard curve with the exception of the two Skull  
20 Valley curves?

21 DR. STAMATAKOS: I'm sorry. I didn't  
22 understand your question. Could you repeat it?

23 Q. Aren't the near-surface site materials  
24 for all of the sites listed on Staff's Exhibit R,  
25 aren't they all different with the exception of the

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1 two Salt Lake valley sites -- or Skull Valley  
2 sites?

3 DR. STAMATAKOS: Well, there may be some  
4 differences especially for those curves that  
5 include a soil component, but for the hard rock  
6 curves I would anticipate that the differences are  
7 somewhat smaller. So again, that's why in the  
8 comparison I looked at a hazard curve derived for  
9 hard rock compared to Skull Valley hard rock curve.

10 Q. And location to soils is going to --  
11 site distance to soil, earthquake soils is going to  
12 be different?

13 DR. STAMATAKOS: That's one factor.  
14 Magnitude frequency of how often those large  
15 earthquakes occur is also a very critical factor,  
16 maybe in this case slightly more critical.

17 Q. On page 69 of your notebook you say, the  
18 results showed the conservative nature of the  
19 applicant's soil characterization and PSHA results  
20 presented in the SAR. Do you see that? That's on  
21 the top of page 6.

22 DR. STAMATAKOS: Yes. We've concluded  
23 and stated in many of our documents that --

24 Q. There's no question.

25 DR. STAMATAKOS: -- that the Applicant's

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1 PSHA is conservative.

2 DR. McCANN: Can I --

3 Q. If all of the hazard curves for the  
4 sites are a different location with different  
5 surface materials, different site to soil  
6 locations, how can you draw any conclusions at all  
7 from them about the level of conservatism in the  
8 Skull Valley hazard curves?

9 DR. STAMATAKOS: Because you can still  
10 look at the general amounts of ground motion that  
11 are predicted for Skull Valley, and if we assume  
12 for a moment there are no soil effects and just  
13 look at the Skull Valley rock curve, it predicts  
14 very high ground motions, given the conditions at  
15 the site when you consider the fact that there are  
16 faults there that are considerably less active and  
17 produce smaller magnitude earthquakes than many of  
18 the other hazard curves that are here.

19 The Hosgri fault for the Diablo Canyon  
20 site is a larger fault that produces a larger  
21 magnitude, maximum magnitude earthquake. The  
22 Wasatch fault certainly is a larger fault, and in  
23 fact it's stated so in one of your witnesses'  
24 testimony that it's probably one of the biggest and  
25 most active normal faults known in the world. It

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1 has a slip rate that's up to five to ten times  
2 larger than slip rates that are predicted by  
3 Geomatrix in their analysis of the Stansbury and  
4 East fault.

5 And so as a first order comparison, to  
6 us it seems that the PSHA performed by Geomatrix  
7 results in a conservative hazard curve given those  
8 first order observations.

9 And then what we did is some specific  
10 calculations that supported that. We looked at,  
11 for example, in the '99 report we looked at the  
12 West fault and the interpretation of whether or not  
13 that was an active source. We did a sensitivity  
14 study and we did a re-evaluation, an independent  
15 evaluation of geophysical data that was provided in  
16 the 1999 report, and we concluded that the West  
17 fault was not a fault that was capable of producing  
18 earthquakes, and therefore that was just one  
19 example of the source characterization that we  
20 deemed to be conservative.

21 Q. Staff's Exhibit R shows how seismically  
22 active the PFS site is vis-a-vis other sites.  
23 Isn't that true?

24 MR. TURK: Objection. That's not what  
25 it's represented to be.

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1 MS. CHANCELLOR: Precisely. That's what  
2 I'm getting at.

3 Q. (By Ms. Chancellor) Doesn't this  
4 show --

5 JUDGE FARRAR: Overruled. You may  
6 answer.

7 DR. McCANN: Your question refers to --  
8 I mean, your question used the word "seismicity,"  
9 which of course is only one element of the hazard  
10 analysis. And by that I mean seismicity is, as we  
11 refer to it, generally is restricted to the seismic  
12 sources and the rate of occurrence of earthquakes.  
13 The seismic hazard curve includes ground motion,  
14 site response, etc. So seismicity is one part.

15 Your reference to the hazard curve and  
16 some of the details of differences that might exist  
17 between, say, PFS, a Salt Lake City site, certainly  
18 it is a fair statement to say that a site in Salt  
19 Lake City at whatever street corner one would like  
20 to choose is not precisely the same in every minute  
21 detail as PFS. But there are things one can notice  
22 from the hazard curves that are displayed on the  
23 figure, and let's just stick to Salt Lake City and  
24 PFS in particular.

25 The first is, we can remove a number of

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1 the effects, distance, for example, if we recognize  
2 that a site in Salt Lake City nominally is quite  
3 close to the Wasatch. For discussion, let's say  
4 less than 10 kilometers. The majority of ground  
5 motion attenuation relationships saturated those  
6 distances, and so the difference in distance  
7 between one, two, three, four, five, six up to ten  
8 don't really make as much difference as they would  
9 if we were talking, say, 10 versus 50.

10 Secondly, as you go to very low ground  
11 motions in the hazard curve, one of the things that  
12 you notice on the figure is that for the Skull  
13 Valley curves, both the rock and the soil, is that  
14 they have the same rate of occurrence of very low  
15 ground motions. And what that means is, is that  
16 given the occurrence of an earthquake of magnitude  
17 5 or greater on any one of the seismic sources in  
18 the vicinity of the particular site of interest,  
19 the likelihood of exceeding those low ground  
20 motions, and let's call them numbers slightly  
21 greater than zero just for discussion, that removes  
22 all effects of distance, it removes all effects of  
23 attenuation models, and it removes essentially all  
24 effects of site response.

