

1 MR. TURK: If you would, just to confirm  
2 that, on page 3.8.5-8, Section 2 lists "Applicable  
3 Codes, Standards, and Specifications." And it  
4 indicates that the list of codes, standards, guides,  
5 and specifications is compared with the list  
6 referenced in Subsection Roman numeral ii.2 of this  
7 SRP section.

8 If we go to Section 2.2, we see, again, a  
9 statement of applicable code standards and  
10 specifications, and it indicates -- I won't read the  
11 whole thing -- it indicates what the codes and  
12 standards are, that they're contained in Section 3.8.3  
13 or Section 3.8.1 of NUREG 0800.

14 DR. BARTLETT: Yes, I see those.

15 MR. TURK: And specifically with respect  
16 to containment foundation, it mentions Section 3.8.1,  
17 and your area of focus is foundation, correct?

18 DR. BARTLETT: It is not the structural  
19 performance of the foundations. It is the soils  
20 capacity to resist the foundation loadings and the  
21 failure mechanisms which are overturning, sliding, and  
22 bearing capacity.

23 MR. TURK: In addition to referencing the  
24 standards and codes that would be applicable, if an  
25 applicant follows Section 3.8.5, the document also

1 establishes the loads and load combinations that must  
2 be considered, and that appears in Section 3 on page  
3 3.8.5-6 of Section 3.8.5, Staff Exhibit EE.

4 DR. BARTLETT: That is correct.

5 MR. TURK: Now I think you testified to  
6 this before, but it has been so long, it might have  
7 been another witness. We were directed specifically  
8 to the next page, 3.8.5-7 --

9 DR. BARTLETT: That's correct.

10 MR. TURK: -- where there is a factor of  
11 safety of 1.1 for sliding?

12 DR. BARTLETT: Yes.

13 MR. TURK: And we established which load  
14 combination that was, do you recall?

15 DR. BARTLETT: Yes, I believe it's C as in  
16 "cat."

17 MR. TURK: On page 3.8.5-6, load condition  
18 C is defined as D plus H plus E prime.

19 DR. BARTLETT: Yes, I see that.

20 MR. TURK: And in order to understand what  
21 those are, I think we have to turn to Regulatory Guide  
22 3.8.4, correct?

23 DR. BARTLETT: That is correct.

24 MR. TURK: I would ask to have a document  
25 distributed at this time and ask to have it marked for

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1 identification as Staff Exhibit 64. And what I am  
2 distributing is Section 3.8.4 of NUREG 0800.

3 [Whereupon, the above-referred-  
4 to document was marked as Staff  
5 Exhibit 64 for identification.]

6 MR. TURK: In fact, this is Section 3.8.4  
7 of NUREG 0800?

8 DR. BARTLETT: That is correct.

9 MR. TURK: Okay, let's just, first of all,  
10 identify the load combination that is described here.  
11 There's a definition of acronyms and nomenclature at  
12 pages 3.8.4-7, continuing onto the next page.

13 DR. BARTLETT: Yes, I'm there.

14 MR. TURK: Okay, and for this Category C,  
15 load combination, capital letter "D" is defined as  
16 "deadloads or their related internal moments and  
17 forces, including any permanent equipment load"?

18 DR. BARTLETT: That is correct.

19 MR. TURK: Load H on the next page, I  
20 believe -- let's go to E prime, first of all.

21 DR. BARTLETT: H is actually defined back  
22 in 3.8.5 on page 6. H is the lateral earth pressure  
23 load.

24 MR. TURK: And where are you reading that?

25 DR. BARTLETT: On 3.8.5-6 --

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1 MR. TURK: Okay.

2 DR. BARTLETT: -- Subsection 3, "Load and  
3 Load Combinations."

4 MR. TURK: Just after that listing

5 DR. BARTLETT: Just after the listing of  
6 the different classes. You see in the first line  
7 there it says H is the lateral earth pressure.

8 MR. TURK: Okay. And then E Prime is not  
9 defined in Section 3.8.5, but it does appear in 3.8.4.  
10 And it's defined in that document at page 8 as "loads  
11 generated by the safe-shutdown earthquake."

12 DR. BARTLETT: That is correct.

13 MR. TURK: Okay.

14 CHAIRMAN FARRAR: Where are you all  
15 getting 3.8.5 from?

16 MR. TURK: 3.8.5 is a Staff exhibit, which  
17 is Staff Exhibit EE. The section of the Regulatory  
18 Guidance is entitled, "Foundations."

19 CHAIRMAN FARRAR: Okay.

20 MR. TURK: In essence, Your Honor, this  
21 document, 3.8.5 refers back to 3.8.4.

22 CHAIRMAN FARRAR: Okay.

23 MR. TURK: Before going any further and so  
24 that I don't forget, I'd ask to have Staff Exhibit 64  
25 admitted into evidence.

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1 MS. NAKAHARA: No objection, Your Honor.

2 MR. GAUKLER: No objection.

3 CHAIRMAN FARRAR: All right. Staff 64  
4 will be admitted.

5 (Whereupon, Staff Exhibit 64  
6 admitted in evidence.)

7 MR. TURK: Thank you, Your Honor.

8 In essence then, an Applicant that follows  
9 Section 3.8.5 would also be designing to the  
10 requirements as described in Section 3.8.4 of NUREG  
11 0800. Is that consistent with your understanding?

12 DR. BARTLETT: Yes. You'd need to rely on  
13 section of 3.8.4 to determine the loading conditions.

14 MR. TURK: And also in Section 3.8.4,  
15 there is a description right after the definition of  
16 terms in Section B, on page 3.8.4-9, which is  
17 indicated to be, "Load Combinations for Concrete  
18 Structures."

19 DR. BARTLETT: Yes.

20 MR. TURK: And it indicates that an  
21 Applicant using one of various means of calculation  
22 should include various factors in its calculation in  
23 order to meet the intent of the Regulatory Guide.

24 DR. BARTLETT: Yes, for the structural  
25 design of the foundations. That's correct.

1 MR. TURK: Okay. Also, if you would, look  
2 at page 3.8.4-12, Section 4, "Design and Analysis  
3 Procedures", states, "The design and analysis  
4 procedures utilized for Category 1 structures,  
5 including assumptions on boundary conditions and  
6 expected behavior under loads are acceptable if found  
7 in accordance with the following." Do you see that  
8 statement?

9 DR. BARTLETT: Yes.

10 MR. TURK: And then it indicates -- the  
11 very first element states for concrete structures, the  
12 procedures are in accordance with ACI-349, entitled,  
13 "Code Requirements for Nuclear Safety Related  
14 Structures." So that, in essence -- that ACI standard  
15 is incorporated here as part of the design analysis  
16 and procedures to be used in designing concrete  
17 structures.

18 DR. BARTLETT: That is correct.

19 MR. TURK: Category 1 concrete structures.

20 DR. BARTLETT: Structural design, yes.

21 MR. TURK: Okay. The question that I  
22 ultimately want to get to with all of this is if an  
23 Applicant follows the various design codes, standards,  
24 and methods of analysis that are specified in  
25 Regulatory Guidance, then no matter what the design

1 earthquake is specified to be, for that earthquake  
2 they would be following guidance that has margins  
3 built in, as you've testified before, that the  
4 guidance would contain margins.

5 DR. BARTLETT: That is not correct.

6 MR. TURK: Well, let's ignore the  
7 earthquake, specifically which earthquake they're  
8 designing for.

9 DR. BARTLETT: You cannot --

10 MR. TURK: I'm asking about the methods of  
11 analysis, and codes, and standards.

12 DR. BARTLETT: You can --

13 MR. TURK: Those apply regardless of what  
14 the earthquake level is, don't they?

15 DR. BARTLETT: You cannot. What you've  
16 presented me is the structural design of the  
17 foundation system. There are other failure mechanisms  
18 that one has to consider beyond the structural design  
19 of the system. Those are what we would term "global  
20 failure mechanisms", which have nothing to do with the  
21 structural design of the system, but has something to  
22 do with the soil and its capacity to resist failure  
23 mechanisms. Those are overturning and sliding. Those  
24 particular failure mechanisms, 3.8.5 specifies that  
25 you must have a factor of safety 1.1 or greater for

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1 those mechanisms of failure. And in calculating that  
2 factor of safety of 1.1, you would use the demand  
3 placed on the system by a safe-shutdown earthquake.

4 MR. TURK: Okay. If we follow that  
5 approach, recognizing that these standards apply to a  
6 deterministic earthquake. Correct?

7 DR. BARTLETT: Yes. Deterministic, 84<sup>th</sup>  
8 percentile, I believe.

9 MR. TURK: At what point would you then  
10 scale down to account for the difference between a PC-  
11 4 and a PC-3 facility?

12 DR. BARTLETT: You don't scale factors of  
13 safety.

14 MR. TURK: That's not what I'm asking you.  
15 You would hold -- under your analysis, if one follows  
16 these Regulatory Guidance documents, you would be  
17 designing to a deterministic earthquake, which --

18 DR. BARTLETT: Correct. And calculating  
19 a factor of safety.

20 MR. TURK: Which, hypothetically, let's  
21 say is equivalent to about a 10,000 year earthquake,

22 DR. BARTLETT: That's correct.

23 MR. TURK: Hypothetically only. At what  
24 point would you say to PFS, that's the design. Now  
25 scale down to a PC-3 level. How would you do that?

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1 DR. BARTLETT: You can't scale a factor of  
2 safety.

3 MR. TURK: I'm not asking you to scale a  
4 factor of safety. I'm asking you to scale the  
5 earthquake.

6 DR. BARTLETT: The proper way of doing it  
7 is setting a performance goal. For a PC-3, it would  
8 be one times ten to the minus fourth or less  
9 probability of failure, and the combination of the  
10 design-basis earthquake and the risk reduction ratios,  
11 you must demonstrate that you have a probability of  
12 failure of one times ten to the minus four or less.

13 MR. TURK: Okay. That's the approach you  
14 would follow.

15 DR. BARTLETT: Yes.

16 MR. TURK: Okay. Let me ask you one more  
17 question about NUREG -- I'm sorry. I'm starting to  
18 call DOE documents by NRC names. DOE Standard 1020,  
19 if a PC-3 facility was to be constructed in accordance  
20 with the DOE Standard, which we understand now to be  
21 four times ten to the minus four, applying to that a  
22 0.9 scaling factor, is it your --

23 DR. BARTLETT: One point five times 0.9.

24 MR. TURK: Yes. Well, in all cases it's  
25 the 1.5.

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1 DR. BARTLETT: Yes, that's correct.

2 MR. TURK: Okay. If a DOE facility was  
3 built in a manner that did not meet that standard but  
4 exceed -- in other words -- I'm sorry, that failed to  
5 meet that standard, which would mean that it --

6 DR. BARTLETT: Failed to meet a  
7 performance goal.

8 MR. TURK: Yes. That would involve the  
9 potential, or that could result in the potential  
10 release of radioactive materials.

11 DR. BARTLETT: No. The definition would  
12 be that there would be potential failure of the  
13 structure system and component to meet its safety  
14 related function.

15 MR. TURK: Judge Farrar asked you a  
16 question, I believe, earlier today as to -- I could be  
17 wrong. It might have been one of the other judges.  
18 It had to do with where Dr. Bartlett would set the  
19 appropriate return period. I thought it was Judge  
20 Farrar, and you indicated that you'd like to see it  
21 greater than 2,000 year return period ground motion.  
22 You weren't sure if 2,500 would be enough. You  
23 thought it should be somewhat higher, somewhere  
24 between 2,500 and 10,000 years. You certainly have  
25 indicated before that you're not testifying with

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1 respect to radiation risk. Correct?

2 DR. BARTLETT: That's correct.

3 MR. TURK: And you've indicated that you  
4 were not presenting testimony as a structural  
5 engineer. You were not evaluating the adequacy of the  
6 structure to withstand any particular earthquake.  
7 Correct?

8 DR. BARTLETT: No. I'm just evaluating  
9 the response of the foundations and the casks in tip-  
10 over.

11 MR. TURK: So when you provided your  
12 estimate of what you considered an appropriate return  
13 period to be, you were not basing that upon a  
14 radiological risk consideration, or a consideration as  
15 to the structural consequences of sliding or cask tip-  
16 over.

17 DR. BARTLETT: No, it was just an opinion.  
18 Many of these decisions are difficult to make, and  
19 normally designer doesn't get the luxury of setting  
20 the design-basis earthquake. It's prescribed by  
21 regulations, and so it's a question that catches me a  
22 little off-guard.

23 MR. TURK: You also indicated in response  
24 to Judge Kline that you believe the Staff had not  
25 studied the consequences of cask tip-over. Do you

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1 recall making that statement?

2 DR. BARTLETT: That the Staff hasn't  
3 evaluated the consequences of cask tip-over?

4 MR. TURK: Well, I wrote down that you  
5 stated, "The Staff had not studied the consequence of  
6 cask tip-over." You were talking about Mr. Guttman's  
7 testimony.

8 DR. BARTLETT: No, I think what I was  
9 trying to say, and this may be -- this is some time  
10 back when I heard Mr. Guttman speak about cask tip-  
11 over versus not, and I think it was in lines with  
12 discussion of NUREG 15-36, which says as an acceptance  
13 criteria that the casks should not collide or tip-  
14 over. NRC's position was that that condition had been  
15 met by this Applicant, and that they hadn't received  
16 an application by this Applicant, or any other  
17 Applicant that had suggested that tip-over did not  
18 have to be met, and based their decision solely on  
19 radiological consequences. They hadn't seen that case  
20 yet, so that's my understanding of Mr. Guttman's  
21 testimony.

22 MR. TURK: Okay. I won't debate that  
23 because I don't recall the testimony myself  
24 specifically. I know that if I tried to debate with  
25 a witness, I wouldn't be allowed to do that. But

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1 you're aware, are you not, that Holtec has performed  
2 a hypothetical cask tip-over analysis?

3 DR. BARTLETT: Yes. I've reviewed part of  
4 those calculations.

5 MR. TURK: Okay. And you're aware that  
6 their conclusion is that there would be no breach of  
7 confinement in the event of a cask tip-over, or are  
8 you not aware of that?

9 DR. BARTLETT: It's been a while, Mr.  
10 Turk. I'm not sure about the conclusions. I do  
11 remember the cask tip-over analysis had a maximum  
12 deceleration of 45g values. Their calculation showed  
13 they were slightly under that. And whether they  
14 inferred being under that then meant that they didn't  
15 have any significant cracking of the cask, I just  
16 don't remember those details. But I do remember the  
17 45g deceleration criterion.

18 MR. TURK: You don't recall at this point  
19 whether or not radiation release was part of that  
20 analysis or a reason why the analysis was performed.

21 DR. BARTLETT: I understand that it was to  
22 show that the decelerations were below a certain  
23 limit, and they looked at two scenarios. I can't  
24 remember the discussions of the consequences, if they  
25 exceed a 45g deceleration in the drop or tip-over

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1 analysis. Whether they felt that there would be  
2 breach at that point or not.

3 MR. TURK: Okay. Also, you indicated at  
4 some point your belief that there would be an angular,  
5 an initial angular velocity in excess of zero if there  
6 was to be a cask tip-over.

7 DR. BARTLETT: Yes.

8 MR. TURK: You also indicated that you're  
9 not appearing here as a structural engineer. And,  
10 therefore, I assume you're relying on the testimony of  
11 other witnesses who have addressed the point.

12 DR. BARTLETT: Well, I know it's very  
13 simple. I don't need other experts to make that  
14 analysis. The tip-over analysis assumes that the cask  
15 is perched on its edge, incipient tip-over, and has no  
16 angular velocity, so it just simply tips over. During  
17 an earthquake, things are rocking back and forth, and  
18 if you reach a tip-over condition, you have certainly  
19 an angular velocity. That's just fundamental to me.  
20 It's rocking back and forth. It'll eventually tip-  
21 over and it will have an angular velocity associated  
22 with it that's higher than the condition that Holtec  
23 analyzed.

24 MR. TURK: That surprises me because my  
25 understanding of the physics of the situation would be

1 that you may have an angular velocity up to the point  
2 where you reach that fulcrum, but at the fulcrum point  
3 where it's about to tip-over, which you describe as  
4 incipient tipping, you're at zero. Then velocity  
5 increases from zero.

6 DR. BARTLETT: No.

7 MR. TURK: That's not your understanding?

8 DR. BARTLETT: Say you reach it at this  
9 point. You cycle back this way. Maybe you don't tip-  
10 over. You come back through it again with an extra  
11 inertial force and velocity. You can go passed that  
12 tip-over point with some velocity that's not zero.  
13 There will be an angular velocity higher than what  
14 Holtec calculated if we rock back and forth, and then  
15 tip, versus just reaching this position and stopping,  
16 and then tipping.

17 CHAIRMAN FARRAR: Or, Dr. Bartlett, if you  
18 read -- and let the record reflect you were tipping a  
19 styrofoam cup back and forth. If you reach the tip-  
20 over point and don't tip, then you've got zero  
21 velocity there before you start --

22 DR. BARTLETT: There is a moment that you  
23 would stop and you have zero velocity. Then the next  
24 pulse would drive you back the other direction.

25 CHAIRMAN FARRAR: Right. So --

1 DR. BARTLETT: And you could tip-over in  
2 the next cycle with some velocity that's beyond zero.  
3 That's what may happen.

4 MR. TURK: And where is the center of  
5 gravity in this demonstration you just made?

6 DR. BARTLETT: I think it would perched  
7 right at the edge of the cask, or its contact point.  
8 If it went beyond that outside edge, then you would  
9 have a condition that would lead to tip-over.

10 MR. TURK: Have you done any calculations  
11 or analysis to support that view?

12 DR. BARTLETT: Oh, I thought about it. I  
13 can easily see a scenario where a cask could tip-over  
14 with higher angular velocity than what was assumed in  
15 the calculation.

16 MR. TURK: You, yourself, have not done  
17 any calculations or analysis?

18 DR. BARTLETT: Not on tip-over, no. We  
19 also forgot about the case of one cask impacting  
20 another cask, and knocking an adjacent cask over.  
21 That could cause a higher angular velocity too.

22 MR. TURK: And, by the way, the issue that  
23 you just addressed, that's part of Part B of the  
24 Contention. Correct? It goes to the analyses.

25 DR. BARTLETT: I think Dr. Kahn did some

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1 angular velocity calculations in his report, and  
2 concluded there was high enough velocities for tip-  
3 over.

4 MR. TURK: And are you relying on Dr.  
5 Kahn's analyses in making your statements here today?

6 DR. BARTLETT: No. I'm putting forth the  
7 point that if cask tip-over does occur, that the  
8 condition would not be bounded by the Holtec analysis,  
9 because there would be a non-zero angular momentum  
10 where the center of gravity reached the edge of the  
11 cask, so there could be a condition more severe than  
12 what Holtec analyzed for, if tip-over was to occur  
13 during an earthquake.

14 MR. TURK: And in order -- if I understand  
15 the physics again, in order to reach the conclusion  
16 that you reached, you would have to have a ground  
17 motion that's so significant, as to essentially propel  
18 the cask over --

19 DR. BARTLETT: Rock the casks.

20 MR. TURK: Not just rock it, but rock it  
21 to such an extent that the velocity is sufficient to  
22 thrust the cask over the fulcrum, essentially, and  
23 then to collapse.

24 DR. BARTLETT: What's happening, let's say  
25 the peak inertial force hasn't arrived yet, and we're

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1 in a state of rocking. And in extreme case, let's say  
2 we reach a case where we're right at incipient tip-  
3 over but we don't tip. Then let's say the peak  
4 inertial forces hit, and they're going in the other  
5 direction. Now as you rock back through, you've  
6 picked up angular momentum in addition to the inertial  
7 force, so you'll rock through and tip-over at a higher  
8 angular velocity than what Holtec would have  
9 calculated.

10 MR. TURK: A small amount of rocking  
11 wouldn't have that conclusion. Correct?

12 DR. BARTLETT: If we don't reach this near  
13 incipient tip-over condition in the rocking back and  
14 forth, yes. It would not cause tip-over, but if we  
15 reach a case where we're at incipient tip-over, the  
16 earthquake could cause angular velocities that are  
17 higher than what Holtec used in their analysis.

18 MR. TURK: Could you turn to answer 24 of  
19 your testimony.

20 CHAIRMAN FARRAR: Mr. Turk, while he's  
21 doing that, you had indicated that after about an hour  
22 or so you might have an idea.

23 MR. TURK: I'm at Item 22 on my cross  
24 plan, Your Honor. And I would estimate no more than  
25 half an hour, if that much.

1 CHAIRMAN FARRAR: All right.

2 MR. TURK: Do you have your testimony  
3 there?

4 DR. BARTLETT: Yes, I do.

5 MR. TURK: There is a discussion of dose  
6 consequences at the bottom of page 11. And just so  
7 that I'm clear, you indicate that a reduction of a  
8 storage cask's ability to shield radiation, thereby  
9 causing an increase in dosage would be a failure of  
10 the HI-STORM 100 cask. And you state, "Dr. Marvin  
11 Resnikoff calculated an increase in radiation dose in  
12 the event of cask tip-over." You're not making any  
13 statements of your own concerning radiation. You're  
14 simply reciting Dr. Resnikoff's conclusion there?

15 DR. BARTLETT: Yes. And the belief that  
16 what constitutes failure here is an increase in  
17 radiation dose from a tip-over event.

18 MR. TURK: In answer 27 you compare -- as  
19 I understand your testimony, you compare the NRC  
20 Standard Review Plan design standards with the DOE  
21 1020 Standard. Do you see the very first paragraph of  
22 your answer? You state that, "PFS claims the NRC SRPs  
23 have equivalent or greater risk reduction ratios as  
24 those stated in DOE Standard 1020-94 for performance  
25 Category 3 and 4 facilities." And then you go on to

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1 contest that with what you describe as PFS' position  
2 in the balance of your answer, as I understand it.

3 DR. BARTLETT: Yes.

4 MR. TURK: Were you attempting to make any  
5 kind of a direct correlation between specific design  
6 standards in the NRC Regulatory Guidance, with those  
7 of the DOE guidance, or is this just a general  
8 philosophy approach?

9 DR. BARTLETT: No, I wouldn't try to make  
10 any conclusions between the DOE standards and NRC  
11 standards. I think the first part of this is just in  
12 response, that if NRC Standard Review Plans have been  
13 used for design of the ISFSI, then it has protection.

14 MR. TURK: Equal protection with the DOE  
15 standard protection?

16 DR. BARTLETT: There was a concern here  
17 that for ISFSIs, in particular, the governing NUREGs  
18 are not the SRPs for nuclear power plants, but those  
19 for ISFSIs, and whether the NUREG 1536 and 1567 have  
20 the same margins and design conservatisms as the SRPs  
21 for nuclear power plants.

22 MR. TURK: You haven't done a detailed  
23 comparison of them in order to take a position one way  
24 or the other, do you, or have you?

25 DR. BARTLETT: No, I haven't. Just

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1 expressing a concern that maybe some of the  
2 conservatism, because of -- some of the conservatism  
3 may be less for ISFSIs versus nuclear power plants.

4 MR. TURK: Can you point to anything  
5 specifically when you make that statement?

6 DR. BARTLETT: Well, we talked a little  
7 bit about, again, the factor of safety. If one adopts  
8 a factor of safety of 1.1 for the design of an ISFSI  
9 against global foundation failure, such as bearing  
10 capacity, overturning or sliding, that doesn't  
11 guarantee the same margins as if one was to design a  
12 nuclear power plant foundation for the safe-shutdown  
13 earthquake.

14 MR. TURK: And that's because the design  
15 earthquake in the formula, i.e., the demand side, is  
16 different.

17 DR. BARTLETT: That is correct, so your  
18 real margins are different.

19 MR. TURK: And that's the only concern  
20 you've identified at this time with respect to the  
21 potential for ISFSI Regulatory Guidance to be less  
22 conservative than Regulatory Guidance for a nuclear  
23 power plant.

24 DR. BARTLETT: That's one of the main  
25 ones. Let me see if there's anything else here I'm

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1 trying to capture. Other than also, that the Reg  
2 Guides developed for ISFSIs are not, I think, as  
3 specific as they are for nuclear power plants, and not  
4 fleshed out in the regulatory framework as much as the  
5 nuclear power plants have been, so I think it's  
6 somewhat a work in process, at least, the design  
7 criterion and codes that govern for ISFSIs.

8 MR. TURK: Prior to your involvement in  
9 this proceeding, had you ever had occasion to read any  
10 Regulatory Guidance for ISFSIs?

11 DR. BARTLETT: No, I had not.

12 MR. TURK: And when you describe the  
13 Regulatory Guidance for ISFSIs, you're aware, are you  
14 not, that they're published by the same regulatory  
15 body, i.e., the Nuclear Regulatory Commission, as is  
16 the Regulatory Guidance for nuclear power reactors?

17 DR. BARTLETT: That is correct.

18 MR. TURK: Have you read NUREG 1536 in  
19 detail?

20 DR. BARTLETT: Yes, I think I have. At  
21 least, it may have been some time ago, but I think I  
22 read it in its entirety.

23 MR. TURK: And have you read 1567?

24 DR. BARTLETT: I don't believe I have all  
25 of 1567 in its entirety. I was mainly looking at its

1 applicable codes and standards for foundation and cask  
2 design.

3 MR. TURK: Do you recall 1567, which codes  
4 and standards it references?

5 DR. BARTLETT: I do not.

6 MR. TURK: In fact, it references the same  
7 American Concrete Institute Standard 349, that the  
8 Regulatory Guidance for nuclear power plants  
9 references, doesn't it, or do you not know?

10 DR. BARTLETT: I could verify that, but  
11 I'll take your characterization as being accurate.  
12 But again, the focus of my review has not been on the  
13 structural design of the foundation systems. It's  
14 been looking at the global failure mechanisms, and in  
15 those cases, we don't have really developed criteria,  
16 except for a factor of safety.

17 MR. TURK: In answer 15, as I read that  
18 answer, and please correct me if I'm wrong, but to me  
19 it reads like a legal brief. It cites different  
20 responses to Summary Disposition Motions. It cites  
21 different regulatory documents. It cites responses to  
22 discovery. It cites the Exemption Request. If I was  
23 a lawyer, I would write a paragraph or I would write  
24 an answer like that. Is that --

25 DR. BARTLETT: I have some good people

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1 looking over my shoulder.

2 MR. TURK: Were they looking over your  
3 shoulder, or was it vice versa?

4 DR. BARTLETT: I don't really recall, Mr.  
5 Turk.

6 MR. TURK: Do you know off-hand whether  
7 that answer was written by one of the counsel for the  
8 State, rather than by yourself?

9 DR. BARTLETT: Could you refer me to --

10 MR. TURK: Answer 15.

11 CHAIRMAN FARRAR: Wait a minute. I would  
12 operate under the assumption that every piece of  
13 direct testimony that's been submitted to us has not  
14 been exclusively authored by the scientist who wrote  
15 it. Different answers may be a matter of degree.  
16 Every one of these witnesses has taken the stand and  
17 said that it was written under his direction or  
18 supervision, and he subscribed to it, so why are we  
19 going to look into who -- why are we going to look  
20 into this in this particular instance on the eighth  
21 week of the trial?