25 So here we have a case where, for all

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1 practical purposes, the Skull Valley site, the Salt  
2 Lake City site have the same rate of occurrence of  
3 exceeding this very low ground motion.

4 What that's saying is that the rate of  
5 occurrence of earthquakes in the vicinity, in the  
6 general vicinity of Skull Valley and Salt Lake, are  
7 essentially the same, even though Skull Valley is  
8 considerably removed from Salt Lake City and the  
9 very active Wasatch Front -- Wasatch Fault. By the  
10 same token, it also comes very close to the rate of  
11 occurrence of exceeding those low ground motions  
12 for the San Francisco Bay Bridge, which has many,  
13 many active faults on both sides of the east and  
14 the west.

15 So this curve tells us that the Skull  
16 Valley site appears to be challenging some of the  
17 more seismically active areas in the country which  
18 the seismic source characterization by itself  
19 doesn't necessarily support, and thus appears to be  
20 conservative.

21 MS. CHANCELLOR: I'd like to have marked  
22 State's Exhibit 185, Final Report, Volume I of III,  
23 Fault Evaluation Study and Seismic Hazard  
24 Assessment, Revision 1, prepared by Geomatrix  
25 consisting of Figure 6-12, Table 6-2, which

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1 continues on for approximately five pages, and then  
2 Figure 6-6 continues on for three pages.

3 JUDGE FARRAR: Do you want this marked  
4 as --

5 MS. CHANCELLOR: State's Exhibit 185,  
6 please, your Honor.

7 JUDGE FARRAR: Then we'll pause and let  
8 the reporter do that.

9 (STATE'S EXHIBIT-185 MARKED.)

10 Q. (By Ms. Chancellor) Let's try and get  
11 at this conservatism in the Staff's exhibit.  
12 Dr. McCann, would you please look at the second  
13 page, Figure 6-12 in the Geomatrix report showing  
14 contributions of individual sources to total mean  
15 hazard for horizontal motion at the CTB site.

16 DR. McCANN: Yes.

17 Q. Please review the bottom left which  
18 shows hazard curves for peak horizontal ground  
19 acceleration. Let me ask the question, then you  
20 may need some time to review. For peak  
21 accelerations greater than 0.1 g, which fault is  
22 the larger contributor to the seismic hazard at the  
23 PFS site?

24 DR. McCANN: Did you say 0.1?

25 Q. 0.1 g. Which fault is the largest

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1 contributor? I'll give you a hint. Is it  
2 Stansbury fault?

3 DR. McCANN: No, it doesn't appear to  
4 be.

5 Q. It's maybe a little confusing, because  
6 Stansbury fault is that dash-dot pattern that if  
7 you look on the Y axis, it's the second line from  
8 the top.

9 DR. McCANN: It's a little confusing to  
10 me. The legend appears to be a line and two dots,  
11 and the line on the figure appears to be -- or the  
12 curve on the figure appears to be a line and one  
13 dot.

14 JUDGE FARRAR: And there's another curve  
15 that's a line and one dot.

16 MS. CHANCELLOR: I believe there's a dot  
17 before every name on the legend.

18 DR. McCANN: Oh, I see. Okay. So yes,  
19 it looks like it's the Stansbury.

20 Q. (By Ms. Chancellor) And which fault is  
21 the second largest contributor? Is that the East  
22 fault/Springline?

23 JUDGE FARRAR: Wait a minute. Starting  
24 at the one that intersects the top horizontal line  
25 of the margin of the graph. If I come down one

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1 from that solid line which represents total, I have  
2 a line and a dark dot. Then if I come down two  
3 more, I have a line and a not dark dot. Which is  
4 which? The second one is Wasatch?

5 MS. CHANCELLOR: The second one is the  
6 Stansbury.

7 JUDGE FARRAR: Well, I don't know that.

8 DR. McCANN: The question referred to,  
9 Judge, at .1 g?

10 JUDGE FARRAR: No, I'm just trying to  
11 read the graph right now.

12 DR. McCANN: Okay. I'm sorry.

13 JUDGE FARRAR: I have -- my first -- of  
14 the first four lines on that graph, kind of heading  
15 in a southwesterly direction from the top of the  
16 map, from the top of the graph, the second line, is  
17 that Stansbury or is that Wasatch?

18 MS. CHANCELLOR: It may be easier to  
19 look if you go to .1 g and go up to the top and --

20 JUDGE FARRAR: No, I'm just trying to  
21 read it. I'm not trying to get a reading, I'm  
22 trying to figure out which line represents which  
23 graph according to your -- which line represents --

24 MR. TURK: Could I possibly help?

25 JUDGE FARRAR: Which thing in the

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1 legend? Well, if they can't help me --

2 MR. TURK: No, if the witnesses have the  
3 original rather than a copy of the chart -- do you  
4 have the original Geomatrix revision?

5 DR. STAMATAKOS: No.

6 MR. TURK: I think it may be a  
7 reproduction diffusion of the symbol that's the  
8 problem, photocopying problem.

9 JUDGE FARRAR: Right. But if it is,  
10 then they need to interpret this for us in light of  
11 Ms. Chancellor's questions.

12 MS. CHANCELLOR: If you start from the  
13 right-hand edge and come over to the left, the  
14 lines of interest are easier to distinguish where  
15 you have a solid line as the total, and then the  
16 next one over going from right to left is the  
17 Stansbury.

18 JUDGE FARRAR: I don't know that.

19 MS. CHANCELLOR: Okay, that's fine.

20 JUDGE FARRAR: That's what I'm asking.  
21 I have the legend that has two different ways of  
22 relying on a dot. One's a dark dot and one's a  
23 light dot, and I just want to make sure the quality  
24 of the reproduction, we know which is which on the  
25 picture.

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1 MR. SILBERG: Are we looking at the left  
2 chart or the right chart?

3 MS. CHANCELLOR: The left.

4 DR. McCANN: The left one.

5 JUDGE FARRAR: Oh, I was looking at the  
6 right one. Thank you.

7 MR. TURK: But aside from that, the  
8 problem is in the legend.

9 JUDGE FARRAR: Right, but --

10 DR. STAMATAKOS: I believe that Wasatch  
11 is a line with what's supposed to be a blackened  
12 star.

13 JUDGE FARRAR: It looks like a big black  
14 dot on the reproduction.

15 DR. STAMATAKOS: Yeah. It's supposed to  
16 be a blackened star, and Stansbury is the line with  
17 the small dot. So I think Ms. Chancellor is  
18 correct. If you go to the left, then the first one  
19 there is the Stansbury.

20 Q. (By Ms. Chancellor) So we've  
21 established that the Wasatch -- that the Stansbury  
22 is the largest contributor to accelerations greater  
23 than .1 g, correct?

24 MR. TURK: The Stansbury.

25 MS. CHANCELLOR: Stansbury. And is the

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1 East fault/Springline fault the second largest  
2 contributor?

3 DR. McCANN: Can we make a clarification  
4 on your prior statement? When you say largest  
5 contributor, just to put it in context, as I read  
6 it, at .1 g we roughly have a 10-2 probability of  
7 exceedance for the total; and for the Stansbury,  
8 which is the next curve down, we have a --  
9 approximately, just to make it easy,  $3 \times 10^{-3}$   
10 probability of exceedance. So that would mean that  
11 the Stansbury contributes about 30 percent to the  
12 total.

13 Q. Okay. And how much does -- and the East  
14 fault/Springline, would that be the next largest  
15 contributor?

16 DR. McCANN: Yes. And roughly I would  
17 read that as, just for this discussion,  $2 \times 10^{-3}$ ,  
18 and therefore contributing about 20 percent to the  
19 total.

20 Q. And the East fault is about what, .9  
21 kilometers from the canister transfer building?  
22 Don't recall?

23 DR. McCANN: It's fairly close. I don't  
24 remember the exact number.

25 Q. And would you agree that the East fault

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1 is a major contributor to the seismic hazard at the  
2 PFS site?

3 DR. McCANN: Yes.

4 Q. Could the hazard from the East fault be  
5 in part responsible for the apparently higher  
6 ground shaking at the PFS site compared to that of  
7 the unspecified site in Salt Lake City for which  
8 Frankel computed the hazard curve, the USGS hazard  
9 curve?

10 DR. McCANN: Could you restate your  
11 question?

12 Q. Could the hazard from the East fault be  
13 in part responsible for the apparently higher  
14 ground shaking hazard at the PFS site compared to  
15 the unspecified site in Salt Lake City from the  
16 Frankel figure, USGS?

17 DR. McCANN: The East fault, yes, is a  
18 significant or important contributor to the seismic  
19 hazard at the PFS site and would not, I would not  
20 expect have an important contribution to ground  
21 motions in Salt Lake City.

22 MR. TURK: I don't know if the witness  
23 understood the question.

24 MS. CHANCELLOR: Well, that's for the  
25 witness to tell me.

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1 MR. TURK: Well, his answer didn't match  
2 the question. We'll do it with redirect.

3 MS. CHANCELLOR: Fine.

4 Q. (By Ms. Chancellor) On page 17 of your  
5 testimony you state, it should also be noted that  
6 the ground motions estimated by the Applicant in  
7 Skull Valley are higher than those estimated for  
8 the I-15 corridor, despite the close proximity of  
9 Salt Lake City to the Wasatch fault which has a  
10 slip rate nearly ten times greater than the  
11 Stansbury or East fault, citing Martinez, etc., and  
12 is capable of producing significantly larger  
13 magnitude earthquakes than the faults near the  
14 proposed PFS facility site in Skull Valley, citing  
15 several references. Do you see that, page 17?

16 DR. STAMATAKOS: Yes.

17 Q. Would you please look at Table 6-2 at  
18 page 2, Table 6-2 at page 2. Under the column  
19 Fault, and it's listed Stansbury, and also look at  
20 the slip rate. What is the range of slip rates  
21 given for the Stansbury fault?

22 DR. STAMATAKOS: The range is --

23 MR. TURK: I'm sorry. We're looking for  
24 the document.

25 MS. CHANCELLOR: It's the exhibit we

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1 handed out, State's Exhibit 185.

2 MR. TURK: Table 6-2?

3 MS. CHANCELLOR: Table 6-2.

4 MR. TURK: Which page?

5 MS. CHANCELLOR: Page 2.

6 MR. TURK: Labeled 2 of 5, okay. Page 2  
7 of 5. Now, I'm sorry .

8 Q. (By Ms. Chancellor) What is the range  
9 of slip rates given for the Stansbury fault?

10 DR. STAMATAKOS: 0.3 millimeters per  
11 year to 0.5 millimeters per year with the highest  
12 weight given to a value of 0.4 millimeters per  
13 year.

14 Q. Now, if you look at pages 4 and 5 of  
15 this exhibit on the Wasatch fault, is it correct  
16 that there are no slip rates given for Salt Lake  
17 City, but there are slip rate distributions given  
18 for the unsegmented model of the Wasatch fault? Is  
19 that right?

20 DR. STAMATAKOS: That's correct.

21 Q. Can you tell me what the range of slip  
22 rate is?

23 DR. STAMATAKOS: For an unsegmented  
24 amount it looks like it goes between 0.1 millimeter  
25 a year to 0.05 millimeters per year.

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1 Q. And the highest weight?

2 DR. STAMATAKOS: I'm sorry. It goes  
3 from 0.7 millimeters a year to 1.8 millimeters.  
4 Highest weight given to 1.1 millimeters per year.