22 MR. TURK: The next question will  
23 elucidate. I certainly agree with Your Honor. It  
24 doesn't matter who writes it. If the witness reads  
25 it, and agrees with it, and adopts it, it becomes his

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1 testimony.

2 CHAIRMAN FARRAR: Ask him that.

3 MR. TURK: I'm satisfied that he's done  
4 that already. He's adopted the testimony.

5 CHAIRMAN FARRAR: Okay. Then why do you  
6 want to know -- then what was the purpose of the  
7 question that aroused me?

8 MR. TURK: I'd ask the witness to turn,  
9 and this is the next question I would ask, Your Honor.  
10 If you turn to answer 27 -- would you allow me to get  
11 an answer to the question, Your Honor?

12 CHAIRMAN FARRAR: Not unless you give me  
13 a really good reason.

14 MR. TURK: Well, I want to understand  
15 whether certain statements that appear in this  
16 testimony were based on his knowledge, or on  
17 representations by counsel.

18 CHAIRMAN FARRAR: And suppose we got an  
19 answer to that that was to your liking, what would  
20 that accomplish? Suppose he put something in an  
21 answer that counsel represented was true, I mean, now  
22 we're going to get into work product. We're going to  
23 get into a whole lot of stuff we don't want to get  
24 into.

25 MR. TURK: I withdraw that question.

1 CHAIRMAN FARRAR: Thank you.

2 MR. TURK: Would you look at answer 27,  
3 please. On page 13, there's a large paragraph  
4 starting about halfway down the page, in which you  
5 discuss NRC Regulatory Guidance and NUREG 1536 and  
6 NUREG 1567.

7 DR. BARTLETT: Correct.

8 MR. TURK: Did you provide those  
9 statements? Are they based on your knowledge?

10 DR. BARTLETT: Yes, I think so. Well,  
11 they're discussions I think we had as a team, and this  
12 may go back into response to Summary Disposition by  
13 the State to PFS back last fall. But whether the same  
14 levels of conservatisms in nuclear power plants in  
15 their design was then transferred into NUREG 1536 and  
16 1567, so I guess I do recall the discussions that we  
17 had at the time of the Summary Disposition about this.

18 MR. TURK: Let me come to the ACI  
19 Standard. Do you have NUREG 1567 in front of you?

20 DR. BARTLETT: I have pieces of it.

21 MR. TURK: Which pieces are you familiar  
22 with in 1567?

23 DR. BARTLETT: I guess I could respond,  
24 the pieces that I have.

25 MR. TURK: Okay. It is a document that's

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1 about one inch thick, double-sided?

2 DR. BARTLETT: That is correct. And I  
3 think my review is limited to the foundations part of  
4 that.

5 MR. GAUKLER: Dr. Bartlett, I have a  
6 complete copy of 1567 if you want it.

7 DR. BARTLETT: Yes, I might be able to  
8 recognize the parts that I looked at just from the  
9 full copy. I thought I had it in this set of  
10 regulatory documents that I have, but I'm not seeing  
11 it immediately.

12 MR. TRAVIESO-DIAZ: Mr. Chairman, I don't  
13 want to interrupt cross examination, but in the  
14 interest of efficiency, could this be a good time to  
15 take a break so the witness can review the document?

16 DR. BARTLETT: I found it.

17 MR. TURK: I'm just about done. It might  
18 be better that we finish.

19 MR. TRAVIESO-DIAZ: Okay.

20 DR. BARTLETT: Mr. Turk, my review of  
21 1567, at least what was provided to me was pages 2-10,  
22 7-20, and 7-54.

23 MR. TURK: Those are the three pages in  
24 the document that you reviewed?

25 DR. BARTLETT: Yes. Again, my review is

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1 limited to earthquakes and foundation design.

2 MR. TURK: And on the basis of your review  
3 of those three pages, you reached the conclusion that  
4 the SRP in NUREG 1567, "May already incorporate less  
5 conservatism than nuclear power plant SRPs."

6 DR. BARTLETT: I would say on my review,  
7 and then again, discussions that we had as a team  
8 during response to Summary Disposition.

9 MR. TURK: In answer 27 also, that same  
10 paragraph on page 13, you discuss what you represent  
11 as, "NRC Staff and PFS claimed that potential  
12 consequences of seismic failure of ISFSIs are much  
13 less severe than those of nuclear power plants." Do  
14 you see that statement?

15 DR. BARTLETT: That was on page?

16 MR. TURK: Page 13 of your testimony. The  
17 third full paragraph on the page.

18 DR. BARTLETT: Yes, I find -- that's the  
19 beginning sentence of that paragraph.

20 MR. TURK: Okay. As I understand your  
21 testimony today, you're not holding yourself out as an  
22 expert with respect to what are the consequences of a  
23 breach of confinement in an ISFSI or radiological  
24 release at a nuclear power plant. You're not here as  
25 an expert on the relative risk of the two types of

1 facilities.

2 DR. BARTLETT: No, that's not my area of  
3 expertise.

4 MR. TURK: I just have a few more items.  
5 I'm at number 27, Your Honor.

6 In that same paragraph, you make a  
7 specific reference to NUREG 1567 at 7-20 and 7-54?

8 DR. BARTLETT: Yes.

9 MR. TURK: Could you explain what those  
10 references are? If you have the NUREG document in  
11 front of you, do you have NUREG 1567?

12 DR. BARTLETT: Yes.

13 MR. TURK: Would you agree that those  
14 pages don't exist?

15 DR. BARTLETT: See 7-20 and 7-54 of 1567?

16 MR. TURK: That's what your testimony  
17 states.

18 DR. BARTLETT: I'm confused because they  
19 exist in what I have.

20 MR. TURK: In what you have in front of  
21 you?

22 DR. BARTLETT: Yes.

23 MS. NAKAHARA: Dr. Bartlett, will you  
24 clarify what document you're looking at?

25 DR. BARTLETT: NUREG 1567.

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1 MS. NAKAHARA: Is that your copy you're  
2 looking at?

3 DR. BARTLETT: It is my copy.

4 CHAIRMAN FARRAR: And weren't you just  
5 given a different copy, or do you have two versions in  
6 front of you?

7 DR. BARTLETT: Was that taken from me?  
8 Oh, no. Here it is. Excuse me.

9 MR. TURK: What is the date of the  
10 document that you're looking at in which you found  
11 those pages?

12 CHAIRMAN FARRAR: Not the one that --

13 DR. BARTLETT: This may be part of the  
14 problem. The document I've been using is a draft  
15 report for comment. What I've been handed is a final  
16 report, so there was a revision from a draft to a  
17 final version. So I -- when we referenced this  
18 document, we should have referenced it as draft.

19 MR. TURK: And which draft are you looking  
20 at?

21 DR. BARTLETT: It's just labeled, "Draft  
22 for Comment."

23 MR. TURK: It may be, Your Honor, I just  
24 have a bit more. Would this perhaps be a good time to  
25 break, and I would ask if I may look at Dr. Bartlett's

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1 copy of the draft to see what the reference was.

2 CHAIRMAN FARRAR: Very well.

3 MR. TURK: Perhaps, if the State could  
4 point me to the sentence, that would speed things up.

5 CHAIRMAN FARRAR: All right. Why don't  
6 you all work that out, and then we can just stipulate  
7 what happened, rather than go round and round on it.  
8 All right. Then this is a good time for a break.

9 (Off the record 2:44:42 - 3:02:41 p.m.)

10 CHAIRMAN FARRAR: Back on the record.

11 MR. TURK: Thank you, Your Honor. As the  
12 day gets longer, we all have more papers on our desks.

13 CHAIRMAN FARRAR: That reminds me of two  
14 things. Next week the people who were worried about  
15 Yucca Mountain Electronics are going to be in here  
16 watching us do aircraft as kind of a case study to see  
17 how they need to set up the electronic filing and  
18 paperless system we're supposed to have at Yucca  
19 Mountain.

20 Also in case I forget, tomorrow morning  
21 apparently there's some major public meeting at the  
22 Commission that starts at 8:30 a.m. People will be  
23 arriving as early as 7:30 a.m. So you can come in  
24 after 8:30 a.m. and hope everyone who is supposed to  
25 be here is here and has cleared security, or you can

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1 come in earlier and eat at the cafeteria. Mr.  
2 Delligatti, do you have a suggestion?

3 MR. DELLIGATTI: (Away from microphone.)  
4 Yes. Actually it was Mr. -- that suggested you might  
5 also consider coming in Building One rather than  
6 Building Two because --

7 (Discussion off the microphone.)

8 CHAIRMAN FARRAR: Inside. You go into the  
9 tall building closer to the Metro Station and check in  
10 there. Then there's a glass enclosed above-ground  
11 tunnel that takes you over to here.

12 (Discussion off the microphone.)

13 CHAIRMAN FARRAR: Although they seem to  
14 have less of a staff.

15 MR. DELLIGATTI: (Away from microphone.)  
16 It would probably be a good idea to have -- contact --

17 CHAIRMAN FARRAR: Yes.

18 (Discussion off the microphone.)

19 CHAIRMAN FARRAR: All right.

20 MR. TURK: Maybe if we proceed with Dr.  
21 Cornell this afternoon, we can take a late start  
22 tomorrow. I guess we'll see.

23 CHAIRMAN FARRAR: Let's see how far we  
24 get.

25 MR. TURK: I am ready to go. Are we on

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1 the record?

2 CHAIRMAN FARRAR: Yes.

3 CROSS EXAMINATION (cont.)

4 BY MR. TURK:

5 Q Dr. Bartlett, the last question I asked  
6 you had to do with a reference in your testimony, the  
7 NUREG 1567 that you cite on page 13 of your testimony,  
8 that document at pages 7-20 and 7-54. I believe you  
9 indicated before we broke that it was the draft  
10 version of NUREG 1567.

11 A That is correct.

12 Q You were kind enough to give me a copy of  
13 the pages, 7-20 and 7-54, to which you referred in the  
14 draft document.

15 A That is correct.

16 Q In citing that document, you indicate that  
17 under the Standard Review Plan 1567 there's an  
18 assumption that the design earthquake is equivalent to  
19 a safe shut down or deterministic earthquake used for  
20 nuclear facilities under 10 CFR Part 50. That's your  
21 reason for citing that statement in the draft guidance  
22 document. Correct?

23 A That was found on page 7-54, correct.

24 Q You recognize that here PFS is applying  
25 for an exemption from the requirement of they follow

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1 the deterministic approach in order to enable them to  
2 use the probablistic seismic hazard analysis that  
3 they've performed to establish the design earthquake.  
4 Is that correct?

5 A Yes. That's my understanding of them  
6 applying for an exemption.

7 Q Nonetheless, without respect to the  
8 exemption request, your comment is that the Standard  
9 Review Plan and you say this twice in the same  
10 paragraph by the way that the Standard Review Plan for  
11 an ISFSI "may already incorporate less design  
12 conservatism than NPP SRPs." In other words, less  
13 design conservatism than a nuclear power plant  
14 Standard Review Plan. Where in what you just referred  
15 me to in NUREG 1567 do you reach that or do you have  
16 a basis to reach that conclusion?

17 A We've talked at length about factor of  
18 safety and the design criterion for the factor of  
19 safety. I think that would be one instance.

20 Q I don't understand. Factor of safety,  
21 that had to do with a proposal by PFS to reduce the  
22 seismic demand from the deterministic earthquake.  
23 Correct?

24 A Yes. Right. And use a factor of safety  
25 of 1.1 for the exemption earthquake.

1 Q Right. But you're not stating in this  
2 paragraph that the exemption is less conservative or  
3 would establish a less conservative value than the  
4 deterministic earthquake. You're stating that NRC  
5 guidance documents which you yourself just indicated  
6 apply for the deterministic or safe shut down  
7 earthquake is less conservative than the nuclear power  
8 plant's safe shut down earthquake regulatory guidance.  
9 I don't see that connection.

10 A I guess I'm putting forth the idea that if  
11 one was to design according to nuclear power plant  
12 guidance that the factor of safety for overturning  
13 bearing capacity and sliding would be based on a safe  
14 shut down earthquake.

15 Q Yes.

16 A If one was to design for an earthquake  
17 that's been granted due to an exemption and designed  
18 to the same factor of safety 1.1, then in real terms  
19 the margins have been decreased.

20 Q Okay.

21 A Does that help?

22 Q It does help. But I think that you need  
23 to correct your testimony in light of that statement.

24 A It may be unclear.

25 Q Twice in that same paragraph, halfway down

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1 page 13, you state not that the exemption request  
2 establishes a less conservative licensing basis, but  
3 rather that the Standard Review Plans in 1567 and 1536  
4 establish a less conservative design basis than  
5 regulatory guidance for nuclear power plants. That's  
6 not a correct statement. Is it?

7 A I'm not sure. I think the intent as I  
8 recall when this was written was that there's an  
9 argument put forth that ISFSIs inherently pose a less  
10 hazard than nuclear power plants because of their  
11 complete difference in operations. If one adopts that  
12 philosophy, then there may be a relaxing of the reg  
13 guides and not holding them to the same level of  
14 conservatism to a nuclear power plant just because  
15 that ISFSIs are inherently less dangerous. Does that  
16 help?

17 Q No. The reason is when you talk about an  
18 ISFSI being inherently less dangerous, you're now  
19 addressing the probablistic approach and the thought  
20 that because an ISFSI is inherently less dangerous,  
21 they need not design to the safe shut down earthquake  
22 for a nuclear power plant. Right?

23 A Yes. On the demand side, that would be  
24 correct.

25 Q All right. But that's not a failure or a

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1 lack of conservatism in the regulatory guidance. That  
2 rather would apply to using a probablistic approach  
3 and designing for an earthquake less than that which  
4 is stated to be needed in the regulatory guidance for  
5 ISFSIs. Correct?

6 A Again, I guess I'm saying there's very  
7 little guidance.

8 Q Let's look at the citation that you give  
9 us in your testimony.

10 A There's very little guidance about design  
11 of foundation systems.

12 Q I think it's just a simple error in the  
13 writing of the testimony. Let's look at your  
14 citations and make that very clear. You cite page 2-  
15 10 of NUREG 1536. The discussion of earthquakes on  
16 that page states that "the SAR should state the  
17 parameters of the design basis earthquake for ISFSIs  
18 at reactor sites. This is equivalent to the SSE used  
19 for analysis of nuclear facilities under 10 CFR Part  
20 50." Right?

21 A Yes.

22 Q So that states if the generic COC is  
23 issued for a dry cask storage system which is what  
24 NUREG 1536 addresses, then the design basis earthquake  
25 for the reactor would be the applicable design

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1 earthquake. Right?

2 A That's correct.

3 Q That's not less conservative than the  
4 regulatory guidance for reactors. Right?

5 A That would not be.

6 Q All right. Then you cite the NUREG 1567.  
7 Here you're citing to the draft document which I have  
8 no problem with. At page 7-20 of that draft document,  
9 the following statement appears. "The design  
10 earthquake shall be not less than that required for  
11 the site by 10 CFR 72.102." Do you see that  
12 statement?

13 A Yes.

14 Q And that's what you're referring to in  
15 your testimony. Correct?

16 A Yes.

17 Q 72.102 establishes that a design  
18 earthquake for an ISFSI shall be equivalent to the  
19 safe shut down earthquake for nuclear power plants.  
20 Correct?

21 A That's correct.

22 Q So this guidance in NUREG 1567 draft  
23 document is not less conservative than the regulatory  
24 guidance for a nuclear power plant.

25 A No, that's correct.

1 Q Then you also cite page 7-54 of the draft  
2 document. On that page in discussing earthquake  
3 loads, there are two citations of sources. Do you see  
4 the citation as ANSI 57.9 and ACI 349?

5 A Yes.

6 Q Those same sources apply to an ISFSI as  
7 apply to nuclear power plants. Correct? This  
8 document establishes that those sources or those  
9 references apply in the regulatory review of an ISFSI  
10 application. Right?

11 A Yes. That's correct.

12 Q Those same references appear in the  
13 regulatory guidance for nuclear power plants. Are you  
14 aware of that or shall we point to the specific  
15 provisions?

16 A No. I'll take your characterization.  
17 That's fine.

18 Q Okay. In the textural discussion next to  
19 that discussion on page 7-54, the following statement  
20 appears. "Loads do to the direct and secondary  
21 effects of the design basis earthquake (DE), the DE is  
22 comparable to the safe shut down earthquake used for  
23 analysis of nuclear facilities under 10 CFR 50." Do  
24 you see that statement?

25 A Yes. That's correct.

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1 Q In fact in the copy that you handed me  
2 that I photocopied, you've underlined that sentence  
3 that I just read.

4 A Yes.

5 Q That's the reference that you're citing in  
6 your testimony when you were discussing this page of  
7 the regulatory guidance document. Correct?

8 A Yes.

9 Q So that's not any less conservative than  
10 the guidance for nuclear power plants. Is it?

11 A Not for the design basis earthquake. That  
12 is correct.

13 Q So is it fair to say then that in your  
14 testimony when you say that the regulatory guidance  
15 for ISFSIs is less conservative than the guidance for  
16 nuclear power plants, you weren't thinking of this  
17 regulatory guidance, but rather you were thinking of  
18 the concept of using a PSHA with a design earthquake  
19 somewhere less than the deterministic safe shut down  
20 earthquake as the basis for licensing an ISFSI? I.e.,  
21 you were thinking of the exemption request being less  
22 conservative than the regulatory guidance.

23 A I think the basis of the statement is more  
24 back to the concept that ISFSI facilities are less  
25 vulnerable to earthquake initiated accidents than

1 nuclear power plants. There was a concern that some  
2 of this idea because they're less vulnerable, the  
3 nuclear power plants would there be some relaxation in  
4 the reg guides which may potentially incorporate less  
5 conservatism.

6 Q But you're not aware of any specific area  
7 of the reg guide that does that.

8 A At this point, I haven't reviewed them in  
9 detail.

10 Q So you can't point us to anything today  
11 that you think is less conservative.

12 A No. But I certainly --

13 Q Is that correct?

14 A Yes. After what we've reviewed today, I  
15 would certainly agree that as you look at these  
16 guidance at least in relation to the design basis  
17 earthquake that 1536 and 1567 do point to the same  
18 shut down earthquake that would be used for a nuclear  
19 power plant.

20 Q Yes. And the regulation does that also.  
21 Correct?

22 A Yes.

23 Q 72.102.

24 A Yes.

25 Q One last point about the regulatory

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1 guidance in 1536. You state at the bottom of page 13  
2 that "NUREG 1536 requires the Applicant to demonstrate  
3 that the dry cask system will not tip over or drop as  
4 a result of a natural phenomenon event such as an  
5 earthquake." Then you cite NUREG 1536.

6 A Yes. That's correct.

7 Q Do you have NUREG 1536 there with you?

8 A I'm just checking. It shows final report.  
9 So, yes I have the final version it appears.

10 Q Do you have page 3-14?

11 A I do not.

12 MR. TURK: I'd like to read a statement.  
13 Perhaps I should walk over to the witness and show him  
14 the document unless the State has an extra copy.

15 CHAIRMAN FARRAR: Go ahead. Do that. Why  
16 don't you walk over there, Mr. Turk?

17 MR. TURK: I have two copies but before I  
18 can open one up I might as well just walk over there  
19 and read the sentence.

20 CHAIRMAN FARRAR: Right.

21 MR. TURK: Let me indicate I'm showing Dr.  
22 Bartlett a copy of NUREG 1536 entitled "Standard  
23 Review Plan for dry cask storage systems."

24 BY MR. TURK:

25 Q It bears the date of January 1997.

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1 Correct?

2 A Yes.

3 Q At page 3-14, I'd like to read the  
4 following two sentences. "The Applicant should  
5 demonstrate that no tip over or drop will result from  
6 an earthquake. In addition, impacts between casks  
7 should either be precluded or should be considered an  
8 accident event from which the cask must be shown to be  
9 to be structurally adequate." Do you see that  
10 statement?

11 A Yes.

12 Q Okay. Is it fair to say then based on  
13 this reading of NUREG 1536 that one option for an  
14 Applicant which has not been proposed here to my  
15 knowledge is an analysis that shows that even if casks  
16 impact there's no structural inadequacy that would  
17 result from that?

18 A That's my understanding of what you read.

19 Q The whole point is and maybe you can  
20 confirm your understanding of this, that the Nuclear  
21 Regulatory Commission is concerned with the protection  
22 of the public from radiological hazards. Is that your  
23 understanding of the regulatory mission of the Agency  
24 or do you know?

25 A No. I really can't comment on the mission

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1 of the NRC.

2 Q You would agree though that we aren't an  
3 engineering review board. We do have a function  
4 that's related to radiological risk.

5 A Yes. I would assume that you would.

6 MR. TURK: Does anyone have a question  
7 they want me to ask?

8 (Laughter.)

9 MR. TURK: Thank you very much, Dr.  
10 Bartlett.

11 DR. BARTLETT: You're welcome.

12 CHAIRMAN FARRAR: Thank you, Mr. Turk.  
13 Any redirect by the State?

14 MS. NAKAHARA: Very briefly.

15 CHAIRMAN FARRAR: We have no more  
16 questions. Do you have anything, Ms. Nakahara?

17 MS. NAKAHARA: A few question, Your Honor.

18 CHAIRMAN FARRAR: All right. Go ahead.

19 REDIRECT EXAMINATION

20 BY MS. NAKAHARA:

21 Q Dr. Bartlett, in response to questions  
22 from Mr. Gaukler, you discussed your experience in  
23 applying DOE Standard 1020 at Savannah River. Are you  
24 familiar with the application of DOE 1020 to  
25 structures from your experience at Savannah River?

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1           A       Well, we worked as a team. There was a  
2 structural mechanics group that was working with us in  
3 the team. So there was a lot of interplay between the  
4 foundations engineering which is being done by the  
5 Geotechnical Engineering and the structure mechanics  
6 group. So though I'm not directly responsible for  
7 that area of review, I have sat in several review  
8 meetings that discussed things related to the  
9 structural performance of the facilities.

10           Q       In further responses to Mr. Gaukler, you  
11 stated that you're limiting your opinion to  
12 foundations and not structures. However, in your  
13 opinion, wouldn't the general application of DOE 1020  
14 or the two-handed approach as it has been referred to  
15 in this proceeding would apply equally to structures?

16           A       Well, certainly. The intent of DOE  
17 Standard 1020 is actually more applicable I think to  
18 structures. The DOE Standard 1020 when it comes to  
19 foundation issues such as sliding and overturning is  
20 very brief and gives the designer some options of what  
21 can do. I think we discussed at least for foundation  
22 evaluation criteria the use of this formula that  
23 allows you to use a scale design basis earthquake at  
24 1.5 times the scaling factor times the design basis  
25 earthquake. But DOE Standard 1020 mostly applies to

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1 structural and mechanical design.

2 Q In response to a question from Mr. Gaukler  
3 about your answer to question 9, you essentially  
4 agreed that the answer was historical. Do you recall  
5 if the Staff proffered a two-handed approach as has  
6 been referenced in this proceeding using a design  
7 basis earthquake with the design conservatism in their  
8 justification in the SER?

9 A I don't recall any justification. The  
10 Staff's review seemed to be pretty one-handed focusing  
11 on the design basis earthquake. It was not until  
12 testimony by Dr. Cornell that we saw the introduction  
13 of this two-handed approach in using concepts that are  
14 similar to DOE Standard 1020.

15 Q Finally, today you offered testimony that  
16 described containment. Will you define how you view  
17 containment in your responses to your questions from  
18 Mr. Gaukler, Mr. Turk, and the Board?

19 A Lack of containment. I would say that  
20 lack of containment would be where radiological dose  
21 is increased. So if for example the cask tips over  
22 and as a result of that tip over radiological dosage  
23 increases, I would consider that lack of containment.

24 MS. NAKAHARA: Thank you, Dr. Bartlett.  
25 I have no further questions.

1 CHAIRMAN FARRAR: Thank you, Ms. Nakahara.

2 Recross?

3 MR. GAUKLER: No recross.

4 CHAIRMAN FARRAR: Mr. Turk?

5 MR. TURK: Nothing, Your Honor.

6 CHAIRMAN FARRAR: Okay. Then that  
7 concludes Dr. Bartlett's testimony. He'll be staying  
8 with you for Dr. Cornell's.

9 MS. NAKAHARA: Yes, Your Honor.

10 CHAIRMAN FARRAR: But he will not be  
11 testifying again.

12 MS. NAKAHARA: Depending upon Dr.  
13 Cornell's rebuttal and whether PFS has any with Dr.  
14 Cornell of Dr. Bartlett.

15 CHAIRMAN FARRAR: All right.

16 MS. NAKAHARA: But no, we're not planning  
17 any.

18 CHAIRMAN FARRAR: On the assumption, Dr.  
19 Bartlett, you will not be back on the stand, let us  
20 take this opportunity. You've had a lead role in the  
21 entire aspect of the entire State case on seismic  
22 matters. We very much appreciate as I'm sure they and  
23 the Governor do the enormous effort you've put into  
24 this on behalf not only of the State but the citizens  
25 of Utah. So we particularly appreciate your effort in

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1 this case.

2 DR. BARTLETT: Thank you, Your Honor. I'm  
3 thankful for the opportunity to express my views and  
4 opinions.

5 MS. CHANCELLOR: Your Honor, could I make  
6 a dangerous suggestion?

7 CHAIRMAN FARRAR: Yes. We need some  
8 excitement.

9 MS. CHANCELLOR: I was just chatting with  
10 Mr. Gaukler. There may be a possibility we could  
11 finish today.

12 CHAIRMAN FARRAR: We had thought of that.  
13 It's your option. It's recently prepared rebuttal but  
14 if you're prepared to go ahead and cross on the spot,  
15 then --

16 MS. CHANCELLOR: We could certainly cross  
17 on the written rebuttal.

18 CHAIRMAN FARRAR: All right. Then let's  
19 have at it.

20 MR. GAUKLER: I'd like to take about a ten  
21 minute break before rebuttal, 15 minutes at most.

22 CHAIRMAN FARRAR: Okay. Everyone has the  
23 prefiled -- Oh, you're going to do the prefiled  
24 rebuttal and rebuttal --

25 MR. GAUKLER: Yes.

1 CHAIRMAN FARRAR: So the rebuttal to Dr.  
2 Bartlett.

3 MR. GAUKLER: Right. 15 minutes or less.

4 CHAIRMAN FARRAR: Okay. The prefiled is  
5 to Dr. Arabasz. Right?

6 MR. GAUKLER: Right.

7 CHAIRMAN FARRAR: Okay. Fine then it's  
8 almost 3:30 p.m. Let's come back at 3:40 p.m. Or do  
9 you need longer?

10 MR. GAUKLER: Let's make it 3:45 p.m.

11 CHAIRMAN FARRAR: Make it 3:45 p.m. We'll  
12 press along. Off the record.

13 (Whereupon, the foregoing matter went off  
14 the record at 3:29 p.m. and went back on  
15 the record at 3:48 p.m.)

16 CHAIRMAN FARRAR: On the record. Mr.  
17 Turk, you had wanted to make a statement.

18 MR. TURK: Yes, Your Honor. In one of my  
19 last sets of questions to Dr. Bartlett, I was  
20 inquiring about why the regulatory guidance for ISFSIs  
21 would be less conservative than the regulatory  
22 guidance for nuclear power plants.