5 Q. So does this -- have you reviewed this  
6 Geomatrix report before, Dr. Stamatakos?

7 DR. STAMATAKOS: Yes.

8 Q. And you've presumably signed off on it  
9 or done --

10 DR. STAMATAKOS: Presumably signed off  
11 on it? It's -- certainly looked at this data.  
12 This hasn't -- this data hasn't changed from the  
13 data that was provided in their -- much of this  
14 data hasn't changed since it was originally  
15 provided in 1999.

16 Q. Does the data on the two tables we  
17 looked at in the Geomatrix report support your  
18 statement that the slip rate on the Wasatch fault  
19 is ten times greater than the slip rate on the  
20 Stansbury fault?

21 DR. STAMATAKOS: As quoted in your  
22 answer on page 17?

23 DR. STAMATAKOS: My -- to be precise, my  
24 answer said early ten times. And the --

25 Q. How near are you?

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1 MR. TURK: Could the witness be allowed  
2 to answer the question without interruption?

3 DR. STAMATAKOS: Well, if you're going  
4 to make -- based on this comparison, I would say  
5 it's a factor of three, 1.1 to 0.4, whatever that  
6 distribution. So roughly a factor of three. What  
7 I was alluding to here was slip rates estimated  
8 based on other published information on slip rates  
9 on the Wasatch fault. For example --

10 Q. The publication by Martinez?

11 DR. STAMATAKOS: Martinez, which I think  
12 that's based on GPS data, global positioning  
13 satellite data gives slip rates up to five  
14 millimeters per year, if memory serves me  
15 correctly.

16 Q. Is the slip rate estimated on GPS data  
17 available for the Stansbury fault near the PFS  
18 site?

19 DR. STAMATAKOS: Not in specific, but I  
20 would add that if you look at the entire Basin and  
21 Range in terms of GPS models, models of the slip  
22 rates for the GPS data that's available, and that  
23 would cover the total amount of extension that's  
24 occurring in the Basin and Range from the Wasatch  
25 Front all the way to California, that in those

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1 models the large percentage, perhaps I think 80  
2 percent of that strain is accommodated by the  
3 Wasatch Front and by faults in California, and the  
4 remaining strain is absorbed by faults, all of the  
5 other faults that lie between the Basin and Range.  
6 And if memory serves me correctly, that conclusion  
7 was in a paper by Thacker and others that was  
8 published in Science, I believe. And I can provide  
9 you that reference. I could look up that reference  
10 if you want to see it.

11 Q. Is it legitimate to compare a GPS  
12 derived slip rate to the slip rate determined by  
13 Geomatrix for the Stansbury fault? Are we  
14 comparing apples and oranges, or, as  
15 Mr. Travieso-Diaz says, apples and bananas, I  
16 think?

17 DR. STAMATAKOS: Well, certainly there  
18 is some controversy in the scientific community  
19 about how you actually interpret the GPS slip  
20 rates. But they are making their way into seismic  
21 hazard assessments and I believe they were a  
22 component of what was evaluated by the experts for  
23 Yucca Mountain. I don't know whether they were  
24 displaced or not. They're a proponent of what was  
25 used for some recent analysis, for example, like

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1 Paducah, Kentucky.

2 Q. If you would turn to State's Exhibit 185  
3 to Figure 6-6, third to last page in the exhibit.  
4 The figure shows maximum magnitude distributions  
5 for fault sources.

6 DR. STAMATAKOS: That's correct.

7 Q. Would you please look at the plot for  
8 the Stansbury fault on the first page on the top  
9 left?

10 DR. STAMATAKOS: Okay.

11 Q. What is the largest maximum magnitude in  
12 the distribution?

13 DR. STAMATAKOS: Well, looks like  
14 there's one little low probability node at 7.5, but  
15 the distribution seems to be centered around  
16 magnitude 7.

17 Q. So the magnitude 7 would be the mean  
18 distribution, right?

19 DR. STAMATAKOS: I believe that's  
20 correct.

21 Q. If you would turn to the last page and  
22 look at the plot for the Wasatch fault on the top  
23 left.

24 DR. STAMATAKOS: Okay.

25 Q. What is the largest magnitude in the

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1 distribution?

2 DR. STAMATAKOS: It's magnitude 7.4.  
3 Although doesn't Dr. Solomon's testimony indicate  
4 magnitudes larger than 7.5?

5 MR. TURK: I'm sorry. You're asking  
6 about the first chart on page --

7 DR. STAMATAKOS: Three of three.

8 MS. CHANCELLOR: The last, top left.

9 MR. TURK: You're only asking about the  
10 Wasatch, not about all the different extensions?

11 MS. CHANCELLOR: Just talking about the  
12 Wasatch, top left.

13 MR. TURK: I think that might be a  
14 little confusing. Aren't the other segments part  
15 of the Wasatch as well?

16 DR. PECHMANN: We'll get to that.

17 MR. TURK: As long as we're clear, we're  
18 only talking about the first box.

19 JUDGE FARRAR: If I might remind you,  
20 you told me the other day you didn't want to make  
21 it into the witness box. So be careful.

22 MR. TURK: And know that I know  
23 Dr. Pechmann's name, I look forward to hearing from  
24 him.

25 MR. SILBERG: My only question is will

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1 we get to it before lunch or after lunch.

2 MS. CHANCELLOR: Depends how many  
3 interruptions I get, Mr. Silberg.

4 Q. (By Ms. Chancellor) So the largest  
5 magnitude and its distribution is 7.4?

6 DR. STAMATAKOS: 7.4, okay.

7 Q. And the mean distribution?

8 DR. STAMATAKOS: Centered again around 7  
9 or slightly above 7.

10 Q. Okay. Please look at the Salt Lake City  
11 segment of the Wasatch fault, the third panel.

12 MR. TURK: And could I ask Mr. -- ask  
13 him to eyeball these charts, give him a moment to  
14 do whatever measurement he needs to do.