23 CHAIRMAN FARRAR: Right.

24 MR. TURK: And in that course of my  
25 questioning, I referred to two documents that were

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1 cited in the draft guidance document that Dr. Bartlett  
2 had relied on. That was the draft guidance document  
3 for NUREG 1567. One of those was ACI-349 which as  
4 earlier testimony indicated appears both in the  
5 regulatory guidance for ISFSIs and for nuclear power  
6 plants. I also suggested to Dr. Bartlett that the  
7 reference at page 7-54 of the draft NUREG 1567 which  
8 cites ANSI 57.9 also applies to nuclear power plants  
9 not just ISFSIs.

10 Dr. Bartlett was nice enough to accept my  
11 representation on that basis. We didn't go and look  
12 for the specific reference in the regulatory guidance.  
13 In fact when I looked at the regulatory guidance, I  
14 see there's no citation for nuclear power plants  
15 through the ANSI Standard. Then when I look at the  
16 ANSI Standard, I understood why. The ANSI Standard  
17 specifically indicates that it's applicable to ISFSIs.

18 The ANSI Standard by the way, we put some  
19 of those pages in previously. That's Staff Exhibit  
20 57. So I want to make that known that my  
21 representation was incorrect. If the State has any  
22 other testimony they wish to offer on that point, I  
23 certainly wouldn't object inasmuch as it was my  
24 representation that drew the answer.

25 MS. NAKAHARA: No, Your Honor. We

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1 appreciate the correction.

2 CHAIRMAN FARRAR: Yes. Thank you, Mr.  
3 Turk. We do appreciate the correction. We'll  
4 reinterpret the testimony in that light. Dr. Cornell,  
5 you've previously been sworn. Good to have you back.  
6 Consider yourself still under oath. I think you  
7 waited a long time in Salt Lake City to get back on,  
8 finally got disgusted, and left which was probably a  
9 good move.

10 (Laughter.)

11 DR. CORNELL: Those aren't my words.

12 CHAIRMAN FARRAR: But we're glad to have  
13 you back. Go ahead, Mr. Gaukler.

14 DIRECT EXAMINATION

15 BY MR. GAUKLER:

16 Q Dr. Cornell, do you have before you a copy  
17 of rebuttal testimony of C. Allin Cornell to the  
18 testimony of the State witness Dr. Walter J. Arabasz  
19 on Section E of unified contention Utah L/QQ?

20 A Yes I do.

21 Q Was this rebuttal testimony prepared by  
22 you or under your supervision and direction?

23 A Yes it was.

24 Q Is this testimony true and correct to the  
25 best of your knowledge?

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1 A Yes it is.

2 Q Do you adopt this as your sworn rebuttal  
3 testimony with respect to the testimony of Walter J.  
4 Arabasz in this proceeding?

5 A Yes I do.

6 MR. GAUKLER: Your Honor, I would request  
7 that this rebuttal testimony of Dr. Cornell be bound  
8 into the record as if read.

9 CHAIRMAN FARRAR: Any objection?

10 MS. NAKAHARA: No objection, Your Honor.

11 CHAIRMAN FARRAR: Staff?

12 MR. TURK: No, Your Honor.

13 CHAIRMAN FARRAR: All right. Then the  
14 rebuttal testimony of Dr. Cornell dated June 27  
15 responding to Dr. Arabasz will be bound into the  
16 record at this point as if read.

17 (Insert prefiled testimony of Dr. Allin Cornell.)

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June 27, 2002

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of )

PRIVATE FUEL STORAGE L.L.C. )

(Private Fuel Storage Facility) )

Docket No. 72-22

ASLBP No. 97-732-02-ISFSI

**REBUTTAL TESTIMONY OF C. ALLIN CORNELL  
TO THE TESTIMONY OF STATE WITNESS DR. WALTER J. ARABASZ  
ON SECTION E OF UNIFIED CONTENTION UTAH L/QQ**

**Q1.** In Answers 14-15 of his pre-filed testimony, Dr. Arabasz takes issue with the position stated in paragraph 49 of your November 7, 2001 declaration that in "virtually all areas of public safety hazards are measured as annual probabilities (or frequencies) of occurrence regardless of the length of the activity in question, the exposure time, the estimated facility life, or the licensing duration." See "State of Utah Testimony of Walter J. Arabasz Regarding Unified Contention Utah L/QQ (Seismic Exemption)," April 1, 2002 ("Arabasz Direct Testimony"). According to Dr. Arabasz, many standards make use, not of annual probabilities, but of probabilities of exceedence in units such as 10%, 5% or 2% in 50 years. What is your response to Dr. Arabasz's criticism?

**A1.** Stating probabilities of exceedence in such terms as a 10% probability of exceedence in 50 years (as opposed to annual probability of exceedence of  $2 \times 10^{-3}$ ) is just a different way of presenting the frequency of occurrence. Neither method of specifying frequency is predicated on the lifetime of a facility, nor does the application of the standard vary depending on a facility's projected lifetime. This is clearly reflected in the quotation on page 15 of Dr. Arabasz's direct testimony from the National Research Council's Panel on Seismic Hazard Analysis, which directly equates a design seismic hazard level with a 10% probability of exceedence in 50 years to an annual probability of exceedence of  $2 \times 10^{-3}$ .

Thus, for example, applying a seismic standard of 10% probability of exceedence in 50 years to two buildings, one constructed for a 10 year lifetime and the other for a 100 year lifetime, would result in the same annual probability of exceedence of  $2 \times 10^{-3}$  for each building. Therefore, the examples cited by Dr. Arabasz

confirm my basic thesis, which is that in these codes and criteria the frequency of occurrence used is (and should be) independent of the length of the lifetime of the facility or item at risk. All that his examples confirm is that different standards use different units for measuring frequency.

Q2. In his testimony at the hearing (Tr. 10164-10170), Dr. Arabasz acknowledged the potential for logical inconsistencies that might result from adopting a design return period proportional to the duration of the facility lifetime. The two examples discussed were (1) that under a facility lifetime-dependent approach a reduction of the plant design life could lead to perhaps unreasonably reduced design return periods; and (2) that ambiguities could arise in a nuclear power plant ("NPP") re-licensing application of a plant whose original lifetime has expired. Dr. Arabasz further stated that under the DOE 1020 paradigm the lifetime-independent, annual frequency approach would be appropriate and preferable, but that lacking "the pertaining regulatory guidance . . . and clearly established framework for decision making" (such as that in DOE 1020) would apparently lead him in the direction of a duration-dependent safety criterion here. (Tr. 10170) Do you believe that a clearly established framework for decision making based on a lifetime-independent, annual frequency approach is lacking in the NRC arena?

A2. No. In my written testimony I cite several NRC documents that attest to that agency's clear adoption of annual frequency as the appropriate basis for safety criteria and a risk-informed decision-making framework. For example, both the Commission's Reactor Safety Policy Statement [(SECY 00-007), Ref. 22 of my direct testimony] at p.6 and Regulatory Guide 1.174 [Ref. 5] clearly set forth frequency-based risk acceptance guidelines for NPPs where the performance objectives are Core Damage Frequency and Early Large Release. While these statements were made in connection with the adoption of frequency-based guidelines for NPPs, the same principles apply to ISFSIs, such as the PFSF.

Another example of the logical inconsistencies that may arise from tying the frequency standard to lifetimes is in the area of worker safety. Worker safety criteria are typically measured in terms of the "probability of death per worker lifetime" (not per annum). However, no such standard to my knowledge differentiates between a 65-year-old worker (whose remaining lifetime is likely to be short) and a younger worker. In other words, while the frequency of occurrence in this example is expressed in units "per lifetime," the standards are not applied differently depending on a person's remaining lifetime. Indeed, the use of a duration-dependent worker safety criterion would lead to implications to which many of us of the older generation would not react kindly. Compared to our younger workplace colleagues, those of us with only, say, a decade of work

ahead of us could be subjected, by the application of such a duration-dependent standard, to significantly reduced work place protection standards: lesser protection against cancer-inducing activities (e. g., working with asbestos), no shields around dangerous equipment, etc.

Q3. In response to questions by Judge Lam (Tr. 10047-50), Dr. Arabasz agreed "emphatically" with your testimony that, in seeking to achieve an acceptable risk of failure of SSCs for ISFSIs, it was appropriate to use a "two hand approach" which took into account, on the one hand, the robustness and conservatism of the design of the SSCs and, on the other hand, the regulatory standard on hazard probability. Dr. Arabasz, however, opined that the levels of conservatism in the design of some of the SSCs for an ISFSI (such as storage casks) may not have been established to the same level of confidence as for nuclear power plant SSCs. For that reason, he suggested that the desired low level of overall risk might not be achieved unless the hazard probability was set sufficiently high. Do you agree with Dr. Arabasz's position?

A3. I agree with Dr. Arabasz's reasoning but not with the premise on which his position is based. Thus, I agree with Dr. Arabasz that, in assessing what seismic safety level has been achieved, one cannot depend solely on either the conservatism in the design or the mean return period of the design basis ground motion. Dr. Arabasz and I apparently agree that both of the two hands must be recognized to make informed public safety decisions. We also agree that for SSCs typical of NPPs we can have confidence that the NRC SRPs will insure very significant levels of robustness in the design; hence, the 2000 year return period will achieve the desired performance goal (i.e., an SSC failure probability of  $10^{-4}$  or less) with high degree of confidence.

Further, Dr. Arabasz is correct in saying that storage casks for ISFSIs do not fall into this "NPP-typical" category, and that some further analysis is necessary to provide confidence that the desired performance goal for these components has been achieved. However, both the NRC staff and PFS have conducted beyond-design-basis analyses of these casks and their foundations with the aim of achieving such levels of confidence. In my view, the analysts of both PFS and the staff have demonstrated (using conservative assumptions with respect to key parameters such as the friction coefficient) that under the  $10^{-4}$  year return period ground motion, the casks to be used at the PFSF site will not tip over. These demonstrations are in themselves sufficient to provide good evidence that a

performance goal in the order of  $10^{-4}$  has been achieved. A further determination has also been made, i.e., that no release would occur even if the casks were to tip over. This further conclusion provides still greater confidence that the annual probability of radioactive releases is less than or equal to  $10^{-4}$ .

Based on the above reasoning, I would answer in the negative Dr. Lam's question as to whether the "design robustness hand" is doing more than its share of heavy lifting vis a vis the "hazard level hand." My negative answer arises from the fact that we are not asking the designs to provide higher levels of performance than what they are naturally capable of providing. For example, as I have testified previously, ductile materials such as steel and reinforced concrete are capable of withstanding dynamic deformations many times larger than their nominal yield levels, and hence are also capable of withstanding ground motion amplitudes multiple times the level that causes the material to reach its nominal yield level. (This capability was recognized by the earthquake engineers when they were for the first time called upon in the 1970s to determine what the realistic seismic margins in existing nuclear power plant SSCs really are.) Thus, the "design robustness hand" is not being unduly emphasized at the expense of the "hazard level definition" hand.

Second, we must keep in mind the chronological sequence of events that have led to the current regulatory standards. Virtually all U.S. NPPs were designed based on Appendix A "deterministic" design basis ground motions and on SRPs that were intentionally more conservative than, for example, corresponding building design standards (e.g., the so-called R or force "reduction factors" in conventional building codes - such as the UBC and IBC, which have been discussed in these proceedings - were not used in the SRPs). Then, PSHA came along and showed that the Appendix A design basis ground motions had a mean return period of about 10,000 years. At about the same time, seismic PRA engineers were conducting the analyses that showed just how robust were the SSCs designed to the NPP SRP. Their conclusion was summarized in  $R_r$  ("risk reduction ratios") of 5 to 20 or more. The resulting implication that NPP SSCs achieved a performance goal of about  $10^{-5}$  was a product of those studies; it was not a pre-defined target. Thus, the relative roles of the seismic hand and the robustness hand were not pre-selected, but resulted from the inherent beyond-design-basis capability of these components, embodied in nuclear design criteria and practices.

As we today consider the safety implications of similar SSCs in ISFSIs such as the storage casks, we are simply building on and working within the logical framework established in the past for nuclear power plant SSCs.

**Q4.** Does that conclude your testimony?

**A4.** Yes.

1 BY MR. GAUKLER:

2 Q Dr. Cornell, I would also like to ask you  
3 a few questions with respect to Dr. Bartlett's  
4 testimony today. If I recall correctly, I believe  
5 that Dr. Bartlett stated his belief this morning that  
6 the risk reduction factor of five to 20 for a typical  
7 nuclear power plant components would not be applicable  
8 to foundations because they would not have been part  
9 of the seismic probability risk assessments that  
10 underlay the development of this five to 20 factor.

11 Do you know whether foundations were part  
12 of the seismic PRAs that underlay the five to 20  
13 factor? Do you have an opinion of whether it was  
14 appropriate to apply this five to 20 risk reduction  
15 factor to foundations?

16 A Well, yes I do know that in the seismic  
17 PRAs and seismic margin studies that were of the  
18 general basis for establishing the five to 20 factor.  
19 Such as I inferred from the 6728 that as I said PRA is  
20 considered also the failure conditions associated with  
21 sliding, overturning, bearing failures. As I stated  
22 in my testimony, I'm not aware of all of the details  
23 of those.

24 However, I do know that those soil failure  
25 conditions or failure modes did not show up in the

1 seismic PRAs as being critical failure conditions.  
2 Those were all structural and mechanical. The one  
3 exception I can think of was in the Midland Plant  
4 where there was a soils problem. So I infer from that  
5 generally speaking the R (sub R) or conservatism  
6 levels that were inferred from the seismic PRAs were  
7 at least as large as those in the five to 20 that I  
8 concur were adopted primarily for structural and  
9 mechanical.