15 MS. CHANCELLOR: Certainly what is the  
16 maximum magnitude of distribution?

17 DR. STAMATAKOS: Magnitude 7.

18 Q. What is the approximate mean of the  
19 distribution?

20 DR. STAMATAKOS: It would have to be  
21 less than magnitude 7. These are pretty small  
22 plots, so I wouldn't know exactly, but it would be  
23 less than magnitude 7.

24 Q. Does Figure 6.6 of the Geomatrix report  
25 that we have gone through support your statement

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1 that the Wasatch Fault is capable of producing  
2 significantly larger magnitude earthquakes than the  
3 faults near the proposed PFS facility?

4 DR. STAMATAKOS: Certain segments of the  
5 fault do. And if you look at their assessment,  
6 again I would say that yes, the magnitudes that are  
7 summarized in the table, the magnitudes for the  
8 Salt Lake City fault are larger, and then the point  
9 of reference, I would point to your own witness's  
10 testimony which again suggests that the magnitudes  
11 on the Wasatch Fault may be as large as magnitude  
12 7.5. And that's given in testimony that I think  
13 everybody has agreed is going to be accepted.

14 Q. I don't think we've reached that  
15 agreement, Dr. Stamatakos.

16 Could you explain what you mean by  
17 saying that the Salt Lake City segment of the  
18 Wasatch Fault is larger than the Skull Valley, that  
19 the magnitudes for the Salt Lake City segment are  
20 larger than the magnitudes for the Stansbury?

21 DR. STAMATAKOS: Well, I don't believe I  
22 said the Salt Lake City, I said for other segments.  
23 So if you look at, for example, if you look at, for  
24 example, the distribution on the -- I would make  
25 comparison to the Lavon segment which has a very

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1 high distribution. Its mean would be higher than  
2 what's offered for the Stansbury. I would have to  
3 go back and look at this data to understand where  
4 the mean values are.

5 And in addition to that, these are  
6 magnitudes offered for specific ruptures for single  
7 segments. Ruptures would also be larger perhaps if  
8 multiple segments of the Wasatch Fault were to  
9 rupture simultaneously. And there aren't models  
10 for maximum magnitude here presented for that  
11 possibility along the Wasatch Fault.

12 Q. Aren't we comparing apples to bananas  
13 here between the Stansbury and the Wasatch with  
14 respect to the PFS site and how there is, quote,  
15 conservatism as you claim in PFS's analyses?

16 DR. STAMATAKOS: I don't think this is a  
17 comparison of apples and bananas. As I've stated  
18 in the first order, what the curves that we plotted  
19 demonstrate is that the calculated hazard for the  
20 PFS site is quite large compared to other published  
21 hazard curves for the western United States,  
22 including the ones in California where we know  
23 activity rates are quite high.

24 And although there may be some  
25 differences in details, it's clear that, and I

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1 don't think anybody would argue the fact that the  
2 Wasatch fault is a much larger, much more active  
3 fault than the Stansbury fault in that the  
4 comparisons show that despite that observation, the  
5 hazard at Skull Valley is plotted as something  
6 that's larger. Even if you make the conclusion  
7 that the Stansbury is like the Wasatch fault, which  
8 I don't think anybody would make, the hazard still  
9 is larger for Skull Valley than it is for hazard  
10 curves that are plotted either by the USGS or Salt  
11 Lake City or the analysis that was performed for  
12 the I-15 project which also showed plot hazard  
13 results for specific sites along the Wasatch Front.

14 MR. TURK: Could I get a clarification  
15 before -- you said the hazard in Skull Valley is  
16 larger. You mean --

17 DR. STAMATAKOS: The amount of ground  
18 motion.

19 MR. TURK: That Geomatrix --

20 DR. STAMATAKOS: That's a Geomatrix  
21 estimate, yeah.

22 Q. (By Ms. Chancellor) So you're saying  
23 that this chart shows that the ground motions at  
24 the PFS site are estimated to be greater than those  
25 estimated in Salt Lake City?

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1 DR. STAMATAKOS: That's correct.

2 Q. If you were -- that's only what Exhibit  
3 R shows, correct? It doesn't show that the  
4 Applicant's estimates of the ground motion are  
5 conservative, it just shows that these are the  
6 ground motions --

7 DR. STAMATAKOS: All the curve shows is  
8 that these are the ground, what under line that is  
9 meant to go and I'd have to do a first order, if  
10 you will, part of the expression smell test to say,  
11 okay, well, why is that? Why is the hazard so high  
12 at a site out in the middle of the Basin and Range  
13 away from the Wasatch Front compared to other  
14 hazards in the western United States, including  
15 southern California, including Salt Lake City,  
16 whereas your witnesses put in their testimony, one  
17 of the largest and most active normal faults exist.  
18 Certainly we've heard some testimony and people are  
19 familiar with the levels of hazards related to  
20 faults like the Hosgri fault and the San Andreas  
21 fault in California that could produce large  
22 magnitudes and can produce those earthquakes more  
23 frequently than is estimated for Skull Valley.

24 So our conclusion based on a comparison  
25 of these curves with that basic explanation plus

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1 some specific analyses that we did, we reached the  
2 conclusion that -- our conclusion that we feel that  
3 the hazard curves presented by PFS for this  
4 facility are conservative.

5 Q. Isn't the maximum magnitude on the Salt  
6 Lake City segment of the Wasatch Front the most  
7 relevant reference for the Salt Lake City curve on  
8 your nap?

9 DR. STAMATAKOS: I'd have to look at --  
10 I can't remember from memory the various segments  
11 of the Wasatch Fault without looking at a map. But  
12 I'm sure that other segments -- if that's true, the  
13 Salt Lake City segment is the one that's closest to  
14 Salt Lake City, would be very important.

15 But other segments would also come to  
16 play, because I'm sure that their site-to-source  
17 distances for some of the other segments are within  
18 the range that are important in the ground motion.  
19 So my conclusion is that this Salt Lake City curve,  
20 although it may depend largely on the Salt Lake  
21 City segment if that's the closest large segment to  
22 downtown Salt Lake City, and other segments of the  
23 Salt Lake City -- of the Wasatch Fault, excuse me,  
24 would also contribute to the hazard at Salt Lake  
25 City.

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1 Q. In going -- in looking at the Stansbury  
2 fault and the Salt Lake City portion of the Wasatch  
3 fault, didn't we establish that the maximum  
4 magnitude on the Stansbury fault would be greater  
5 than the maximum magnitude on the Salt Lake City  
6 segment of the Wasatch fault?

7 DR. STAMATAKOS: Too many pieces of  
8 paper. I believe that's correct. If the Salt Lake  
9 City fault had a lower mean maximum magnitude than  
10 the Stansbury fault.

11 MS. CHANCELLOR: Your Honor, I wish  
12 to --

13 MR. TURK: Could we ask the witness  
14 first to look at the paper and make sure that  
15 that's his answer?

16 DR. STAMATAKOS: The distributions are  
17 quite different, and I would add that the Stansbury  
18 distribution, although the mean is given at around  
19 magnitude 7 and there's a small possibility,  
20 probability of larger earthquakes, that the  
21 distribution that's put for the Stansbury fault is  
22 quite broad. It also includes many smaller  
23 magnitude earthquakes with another, for example, a  
24 fairly significant peak at about a magnitude 6.6.

25 Unlike the -- because of the excellent

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1 work that's been done on the Wasatch fault, all of  
2 the Wasatch fault segments have very narrowly  
3 defined maximum magnitude ranges.

4 MS. CHANCELLOR: Your Honor, the State  
5 renews its objection to Staff's Exhibit R. If this  
6 exhibit were being offered solely for the purpose  
7 of showing what ground motions are at these very  
8 sites, notwithstanding that there is absolutely no  
9 reference on this exhibit, that's one thing. But  
10 the Staff is offering this exhibit to show that the  
11 ground motions estimated at the Skull Valley site  
12 are, quote, conservative. This exhibit does not  
13 stand for that proposition.

14 In addition, the exhibit doesn't even  
15 have the Y axis label. It has no reference  
16 whatsoever to where these data were derived from.  
17 And so I would say that this exhibit, Staff's  
18 Exhibit R, standing by itself will be totally  
19 misleading to the lay person who picks up this  
20 chart and looks at it for the purpose of the  
21 Staff's proposition that this shows that the ground  
22 motions at the Skull Valley site are, quote,  
23 conservative. What it does show is that the Skull  
24 Valley site is -- that the Skull Valley site is  
25 seismically hazardous.

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1 JUDGE FARRAR: If it shows that it's  
2 seismically hazardous, why would you object to its  
3 admission?

4 MS. CHANCELLOR: Because that's not the  
5 reason that it is being put forth. It is being put  
6 forth by the Staff not to show that it's  
7 seismically hazardous but to show that PFS's  
8 numbers are conservative, and in fact they go so  
9 far as to say that they are 1.5 times more  
10 conservative than the estimates of ground motions  
11 in Salt Lake Valley. And that proposition is wrong  
12 based on this analysis.

13 JUDGE FARRAR: Mr. Turk?

14 MR. TURK: Your Honor, we intend to do  
15 redirect, and I would ask that the motion be tabled  
16 unless you would like me to do that now so you can  
17 rule on the motion.

18 JUDGE FARRAR: No, let's continue to  
19 withhold any action on it given the State's  
20 objection, and we'll deal with it after redirect.

21 MS. CHANCELLOR: I would request, your  
22 Honor, if there's any consideration given to  
23 entering this exhibit into the record that it be  
24 accompanied by Dr. Stamatakos's notebook pages 1  
25 through 6, but I don't want to undermine my

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1 argument that it shouldn't be entered into the  
2 record at all.

3 JUDGE FARRAR: Let's wait till we get to  
4 that point.

5 MS. CHANCELLOR: I have one final  
6 question. Where in the consolidated SE -- let me  
7 back up. You cite many regulations in your  
8 testimony. One regulation you don't cite is 72.7,  
9 specific exemptions. And those -- and that  
10 regulation reads, "The Commission may, upon  
11 application by any interested person, or upon its  
12 own initiative grant such exemptions from the  
13 requirements of the regulations in this part as it  
14 determines are authorized work by law and will not  
15 endanger life or property or the common defense and  
16 security and are otherwise in the public interest.

17 Where in the consolidated SER is there  
18 any consideration for public interest in granting  
19 PFS its seismic exemption request?

20 MR. TURK: That may be a question more  
21 properly directed to counsel.

22 JUDGE FARRAR: Maybe we'll do that too,  
23 but let's get the witness's answer.

24 DR. STAMATAKOS: We didn't address that  
25 directly. As stated clearly in our evaluations,

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1 our task was to evaluate the technical merits of  
2 PFS seismic hazard curve in light of the exemption  
3 request. And our conclusions are, you misstated  
4 slightly how we applied those hazard curves as one  
5 example, but we'll get back to that. Our  
6 evaluation is that they did a thorough job, and  
7 that, based on our evaluations the results appear  
8 to us to be conservative. It's not just the  
9 comparison of the hazard curves that that  
10 conclusion was drawn from. That conclusion was  
11 drawn from our evaluation of seismic hazards result  
12 only back to 1999.