10 Q And therefore would also be appropriate to  
11 imply this factor of five to 20 for the foundation  
12 failure mechanisms that were discussed this morning;  
13 sliding, overturing, and bearing capacity.

14 A Yes. I believe that evidence points in  
15 that direction. It's part of my --

16 Q Now again with respect to foundations, Dr.  
17 Bartlett testified this morning I believe that one  
18 could not establish that PFS met a performance  
19 objective of one times ten to the minus four without  
20 doing an analysis using the 10,000 year ground motion.  
21 Specifically, he appeared to further state that PFS  
22 would essentially have to undergo the same analysis  
23 they had done before to show a factor of safety of 1.1  
24 I guess sliding before you could establish a risk  
25 reduction factor of five with respect to sliding. Is

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1 that a correct application of the two-handed approach  
2 as you understand it?

3 A No. I don't believe so. We must recall  
4 that the purpose for purposes of assessing these risk  
5 reduction factors and the available margins associated  
6 with the design procedures and guidelines that apply  
7 here that one is trying to basically strip away  
8 conservatisms and check the conditions under which for  
9 example a sliding failure might occur. Therefore, a  
10 particular one would not be checking whether the  
11 safety factor ratio of capacity to demand exceeded  
12 1.1.

13 One would ask simply does the capacity  
14 with respect to sliding exceed that of the value of  
15 the demand. So in a sense, one is comparing with a  
16 safety factor of 1.0 if you wish, not 1.1. That's one  
17 part of the reply. In my opinion, it's not necessary  
18 also to do an explicit 10,000 year study as was done  
19 for example to the casks and other things in many of  
20 these circumstances if by let's say approximate  
21 reasoning you can infer that we've reached at least an  
22 R (sub R) of five or so.

23 So for example in this case, I would first  
24 look at this capacity. What levels of conservatism  
25 apparently exist in the capacity again let us say with

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1 respect to sliding? In Mr. Trudeau's testimony, we  
2 heard of in his opinion the dynamic shear strength was  
3 at least a factor of one and a half greater than that  
4 of the static strength used in their calculations used  
5 for purposes of confirming adequacy with respect to  
6 the Standard Review Plan or design basis.

7 We also know they used lower bound  
8 strengths rather than average strengths. A variety of  
9 other such factors were used on the conservatism to  
10 induce conservatism of certainly more than a factor of  
11 one and a half on the capacity side of the problem.  
12 If I look at the demand side, I think in my mind let  
13 me see, if I consider changing from a 2000 year to  
14 something like a 10,000 year earthquake, we know from  
15 the hazard curve at this site that this would imply  
16 roughly a one and a half factor in say the PGA.

17 If the ground motion goes up by a factor  
18 of one and a half, how much would the initial demands  
19 that might induce sliding go up? To a first  
20 approximation, I believe they go up roughly  
21 proportionately. Discussion with Mr. Trudeau and Mr.  
22 Ebbeson suggest to me that if anything these demands  
23 would go up less than proportionally, that is less  
24 than a factor of one and a half if the ground motion  
25 goes up one and a half, for example, due to higher

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1 danthing (PH) that would be associated with the higher  
2 strain levels in the soil.

3 So I conclude from that if under something  
4 like this 10,000 year ground motion, the realistic  
5 capacity would exceed the realistic demand.  
6 Concluding there would not be failure. Hence, I could  
7 infer that this risk reduction factor would be if the  
8 order at the order of five or so which is why I get my  
9 conclusion.

10 Q So I guess I have two clarifying question.  
11 In terms of looking at the risk reduction factor and  
12 evaluating whether a risk reduction factor exists,  
13 you're looking at realistically what you think would  
14 occur without conservatisms. Correct?

15 A Correct.

16 Q And also with respect to the issue that  
17 Dr. Bartlett brought up this morning with respect to  
18 the non-linear characteristics of the soil, you  
19 believe based upon your conversations with Mr. Trudeau  
20 and Mr. Ebbeson that if anything that would reduce the  
21 increase in the demand side of the equation. Correct?

22 A Yes. It would lead to less proportional  
23 increases.

24 MR. GAUKLER: I have no further questions,  
25 Your Honor.

1 CHAIRMAN FARRAR: All right. Thank you,  
2 Mr. Gaukler. Is staff prepared or do you need a  
3 minute?

4 MR. TURK: May we have just five minutes?

5 CHAIRMAN FARRAR: Is that enough?

6 MR. TURK: I don't think we'll have any  
7 questions. I just want to confirm that.

8 CHAIRMAN FARRAR: Then let's take ten  
9 minutes.

10 MR. TURK: Even less is okay for us, Your  
11 Honor.

12 CHAIRMAN FARRAR: Okay. Five minutes.

13 MS. NAKAHARA: Your Honor, if you give us  
14 ten, we can be ready as well.

15 CHAIRMAN FARRAR: Right. I forgot.  
16 You're next. Is ten enough or do you want 15?

17 MS. NAKAHARA: No. Ten is fine.

18 CHAIRMAN FARRAR: Okay. It's 4:00 p.m.  
19 We'll be back at 4:10 p.m.

20 (Whereupon, the foregoing matter went off  
21 the record at 4:00 p.m. and went back on  
22 the record at 4:12 p.m.)

23 CHAIRMAN FARRAR: All right. Back on the  
24 record. Has everyone gotten their thoughts organized?  
25 Mr. Turk, are you ready to go ahead?

1 MR. TURK: Yes, I am. No questions.

2 CHAIRMAN FARRAR: It's too bad that that  
3 awards ceremony is now. I could picture myself like  
4 Dustin Hoffman in "The Graduate" coming in the back  
5 and stopping the wedding. That was "The Graduate,"  
6 wasn't it?

7 MS. CHANCELLOR: How about Mrs. Robinson?

8 CHAIRMAN FARRAR: Let's not discuss Mrs.  
9 Robinson in a Federal court room. Ms. Nakahara.

10 MS. NAKAHARA: Thank you, Your Honor. Dr.  
11 Cornell --

12 CHAIRMAN FARRAR: Why don't you hold yours  
13 and we'll ask a few questions and then you can think  
14 those over.

15 JUDGE LAM: Perhaps that would expedite  
16 things little bit.

17 MR. TURK: I hope these aren't based on my  
18 questions.

19 JUDGE KLINE: Dr. Cornell, what do we gain  
20 in terms of improvement in our status of knowledge by  
21 comparing this process that we are in here to previous  
22 reactor licensing given that the previous reactors  
23 themselves went through a fairly subjective process?  
24 For example it's been proffered to us that the western  
25 reactors particularly including like in Diablo Canyon

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1 are somehow probative of what we should do in this  
2 case.

3 It was never clear to me why that should  
4 be. To put it colloquially it looks like we're taking  
5 in one another's laundry here in trying to make a  
6 profit. It doesn't appear to me that we gain any  
7 information by doing that. I would like to know  
8 whether that's right or wrong.

9 DR. CORNELL: The consideration of what's  
10 happened in previous nuclear power plant licensing I  
11 think is done in my mind to lead us to a base or  
12 reference point that is implicit in what was  
13 admittedly a set of subjective judgements as to what  
14 a deterministic earthquake is, what levels of  
15 conservatism should be put into the standard review  
16 plan.

17 Implicit in that process it was deduced  
18 subsequently to the licensing process that those  
19 deterministic earthquakes had probabilities of  
20 occurrence of about  $10^{-4}$ . The plants themselves had  
21 failure probabilities of perhaps  $10^{-5}$ . That  
22 represents a starting point at about what level of  
23 risk or of consequences release is associated with the  
24 nuclear power plant.

25 We add upon that a second step which says

1 by the way the consequences of failure of the ISFSI  
2 would be less severe. By a risk graded approach we  
3 may therefore increase our tolerable failure  
4 probability. In this case that is being done by the  
5 reducing the mean return of the ground motion by  
6 approximately a factor of five in terms of that.  
7 That's a reference point. That's a starting point.

8 JUDGE KLINE: But is it fair to say that  
9 subsequent operating experience of a nuclear power  
10 plant don't really contribute anything to our  
11 confidence that the plant was correctly licensed in  
12 the first place? For example we have cited the Diablo  
13 Canyon and Diablo Canyon went through a fair fuss  
14 during its licensing process over seismic matters.  
15 Now it's operated for 15 years or thereabouts but of  
16 course there has been no design basis earthquake out  
17 there so we have no data from Diablo Canyon to know if  
18 we did right or wrong in terms of operating  
19 experience. Do we? We don't know anymore now than we  
20 did then.

21 DR. CORNELL: In terms of the seismic  
22 behavior we haven't learned anything from the  
23 experience with those plants but the knowledge base  
24 and the relevant sciences is all increased.

25 JUDGE KLINE: Thank you.

1 JUDGE LAM: Professor Cornell, in your  
2 rebuttal testimony you anticipated and answered one of  
3 the questions that I was saving for you for three  
4 weeks. Thank you for providing that in question and  
5 answer three.

6 DR. CORNELL: I heard that question  
7 earlier.

8 JUDGE LAM: The record before as is very  
9 well developed as to your opinion on how the seismic  
10 safety criteria should be formulated. With that as a  
11 background, Professor Cornell, let me ask you to focus  
12 your attention on one of the claims that the State of  
13 Utah has made in this proceeding. It is that the  
14 state highway and bridges are designed to 2,500 years  
15 return interval.

16 If this exemption request of 2,000 year  
17 return interval is granted then this agency is going  
18 to license a nuclear facility to extend a less safer  
19 than that for the highway, bridges. With the earlier  
20 background that I mentioned, I would like you to tell  
21 us your opinion on that.

22 DR. CORNELL: My opinion is that it is an  
23 incorrect conclusion from the simple comparison of the  
24 mean return periods of the design basis earthquakes.  
25 One might even say is that statement made in earlier

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1 presentations by the State's witnesses that initiated  
2 my getting involved in discussing these two hands  
3 because that's the classic example of where simply  
4 comparing the return period of the design basis  
5 earthquake gives you a false impression of what the  
6 relative safety of the comprehensive system is. That  
7 is because there are very important differences in the  
8 levels of conservatism in the criteria.

9 I was just looking in my answer to today's  
10 written rebuttal in answer three page four. There's  
11 a paragraph that discusses some of the conservatisms  
12 that exist in the standard review plan that has in a  
13 sense been stripped away by the UBC or IBC (building  
14 codes) which are associated with buildings but there  
15 are comparable steps made in the bridge codes.

16 In particular I point to this thing called  
17 the R factor. It's not the R sub R factor but just  
18 the R factor which is a reduction factor applied to  
19 the seismic forces at the structure that is a  
20 approximate way of recognizing the high levels of  
21 ductility or yield capacity, deformation capacity in  
22 ductile material such as steel or well detailed  
23 reinforced concrete. Those reduction factors can as  
24 suggested here a factor of four to six for reinforced  
25 concrete structures of the type we are interested in

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1 at the PFSF.

2 So those kinds of significant reductions  
3 in forces simply aren't made in the SRP. Those  
4 transfer into a much stronger levels of conservatism  
5 and safety on the conservatism side of our two hands.

6 JUDGE LAM: That I understand. The report  
7 as I said is reasonably well developed as to what you  
8 are saying now. But if you look at the State's claims  
9 in isolatham (PH) isn't it true in a 2,500 year return  
10 interval imposes a higher seismic standard than a  
11 2,000 year return interval?

12 DR. CORNELL: I'm having trouble with your  
13 word "seismic standard."

14 JUDGE LAM: For example the loads imposed  
15 on the structure. If I had to design a structure to  
16 withstand a 2,500 year return interval, my structure  
17 by necessity would need to be more robust than the one  
18 that would withstand a 2,000 year return interval.  
19 Isn't that true?

20 DR. CORNELL: Only if I design to the same  
21 set of safety standards.

22 JUDGE LAM: That's exactly what I meant.  
23 How do we explain it to a public who may be relatively  
24 uneducated to this two hand approach? I fully  
25 understand what you are saying on a two hand approach

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1 about the degree and the level of conservatism. But  
2 do we have a problem here explaining ourselves as to  
3 we're assuming that one is going to be approved we're  
4 approving a seismic exemption request to a lower  
5 standard than the State of Utah's highways and  
6 bridges?

7 DR. CORNELL: I believe Dr. Arabasz used  
8 the word "optics" or something to that effect that the  
9 difference between 2,000 years and 2,500 years that  
10 you described might appear to or perhaps I should say  
11 surely would appear to someone without a deeper  
12 understanding of the problem as if there were some  
13 distinction.

14 The truth is otherwise however. I think  
15 that it's a fair question to ask how could we come up  
16 with a one sentence description that would satisfy the  
17 average reader of newspaper that you have in fact  
18 imposed much higher seismic safety criteria or have  
19 set much higher safety standards on the SSE than has  
20 been done on these bridges.

21 Off the top of my head I don't know what  
22 that sentence is yet. I'm waiting. But it is an  
23 interesting challenge and it's one I think we should  
24 all think about. It's the nature of this position  
25 that the engineers have put themselves into by in fact

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1 choosing to design for ground motions which have much  
2 lower return periods than the return period of the  
3 event that is going to cause difficulty.

4 As I alluded to in previous discussions  
5 with you that it has been done mostly to simply life  
6 for the engineer. It keeps his analysis in the linear  
7 range. It keeps it where a bachelor's degree engineer  
8 can design our buildings and do so safely and without  
9 having to consider nonlinear dynamic behavior. There  
10 are a variety of cultural reasons why this is true.  
11 I don't think it will change quickly.