13 JUDGE FARRAR: But wait. Are you  
14 answering the question about public interest? In  
15 other words, that deals with what you think about  
16 the public health and safety, but you're saying,  
17 where did you consider the different factor of  
18 public interest?

19 DR. McCANN: I will address --

20 JUDGE FARRAR: And counsel will  
21 eventually argue about what public interest means,  
22 but where do you have it in there?

23 DR. McCANN: In the context of the  
24 probabilistic seismic hazard analysis, which was  
25 the technical focus of our review, and as we and

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1 others have talked at length, these things are not  
2 independent of one another, and therefore one of  
3 our starting points as part of the consideration of  
4 the exemption and the probability of exceedance of  
5 the design basis, we started with the Commission's  
6 statement and the statement related ISFSIs to  
7 nuclear power plants. The Commission has also  
8 stated that existing nuclear power plants operating  
9 today are safe. And that statement --

10 JUDGE FARRAR: We're -- I don't think  
11 we're addressing her point. The point is not  
12 whether you think this is safe, it's -- okay, it's  
13 safe and there's a reason why for the public we  
14 want to head in this direction. Now, to me,  
15 implicit in her question is, that's  
16 counter-intuitive. The public interest would  
17 usually be having something as safe as possible,  
18 anything that pulls away from that you might intuit  
19 is not in the public interest. She's asking what  
20 reason is there that is in the public interest, not  
21 that it's safe from a seismic standpoint, but how  
22 has the public interest served.

23 Now, counsel may argue that this factor  
24 means something different than I'm suggesting here.  
25 But what is the public interest in granting this

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1 exemption? How is the public served by granting  
2 the exemption? Not asking if your work is right,  
3 but is the public interest served by granting this  
4 exemption, and where is that reflected in the  
5 documents.

6 DR. McCANN: Our --

7 MR. TURK: Your Honor, I would simply  
8 note, if you're asking a question about an NRC  
9 Staff's regulatory position, these are not NRC  
10 Staff employees. I have no problem if they give  
11 their own opinions.

12 JUDGE FARRAR: Or he might say he has no  
13 idea, and then you'll have to make up the  
14 difference somewhere else. You know, given this  
15 understanding of the question, are you aware of  
16 anything in your documents that -- how this  
17 exemption promotes the public interest? Not the  
18 public safety, public interest.

19 DR. McCANN: Now I'm confused. Public  
20 interest being and public safety being?

21 JUDGE FARRAR: The regulation mentions  
22 it.

23 Q. (By Ms. Chancellor) Are you familiar  
24 with Section 72.7, which is the standard for  
25 granting an exemption?

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1 DR. McCANN: No, I'm not.

2 Q. And you, Dr. Stamatakos?

3 DR. STAMATAKOS: I'm familiar with that  
4 part of the regulation insomuch as I've read it.

5 Q. Putting aside public safety and threat  
6 to property and security, is there anywhere in the  
7 consolidated SER or any other documents that  
8 address the public interest, to your knowledge?

9 DR. STAMATAKOS: Only insofar as that  
10 the exemption request takes advantage of  
11 significant advances in understanding of how best  
12 to quantify earthquake seismic hazard assessments,  
13 compare to an approach that, by all accounts, the  
14 deterministic approach has significant flaws.

15 So in that aspect, we can argue that by  
16 moving toward a probabilistic society we're moving  
17 toward a better understanding and evaluation of  
18 hazards without incorporating unrealistic effects  
19 into our seismic hazard assessment. And again, our  
20 analysis is based on technical evaluation of the  
21 application and the exemption requests. Larger  
22 issues were not part of our evaluation.

23 Q. Dr. Chen, in the INEEL exemption request  
24 was managing the damage core reactor fuel part of  
25 the contribution of granting INEEL an exemption?

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1 MR. TURK: I'm sorry. It was managing  
2 the fuel? I don't understand it.

3 JUDGE FARRAR: Does the witness  
4 understand it?

5 DR. CHEN: No, I do not.

6 Q. (By Ms. Chancellor) Was the ability to  
7 have a place to store the damaged reactor fuel from  
8 Three Mile Island at the INEEL facility, was that a  
9 consideration in granting INEEL its exemption  
10 request? If you know.

11 DR. CHEN: I still don't quite  
12 understand the question.

13 JUDGE FARRAR: She's saying, was it  
14 in -- was the public interest served by the --

15 MS. CHANCELLOR: By having a place to  
16 put the INEEL damaged core reactor fuel.

17 JUDGE FARRAR: And to your knowledge,  
18 was that factor considered in your decision to  
19 grant an exemption?

20 MS. CHANCELLOR: The witness can answer  
21 to the best of her knowledge.

22 JUDGE FARRAR: And if you don't know the  
23 answer, we've told all witnesses it's fine if you  
24 don't know the answer.

25 DR. CHEN: I can only tell what I know.

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1 It is true that the ISFSI for TMI to was  
2 constructed because DOE realized that their  
3 previous storage facility was not safe enough and  
4 there's not sufficient standards, sufficient DOE  
5 standards. So in that regard, it is.

6 MS. CHANCELLOR: I have no further  
7 questions, your Honor.

8 JUDGE FARRAR: Let me ask one quick --

9 MS. CHANCELLOR: Oh, I do one, your  
10 Honor. Could I move for entry of State's Exhibit  
11 185, which is the exerts from the Geomatrix report?

12 JUDGE FARRAR: Any objection,  
13 Mr. Gaukler?

14 MR. GAUKLER: I guess, I think hinge on  
15 whether or not you admit Staff Exhibit R, and I  
16 believe we should consider the two together. And  
17 if we admit Staff Exhibit R, I have no objection to  
18 the state.