12 JUDGE LAM: Thank you, Dr. Cornell. I  
13 appreciate your comments.

14 CHAIRMAN FARRAR: Let me follow up. If I  
15 understand some of the earlier testimony in the case  
16 that there is sort of a claim by the company that  
17 their design actually goes way beyond or what would be  
18 required at 2,000 or 2,500. In fact I think once I  
19 may have asked them are you claiming that it meets the  
20 10,000 year return earthquake. If I'm right about the  
21 general nature of that testimony and please tell me if  
22 I'm not why isn't the answer to the one line newspaper  
23 sentence that's hard to write just saying let's up it  
24 to 2,500 because we're already there. Does that  
25 question make any sense to you?

1 DR. CORNELL: Yes, I believe it does. If  
2 you were to up it to 2,500 there would be  
3 consequences. Economic consequences to be sure and a  
4 reanalysis if nothing else and one would have to again  
5 demonstrate that you've met the standard review plan.

6 CHAIRMAN FARRAR: There might not be  
7 structural consequences.

8 DR. CORNELL: I can't speak to that. It  
9 depends on how close individual elements in the plant  
10 are to the existing margin with respect to meeting  
11 standard review plan design basis. What has been said  
12 by the Applicant and I support that is that given that  
13 we have design to the standard review plan with a  
14 2,000 year design basis we believe that under the  
15 10,000 year earthquake there would not be release of  
16 radioactivity.

17 Maybe the way to state the sentence is to  
18 focus not so much on the 2,000 year design basis  
19 number but focus on the number for which we and  
20 hopefully Your Honors are comfortable that under such  
21 an earthquake 10,000 years we don't believe there  
22 would be release of radioactivity and bypass the  
23 engineers conventions that confuse us all.

24 JUDGE LAM: You said it well, Dr. Cornell.  
25 If your theory prevails this is indeed an optics

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1 problem.

2 DR. CORNELL: I should say again and I  
3 believe I said it earlier many of us in the earthquake  
4 engineering world are aware of this problem and we are  
5 moving to change it. There is a new set of design  
6 criteria for steel buildings, those that caused the  
7 difficulty in earthquakes in Kobe and North Ridge in  
8 the middle '90s.

9 The new criteria that have been developed  
10 for those structures do indeed set the design basis  
11 earthquake at the probability level of failure that we  
12 are trying to obtain. So we are moving in that  
13 direction. We hope that it will be something that all  
14 the engineers move towards in the future.

15 CHAIRMAN FARRAR: Thank you, Dr. Cornell.  
16 I think that concludes the Board's questions. Go  
17 ahead, Ms. Nakahara.

18 MS. NAKAHARA: Thank you, Your Honor.

19 CROSS EXAMINATION

20 BY MS. NAKAHARA:

21 Q Dr. Cornell, earlier you testified that  
22 various PRAs, seismic PRAs conducted for nuclear power  
23 plants considered the failure of sliding and  
24 overturning. Is that correct?

25 A Yes I did.

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1 Q Were any of these PRAs conducted at a site  
2 where the foundation is supported by cement treated  
3 soil?

4 A Not to my knowledge.

5 Q Are any of these sites supported by a  
6 silty clay, clay silt layer?

7 A I don't know. I can't answer that  
8 question.

9 Q And do any of these sites employ sliding  
10 as a mechanism to reduce seismic demand?

11 A Not to my knowledge other than perhaps wet  
12 fuel storage perhaps sliding is permitted but perhaps  
13 not to -- It would be considered in a PRA if that were  
14 at issue.

15 Q At what facility? I'm sorry.

16 A Elements within wet storage are free to  
17 move to some degree.

18 Q Has any of your prefiled or oral testimony  
19 in this proceeding that you have given earlier  
20 changed?

21 A No.

22 MS. NAKAHARA: I have no further  
23 questions, Your Honor. But we do have a one question  
24 rebuttal of Dr. Cornell for Dr. Bartlett.

25 CHAIRMAN FARRAR: Wait. We will give you

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1 a moment if you want to think about our questions that  
2 changes your plan or thoughts. Okay.

3 MR. TURK: I have some follow on to Your  
4 Honors' questions. Just a limited amount.

5 CHAIRMAN FARRAR: Okay. Since you passed  
6 last time around we will let you take your turn now.

7 MR. TURK: Thank you, Your Honor.

8 CROSS EXAMINATION (con't)

9 BY MR. TURK:

10 Q Judge Kline asked you a question. First  
11 I should say again good afternoon to you, Dr. Cornell.

12 A Good afternoon, Mr. Turk.

13 Q There were a series of very thoughtful  
14 questions from the judges. I want to ask a few follow  
15 on questions to some of those. First Judge Kline  
16 asked you about the licensing of other nuclear power  
17 plants such as Diablo Canyon. As I understood the  
18 question he asked what do we gain by referring back to  
19 those nuclear power plants. As I understood the  
20 question it was as a fact that that plant may have  
21 been licensed initially give us confidence here  
22 because there was a question as to whether it was  
23 licensed properly in the first place or was it a  
24 subjective judgement. My question to you would be is  
25 it fair to say that the Nuclear Regulatory Commission

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1 is aware of the fact that it licensed the facility and  
2 allows it to continue to operate recognizing the  
3 design earthquake that was accepted for that facility.

4 A May I try to restate the question?

5 Q Did you learn something from the fact that  
6 the Commission allows the plant to continue to operate  
7 with the design basis earthquake in place as the  
8 standard for that facility?

9 A Yes, we learned that the new information  
10 that has come along about earthquakes and the behavior  
11 of structures under earthquakes has not changed the  
12 NRC's opinion as to the adequacy of the safety of that  
13 plant. Perhaps it's improved it.

14 JUDGE KLINE: I just want to make clear  
15 that my questions do not challenge the licensing basis  
16 for Diablo Canyon. (Laughter.) We don't want to go  
17 there. I only mean to inquire does comparison to  
18 Diablo Canyon yield anything problematic *vis à vis*  
19 PFS. That's what I explored.

20 MR. TURK: Yes, I'm exploring it a little  
21 bit further the fact that it's continued to allow to  
22 operate must indicate that there's some satisfaction  
23 that the operation is safe.

24 JUDGE KLINE: I just don't want to stumble  
25 into the wrong territory.

1 MR. TURK: No. They will call us out  
2 there for the next Diablo Canyon hearing which I  
3 understand is gearing up.

4 JUDGE LAM: And Judge Kline and I are  
5 sitting on the licensing board. (Laughter.)

6 CHAIRMAN FARRAR: They didn't invite me.  
7 I must have done something wrong.

8 DR. CORNELL: They're saving you for Yucca  
9 Mountain. (Laughter.)

10 BY MR. TURK:

11 Q They're saving all of us for that. Judge  
12 Lam asked you some questions about designing a  
13 facility here to a 2,000 year design basis earthquake  
14 level and comparing that to the fact that there may be  
15 public perception that highways are built to a higher  
16 standard of 2,500 years.

17 Here is my understanding of your answer.  
18 The comparison of the 2,000 year earthquake that the  
19 staff has proposed and accepted and that PFS has  
20 proposed here uses one set of design criteria. As I  
21 understand your answer the criteria for the highways  
22 under the 2,500 year return ground motion are  
23 different. Correct?

24 A Yes, much more liberal.

25 Q Okay. And therefore your conclusion is

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1 designing to the 2,000 year earthquake under Nuclear  
2 Regulatory Commission guidance is not the equivalent  
3 and in fact would exceed designing to a highway  
4 standard of 2,500 year return period earthquake.

5 A Yes, that was my answer and Judge Lam told  
6 me he seemed to understand all of that. It was back  
7 to the perception question that we needed to consider  
8 more.

9 Q Let me ask you one more question about  
10 perception. If the commission was to say to the  
11 public we will license this facility at a 2,500 year  
12 earthquake and draw an analogy to the fact that  
13 highways in Utah may be designed to a 2,500 year  
14 earthquake wouldn't you still have the same perception  
15 problem where the public might say why shouldn't a  
16 nuclear facility be safer or built to a higher  
17 standard than a highway?

18 A You would have a perception problem but a  
19 little more subtle one perhaps.

20 Q Merely adopting that standard wouldn't get  
21 you necessarily anything much in the way of public  
22 perception. Correct?

23 A Correct, because it seems to me that the  
24 intelligent reader of this newspaper would say ah but  
25 we should in fact be holding the ISFSI to a somewhat

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1 higher standards with respect to failure.

2 Q And perhaps one of the answers in terms of  
3 explanations of the optics as Dr. Arabasz used the  
4 term would be to explain that highway failure could  
5 result in death of the traveling public whereas  
6 tipover of a cask would not lead to release or public  
7 safety and health consequences. Would that be part of  
8 the explanation that would explain the return period  
9 selection?

10 A I don't want to put words into Dr.  
11 Arabasz's mouth but in my judgement that's probably  
12 not the way that -- would perceive the two problems.  
13 Correct as it might be.

14 Q Is it your understanding the PFS has  
15 stated that they are already designed to a 2,500 year  
16 earthquake? Or I believe that Judge Farrer asked you  
17 a question which suggested that he had heard testimony  
18 to that effect. Did you understand that PFS is  
19 claiming that they have designed to a 2,500 year  
20 earthquake level?

21 A No. Could you restate that?

22 Q Yes. I just want to be sure that we have  
23 a correct understanding.

24 CHAIRMAN FARRAR: Mr. Turk, you mean by  
25 that question a formal claim as opposed to what I

1 thought I heard in an informal claim. Would that help  
2 state the question?

3 MR. TURK: Yes. Just so the record is  
4 clear PFS does not claim formally that it has designed  
5 this facility to a 2,500 year ground motion. Correct?

6 DR. CORNELL: No it has not.

7 MR. TURK: I have nothing further. I  
8 thank you.

9 CHAIRMAN FARRAR: Thank you, Mr. Turk.  
10 Applicant?

11 MR. GAUKLER: No questions.

12 CHAIRMAN FARRAR: All right.

13 MS. NAKAHARA: Your Honor, I have one  
14 followup to Mr. Turk for Dr. Cornell.

15 CHAIRMAN FARRAR: Certainly.

16 CROSS EXAMINATION (Con'd)

17 BY MS. NAKAHARA:

18 Q Dr. Cornell, Mr. Turk asked you a question  
19 relating to the fact that the NRC continues to allow  
20 Diablo Canyon to operate and said the design basis  
21 earthquake is adequate or something to that effect.  
22 Do you recall that question?

23 A Yes.

24 Q Isn't it true that the design basis  
25 earthquake at licensing Diablo Canyon has changed to

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1 current knowledge of what the seismic hazard is at the  
2 facility?

3 A You are asking me about details of the  
4 Diablo Canyon situation.

5 Q Yes.

6 A I was 20 years ago involved in that  
7 problem. I'm not sure exactly what the current state  
8 is. So I'm not sure I want to respond to that.

9 Q Isn't it true that the ground motions  
10 originally estimated for Diablo Canyon when the  
11 facility was licensed have increased based on new  
12 knowledge?

13 A There is a so-called Hasgri question that  
14 led to a reevaluation of the seismic conditions at  
15 Diablo Canyon. To the best of my knowledge there was  
16 not a change in the design basis earthquake.

17 MS. NAKAHARA: Thank you. I have no  
18 further questions.

19 CHAIRMAN FARRAR: All right. Dr. Cornell,  
20 thank you again. You have the Board's gratitude for  
21 your testimony and the manner in which you explained  
22 things. Thank you.

23 DR. CORNELL: You're welcome. Thank you,  
24 Your Honor.

25 (Witness excused.)

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1 CHAIRMAN FARRAR: State wants Dr. Barlett  
2 on rebuttal.

3 MS. NAKAHARA: Yes, Your Honor.

4 CHAIRMAN FARRAR: Okay.

5 MS. NAKAHARA: Just very briefly.

6 CHAIRMAN FARRAR: Dr. Bartlett, don't make  
7 me take back those nice things I said about you.

8 DR. BARLETT: No more than five minutes.

9 REBUTTAL EXAMINATION

10 BY MS. NAKAHARA:

11 Q Dr. Barlett, do you recall Dr. Cornell's  
12 testimony regarding his discussions with Mr. Trudeau  
13 about the additional margins with respect to the  
14 dynamic shear strength versus the static shear  
15 strength of the soils?

16 A Yes, I'm familiar with that issue.

17 Q And do you agree with Dr. Cornell's  
18 characterization of Mr. Trudeau's conservatism in  
19 using static shear strength versus dynamic shear  
20 strength?

21 A I think Dr. Cornell correctly stated that  
22 PFS's position is that there is increased strength  
23 capacity to the dynamic effect. We disagree with the  
24 amount of conservatisms that is implied. The  
25 Applicant is implying an additional 50 to 100 percent

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1 increase in dynamic strength.

2 The State's position is as stated in my  
3 surrebuttal to Mr. Trudeau that the effect is not as  
4 large as claimed and certainly any effect of that  
5 order of increase should be demonstrated by site  
6 specific testing which has not been done at PFS site.

7 Q And do you recall the question that Mr.  
8 Turk asked Dr. Cornell regarding the design basis  
9 earthquake for highway bridges?

10 A Yes, I do.

11 Q What is the design criteria for bridges in  
12 Utah?

13 A The design basis earthquake is a 2,500  
14 year return period event. UDOT's philosophy at least  
15 for interstate bridges and it only applies to  
16 interstate bridges not all bridges designed in Utah  
17 that these are lifelines. These particular bridges  
18 must be able to survive a 2,500 year return period  
19 event with essentially no structural damage.

20 Q Then Mr. Turk asked Dr. Cornell a question  
21 regarding public perception on where death could occur  
22 on a highway bridge versus what could occur at a PFS  
23 site. Isn't it true that if a cask tipped over a  
24 360,000 pound cask could kill someone?

25 A It certainly could crush somebody.

1 MS. NAKAHARA: I have no further  
2 questions, Your Honor.

3 CHAIRMAN FARRAR: Any cross by the  
4 company?

5 MR. TURK: Dr. Bartlett has the last word.

6 CHAIRMAN FARRAR: Mr. Turk?

7 MR. TURK: I have one question not related  
8 to the rebuttal. But it relates to my correction that  
9 I made earlier. Just so the record is complete if I  
10 may be permitted to ask that question about the ANSI  
11 standard.

12 CHAIRMAN FARRAR: Okay.

13 MR. TURK: That question would be is there  
14 anything about the ANSI/ANS 57.9 standard that you  
15 believe is less conservative than regulatory guidance  
16 for nuclear power plants?

17 DR. BARLETT: No.

18 MR. TURK: Thank you.

19 CHAIRMAN FARRAR: I think we are done.  
20 Ms. Chancellor, please restrain yourself.

21 MR. GAUKLER: Connie, Ms. Nakahara and I  
22 have conferred before we started this and we had this  
23 idea that maybe deferring Dr. Cornell until next  
24 Wednesday just to keep him around. We decided that it  
25 would mean. To Dr. Cornell and Dr. Bartlett but we

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1 deferred to that. (Laughter.)

2 CHAIRMAN FARRAR: I think after  
3 approximately five and half weeks in various locations  
4 in Salt Lake City and in our hearing room we have  
5 finally completed the 21 witnesses with direct  
6 testimony and probably in equal or greater number of  
7 rebuttal and surbuttal witnesses.

8 MS. NAKAHARA: Your Honor, not to dampen  
9 the festivities. Ms. Braxton reminds me I need to ask  
10 a clarification question.

11 CHAIRMAN FARRAR: Okay.

12 MS. NAKAHARA: It's not clear to us  
13 whether State's Exhibit 173 was admitted and we have  
14 a reference in the transcript to 59.57 on April 30.

15 MR. GAUKLER: What is stated --

16 MS. NAKAHARA: I'm sorry. It's Holtec  
17 Multi-cask response that PFS is FSEI from 2,000 year  
18 seismic event.

19 MR. GAUKLER: Revision 2.

20 MS. NAKAHARA: Revision 2.

21 MR. GAUKLER: I thought it was admitted.  
22 We have no objection to its admission.

23 MS. NAKAHARA: It's proprietary.

24 CHAIRMAN FARRAR: Melissa tells me it was  
25 entered on page 6130. But whether or not it was since

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1 there is no objection we will readmit if we didn't do  
2 that.

3 (The document referred to having  
4 previously been marked for identification  
5 as State's Exhibit 173, was received into  
6 evidence.)

7 MR. GAUKLER: Page 6130.

8 CHAIRMAN FARRAR: 6130 it was.

9 MS. NAKAHARA: Thank you, Your Honor.

10 MR. TURK: I would simply note my copy of  
11 the document is marked proprietary. Let's check to  
12 see if it's marked.

13 MR. GAUKLER: It is proprietary. That's  
14 one of the two Holtec proprietary documents that are  
15 part of the record. We agree that we are going to  
16 hold them that way in terms of the documents  
17 themselves being proprietary and would not be make  
18 part of the public record all be it the transcript  
19 discussion of those documents would be made part of  
20 the public.

21 CHAIRMAN FARRAR: All right. We will at  
22 some point down the road we'll make sure we sort out  
23 as we are writing our opinion and you're writing your  
24 briefs will be probably come up with things that need  
25 to reconciled and we can enter a single order

1 somewhere along the line making sure that all those  
2 things are straighten out.

3 MR. TURK: Could I ask while we're on the  
4 subject that Mr. Gaukler identify which document is  
5 the other one that's proprietary? Just so we have it  
6 in one place so we can recall it.

7 MR. GAUKLER: Wait until my paralegal  
8 brings me my book of exhibits and I'll tell you.

9 CHAIRMAN FARRAR: While they are doing  
10 that, Ms. Nakahara, you will be here with Mr. Soper.

11 MS. NAKAHARA: Yes.

12 CHAIRMAN FARRAR: Ms. Chancellor, I first  
13 met you on that screen over there at a prehearing  
14 conference. It seems like a long time ago.

15 MS. CHANCELLOR: It was.

16 CHAIRMAN FARRAR: It was January probably.  
17 You will not be back.

18 MS. CHANCELLOR: Absolutely not. Dr.  
19 Bartlett and I are heading west.

20 CHAIRMAN FARRAR: Mr. Gaukler, you will  
21 here with Mr. Soper.

22 MR. GAUKLER: Mr. Soper and Mr. Barnett,  
23 yes.

24 CHAIRMAN FARRAR: We will miss your  
25 colleagues. Mr. Turk, Ms. Marco will have --

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1 MR. TURK: She will have my company.  
2 Hopefully not my voice.

3 CHAIRMAN FARRAR: All right. Mr. O'Neill,  
4 you I understand if I recall correctly have been  
5 escaping a detail somewhere else. I'm sure it won't  
6 be as much fun as here but we've appreciated having  
7 you with us.

8 MR. O'NEILL: Thank you.

9 MR. GAUKLER: The other exhibits were the  
10 various different versions of PFS Exhibit 86. I think  
11 there was an 86, 86A and 86C but they are all entitled  
12 PFSF Beyond Design Basis Scope Reanalysis for the  
13 product storage facility. They are different versions  
14 of that document that were introduced as under the  
15 label of PFS Exhibit 86.

16 CHAIRMAN FARRAR: Okay.

17 MR. GAUKLER: One small housekeeping  
18 matter, Your Honor. Monday as part of our rebuttal  
19 testimony we may want to tie in Mr. Vigeant by phone  
20 for just a brief period of time.

21 CHAIRMAN FARRAR: He's a meteorologist.

22 MR. GAUKLER: Yes.

23 CHAIRMAN FARRAR: Okay.

24 MR. GAUKLER: We don't need him here for  
25 the entire time but for part of the testimony to have

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1 him tied in.

2 CHAIRMAN FARRAR: What about the 50 or so  
3 exhibits? Did we introduce those?

4 MR. GAUKLER: No, we did not. We  
5 premarked them so they are all marked.

6 CHAIRMAN FARRAR: How can we do that  
7 without wasting a whole lot of time Monday morning?

8 MR. GAUKLER: They are all premarked with  
9 exhibit numbers.

10 CHAIRMAN FARRAR: And everybody had them?

11 MR. GAUKLER: Everybody has them. In  
12 other words, what we did is we marked them with  
13 exhibit numbers and then we made the copies so  
14 everybody should have the same documents with the same  
15 exhibit numbers on them. I would suggest that we just  
16 go with those exhibit numbers.

17 CHAIRMAN FARRAR: You don't have to stand  
18 around and distribute all of them. We can probably  
19 avoid describing each one. There are crash reports  
20 numbered such and such.

21 MR. GAUKLER: And we have the index as  
22 well. We could make that a separate exhibit.

23 CHAIRMAN FARRAR: Right. And what about  
24 the court reporter? Do you have separate set for the  
25 court reporter?

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1 MR. GAUKLER: Yes. I just would confer  
2 with Mr. Barnett because he's been handling that.

3 CHAIRMAN FARRAR: Let's do it in a simple  
4 fashion where you just dump them all in. We all have  
5 them and we can march along and deal with the  
6 substance rather than describing them.

7 MR. TURK: Could we discuss maybe for Ms.  
8 Marco's benefit what is the order of events starting  
9 on Monday? Which panel would be going first?

10 MR. GAUKLER: What will happen on Monday  
11 is that we will have the rest of our rebuttal  
12 testimony which will consist of General Cole, General  
13 Jefferson and Colonel Fry.

14 CHAIRMAN FARRAR: Now they had taken the  
15 stand in rebuttal.

16 MR. GAUKLER: Right.

17 CHAIRMAN FARRAR: They had talked about  
18 the exhibits. We had said fine. We would argue about  
19 them. We said fine let them in but give the other  
20 side time to deal with them. But did they provide  
21 other testimony?

22 MR. GAUKLER: They had provided us some  
23 other testimony and there was some other rebuttal  
24 testimony we were going to provide. We had roughly a  
25 third through our rebuttal testimony if you recall

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1 when this issue came up. So once the issue came up it  
2 didn't make sense to run late to get the rest of the  
3 rebuttal testimony when we couldn't get that in any  
4 event.

5 CHAIRMAN FARRAR: Well, that's all oral  
6 rebuttal.

7 MR. GAUKLER: Yes.

8 CHAIRMAN FARRAR: So no one at this point  
9 has filed written rebuttal.

10 MR. GAUKLER: That's correct. Then we  
11 will be done Monday morning with that. At some point  
12 in time in this process of rebuttal we would probably  
13 want to tie Mr. Vigeant in by phone to include him.

14 CHAIRMAN FARRAR: You're going to present  
15 the reports. Are they going to go through each one  
16 and say here's what they can do for each one?

17 MR. GAUKLER: We weren't planning on doing  
18 that, no.

19 CHAIRMAN FARRAR: Okay.

20 MR. GAUKLER: We could do that if you  
21 want.

22 CHAIRMAN FARRAR: No.

23 MR. GAUKLER: But my understanding from  
24 talking with Mr. Barnett, that right now we don't  
25 plant on doing that.

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1 CHAIRMAN FARRAR: So then you will be  
2 finished with them when?

3 MR. GAUKLER: I would say approximately  
4 lunch time if not before.

5 CHAIRMAN FARRAR: Okay. Then you tie in  
6 Mr. Vigeant.

7 MR. GAUKLER: At some point in time that  
8 made sense to tie him in.

9 CHAIRMAN FARRAR: Same way we did Dr.  
10 Arabasz.

11 MR. GAUKLER: Yes.

12 CHAIRMAN FARRAR: And that's the end of  
13 your rebuttal.

14 MR. GAUKLER: Yes.

15 CHAIRMAN FARRAR: Mr. Turk, can you speak  
16 for Ms. Marco?

17 MR. TURK: Not entirely but I recall when  
18 we broke last time we were planning to put on one of  
19 our witnesses with a small piece of rebuttal. But I  
20 have been out of that loop for some time. I couldn't  
21 speak for her. I assume if we did it would be under  
22 a half hour.

23 CHAIRMAN FARRAR: But now the State will  
24 have a lot of cross examination of the military panel  
25 I assume.

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1 MS. NAKAHARA: Yes, Your Honor. I  
2 wouldn't characterize it as a lot but we will have  
3 probably more rebuttal with Colonel Horstman.

4 CHAIRMAN FARRAR: Talking about the  
5 reports.

6 MS. NAKAHARA: Yes.

7 CHAIRMAN FARRAR: But he will have nothing  
8 in writing.

9 MS. NAKAHARA: No, Your Honor.

10 CHAIRMAN FARRAR: That's all.

11 MS. NAKAHARA: Yes.

12 CHAIRMAN FARRAR: Okay. Sounds good.

13 JUDGE LAM: So are we still planning on  
14 three days of hearing?

15 MS. NAKAHARA: I think so.

16 CHAIRMAN FARRAR: Our target is noon on  
17 Wednesday.

18 MR. GAUKLER: By noon on Wednesday  
19 Hopefully we will be in a situation like this week  
20 where we get done early but I think since we don't  
21 know exactly what our rebuttal is.

22 CHAIRMAN FARRAR: Right and we will make  
23 an effort for those who are traveling. Noon on  
24 Wednesday is a lot better than 7:00 p.m. on Wednesday.  
25 So we will shoot for noon. There is no sense not

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1 finishing.

2 MR. TÜRK: What are start times Monday?  
3 9:00 a.m.?

4 CHAIRMAN FARRAR: Nine and we'll do our  
5 nine to five thing basically all three days. I think  
6 I've indicated something along these lines before but  
7 I may expand on it. I never understood the Patty  
8 Hearst or the hostage syndrome how you could become  
9 friends with the people who were holding you captive  
10 and think they were your best friends.

11 By the time we finish here we will have  
12 spent essentially a calendar quarter 13 weeks, nine  
13 weeks of those 13 in hearings and I think there has  
14 been a good learning curve on everybody's part and if  
15 not a life long bond certainly a mutual respect among  
16 the lawyers and counsel and the Board and visa versa.  
17 I think among the various counsel too. So it's been  
18 a good experience. Apart from the substantive  
19 decision in the case I think we all can try to take  
20 some learning from it that maybe we can incorporate  
21 into future cases and make them go more smoothly and  
22 more quickly. Maybe you have to have this learning  
23 curve in every case. But it's been a excellent  
24 delightful experience working with all of you. We  
25 hope to be able to say the same about your colleagues

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1 in the aircraft matter on Wednesday.

2 So if there are no other matters we'll  
3 make have a little party right down here with the  
4 water that is allowed to be in the courtroom.  
5 (Laughter.) Judge Bollwark runs a tight ship in the  
6 courtroom in not being able to bring in any food and  
7 drink. But thank you all.

8 MS. CHANCELLOR: Your Honor, I would just  
9 like to thank you for the way you've conducted the  
10 proceeding.

11 CHAIRMAN FARRAR: Thank you, Ms.  
12 Chancellor. Off the record.

13 (Whereupon, the above-entitled matter  
14 concluded at 4:58 p.m.)

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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

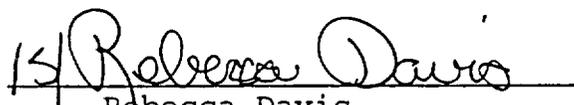
Name of Proceeding: Private Fuel Storage, LLC

Docket Number: Docket No. 72-22-ISFSI

ASLBP No. 97-732-02-ISFSI

Location: Rockville, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

  
Rebecca Davis  
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