19 JUDGE FARRAR: Mr. Turk?

20 MR. TURK: I wasn't going to object to  
21 the introduction of this exhibit by itself, but the  
22 question is, what does it stand for. If it's -- if  
23 it has to do with the reliability of Staff Exhibit  
24 R, then the Applicant's statement and his records  
25 should be viewed together.

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1 MS. CHANCELLOR: Your Honor, there's  
2 testimony that the Wasatch Fault is ten times --

3 JUDGE FARRAR: Is Mr. Gaukler right that  
4 we should hold this and do R and State 185  
5 together?

6 MS. CHANCELLOR: No, your Honor. This  
7 goes to whether the testimony by the witnesses is  
8 correct, and it goes to whether the slip rate on  
9 the Wasatch segment of the Wasatch Fault is ten  
10 times more than the slip rate on the Stansbury  
11 fault. So it's specific to the Staff's testimony.  
12 If refutes that allegation that the slip rate on  
13 the Wasatch is ten times greater, more than on the  
14 Stansbury.

15 JUDGE FARRAR: Maybe there's some  
16 confusion here. The notebook was never marked for  
17 identification, and that certainly has a tie-in to  
18 Exhibit R. Mr. Gaukler, but you think 185 also has  
19 that tie-in?

20 MR. GAUKLER: That's what I understood  
21 from the cross-examination, that it did; and I  
22 would just say that you admit that Exhibit R, and I  
23 have no objection. If we don't, let's address the  
24 issue then.

25 JUDGE FARRAR: Given Mr. Gaukler's

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1 position, let's hold off on 185 until we get to R,  
2 just for efficiency.

3 Let me ask the witnesses, you keep  
4 referring to the Wasatch Fault. If I got in the  
5 car and drove east from here, where is it in all  
6 these mountains that we see out the window?

7 DR. STAMATAKOS: It's somewhere near the  
8 base of the foothills as you start to gain  
9 elevation.

10 JUDGE FARRAR: This side?

11 DR. STAMATAKOS: This side.

12 JUDGE FARRAR: West?

13 DR. STAMATAKOS: West.

14 JUDGE FARRAR: Between us and the  
15 mountain that's on the west side -- the west face  
16 of the mountain?

17 DR. STAMATAKOS: That's correct.

18 JUDGE FARRAR: Judge Lam has some  
19 questions for you.

20 JUDGE LAM: Dr. McCann, Dr.

21 Stamatakos --

22 MS. CHANCELLOR: I believe you have to  
23 go east to get to the Wasatch fault, not to the  
24 west. Which mountains are you --

25 MR. TURK: The witness is describing the

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1 elevation --

2 JUDGE FARRAR: Going east from here I  
3 would come to the west face, and he says that's  
4 where the fault is.

5 MS. CHANCELLOR: Okay. I beg your  
6 pardon.

7 JUDGE LAM: Ms. Chancellor, I thought  
8 you were going to ask the questions for me.

9 MS. CHANCELLOR: No, your Honor.

10 JUDGE LAM: Good afternoon Dr. McCann,  
11 Dr. Stamatakos and Dr. Chen. I read in your  
12 prefiled testimony that the applicant two years  
13 ago, two, three years ago had determined a set of  
14 peak ground motions, and within two years we revise  
15 it upwards by 30 to 40 percent. Is that correct?

16 DR. STAMATAKOS. For the peak ground  
17 acceleration, that's correct, yes.

18 JUDGE LAM: Now, I assume in your  
19 business new information comes up from time to  
20 time. Is that correct?

21 DR. STAMATAKOS: That's correct.

22 JUDGE LAM: Then the question is, what  
23 confidence level do you have that these peak ground  
24 acceleration value would not be revised again and  
25 we open this source of characterization issue for

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1 litigation?

2 DR. STAMATAKOS: Well, to some extent  
3 because that revision really involved soil  
4 characterization, in particular the upper 30 or 60  
5 feet of soil, I would say that -- and then how that  
6 is modeled in the source part, it depends on the  
7 nature of the new information. And to some extent  
8 we would rely on soil experts to tell us about  
9 those specific site conditions that lead to that  
10 component of the seismic hazard.

11 So if there is not a revision in --  
12 significant revision in the inputs that go into the  
13 soil modeling like shear wave velocity, my  
14 confidence would be fairly high that there would  
15 not be a better, substantial change. Do you want  
16 to add?

17 DR. McCANN: I guess the only thing I  
18 would add is two points. One is, in a  
19 probabilistic hazard analysis, as you know, the  
20 uncertainty is explicitly modeled. The negative  
21 side of having that uncertainty is an explicit  
22 admission of what it is we don't know, and some  
23 expectation that the answers could be higher or  
24 lower than what we're seeing based on the  
25 uncertainties that we have.

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1                   Secondly, I think it's also a fair  
2 statement both in a deterministic and a  
3 probabilistic analysis as new, detailed information  
4 becomes available for a site, it poses new issues,  
5 potentially, and that would be true here whether  
6 we're talking about a probabilistic seismic hazard,  
7 and in any licensing environment -- new discovery  
8 of a fault, new site soil information or whatever.

9                   But the probabilistic hazard analysis  
10 presumably has addressed these uncertainties and  
11 quantified them and given as some measure that  
12 there is an expectation that the true answer lies  
13 somewhat higher or somewhat lower than the estimate  
14 we're working with today.

15                   JUDGE LAM: Dr. Chen, do you have  
16 anything to add to that?

17                   DR. CHEN: No, I agree with  
18 Dr. Stamatakos and Dr. McCann.

19                   JUDGE LAM: Also, in two days of  
20 testimony we heard a great deal of statement from  
21 all three of you that the soils characterization is  
22 conservative. Would you collectively or  
23 individually describe to me, what are the most  
24 important contributor to your assessment of these  
25 conservatisms?

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