Experience Summary

Mr. Ebbeson has 29 years of experience in the engineering industry. Currently, he is the supervisor of the structural division for Stone & Webster's Cherry Hill office. In addition to these duties, he is presently involved in a number of projects, including design of a nuclear spent fuel storage facilities in Iowa and Utah and seismic analysis of a nuclear power plant in Taiwan. He serves as a structural engineering consultant on various projects performed in Stone and Webster's Cherry Hill, Boston, Denver and Taiwan offices. Previously, his experience has included assignments on many nuclear power plant projects as a Principal Structural Engineer in a supervisory capacity. He has designed plant modifications and performed safety evaluations to meet licensing requirements. He also has coordinated the implementation of modifications with construction groups and has performed independent design reviews of nuclear power plants at various stages of licensing/operation.

Upon joining Stone & Webster Engineering Corporation in 1973, he was first assigned as a Career Development Engineer in the Structural Division where he was assigned to the Structural Mechanics Section. He was later assigned to the Engineering Mechanics Division as a support engineer in the Structural Mechanics Staff Group. He was reassigned to the Cherry Hill Office in July 1979, to assume the responsibilities as Principal Structural Mechanics Engineer on the River Bend Project. He has worked on various projects where his duties have included conceptual arrangement, analysis, and design of structural components of nuclear power plants.

Prior to joining Stone & Webster Engineering Corporation, Mr. Ebbeson was a Structural Design Engineer with the Philadelphia Water Department, Philadelphia, Pennsylvania.

Education

M.S., Civil Engineering – Tufts University - 1973
B.S., Civil Engineering - Tufts University - 1970

Training

Various courses in Engineering Management - Drexel University
Various Stone & Webster Management Training Classes

Licenses, Registrations, and Certifications

Professional Engineer - Massachusetts - 1977
Professional Engineer - Louisiana - 1981
Professional Engineer - New Jersey - 1983

Professional Affiliations

American Society of Civil Engineers - Member

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Experience History

STONE & WEBSTER ENGINEERING CORPORATION, CHERRY HILL, NEW JERSEY - 1979 TO PRESENT

Structural Division Supervisor (Apr 1999 to Present)

Presently, Mr. Ebbeson is responsible for all Civil/Structural activities in the Cherry Hill Office, including hiring, personnel evaluations, project staffing and technical direction. Additionally, he is actively involved as a consultant on a number of projects, including the Private Fuel Storage Skull Valley project, the Duane Arnold ISFSI project and Taiwan Power's Lungmen project.

Department of Energy MOX Project (July 2000 to Present)

Mr. Ebbeson serves as a member of the Technical Oversight Committee that was responsible for the review of the seismic analysis and structural design of a mixed oxide fuel production facility to be built on the Savannah River site.

AT&T Point of Presence (POP) Building, 700A Street, Wilmington, DE (Sept 1999 to Jan 2000)

Mr. Ebbeson provided civil/structural consulting support for the development of conceptual designs for the 24,000 sq. ft. network building. He was involved in the review of the Geotechnical report and in the preparation of a report performed to evaluate the risk to the facility from floods.

AT&T (Oct 1998 to Nov 1999)

Mr. Ebbeson was assigned to a team responsible for performing reliability assessments of AT&T facilities including those in Durham NC, Dublin O, Chicago, Boston, Staten Island, Miami, Florham Park and Jersey City. He was responsible for performing the civil/structural portion of the assessments, including preparation of reports.

Private Fuel Storage Facility (June 1998 to Nov 2001)

Mr. Ebbeson was responsible for the seismic analysis and structural design of the Canister Transfer Building for a proposed facility that will store spent nuclear fuel. His duties included planning and supervising the preparation of calculations and drawings for the facility, and responding to questions posed by the Nuclear Regulatory Commission.

Public Service Electric & Gas Company (Feb 1990 to Oct 1998)

As Lead Civil/Structural Task Manager, Mr. Ebbeson was responsible for coordinating the civil/structural activities on all tasks for the Hope Creek and Salem Nuclear Generating Stations. He has developed design criteria and technical standards for the design of structures and structural components. He has performed and directed structural activities for a number of major design changes, including feedwater heater replacement, control room architectural renovation, auxiliary building ventilation upgrades, containment fan coil unit upgrades, addition of tornado missile barriers and Salem Unit 3 leakage/spill containment. These activities include design of HVAC, electrical raceway and piping systems, seismic qualification of safety-related equipment, design of equipment

supports, design of new structures, evaluation of existing structures for increased loadings, and design of rigging systems. When necessary, finite element and structural dynamic analyses were performed. He also served as Task Manager, responsible for developing schedules and budgets, managing the task execution, and interfacing with the client's Project Manager, for a number of projects.

Browns Ferry Nuclear Plant (Sept 1989 to Dec 1989)
Tennessee Valley Authority

Assigned to the site as lead Structural Engineer, Mr. Ebbeson was responsible for the update and verification of the Final Safety Analysis Report (FSAR).

Industrial Projects Group (May 1989 to Sept 1989)

As Principal Structural Engineer, Mr. Ebbeson was responsible for a variety of structural tasks, including design of steel and concrete structures for a solid waste resource recovery facility (Pasco County), design of improvements to office buildings (New Jersey Bell), and rewriting of structural specifications (Niagara Mohawk Power Corporation's Nine Mile Point Nuclear Station). Also responsible for investigation of structural adequacy at IBM's East Fishkill, New York, facility.

Limerick Generating Station - Unit 2 (June 1988 to Apr 1989)
Philadelphia Electric Company

As Lead Structural Engineer, Mr. Ebbeson was responsible for the preparation of review plans, performing technical reviews and writing a final report for submittal to the NRC as part of the integrated design and construction assessment.

Brown's Ferry Nuclear Plant (Feb 1988 to Apr 1989)
Tennessee Valley Authority

As Lead Structural Engineer, Mr. Ebbeson was responsible for directing the structural portion of the calculation review program. This program consisted of a technical review of the structural design to verify the adequacy of the existing facility. Also responsible for directing the structural design and analysis tasks required to improve the design of the existing plant.

Comanche Peak Steam Electric Station (Sept 1986 to Jan 1988)
TU Electric Company

As Assistant Lead Engineer, Mr. Ebbeson was responsible for design verification of the containment building base mat and shell, the auxiliary/electric building and the safeguards building. Responsible also for the verification of structural seismic analysis results. Duties also included preparation of estimates, development of design criteria, and writing of reports.

Beaver Valley Power Station Unit 2 - (May 1986 to June 1986)
Duquesne Light Company

As Technical Reviewer, Mr. Ebbeson was responsible for the overall review of structural work. Activities included review of licensing criteria, design basis, technical review of calculations, review of drawings and specifications, and preparation of a final report.

BWR Continuing Services Project (Mar 1986 to Aug 1987)

As Lead Structural Engineer, Mr. Ebbeson was responsible for all structural work performed by SWEC on three existing BWR nuclear projects.

Oyster Creek Nuclear Generating Station (Nov 1983 to Feb 1986)
General Public Utilities Nuclear Corporation

As Lead Structural Engineer, Mr. Ebbeson was responsible for all structural work, concerned with field modifications to the existing nuclear facility.

Structural Division Staff (June 1982 to Feb 1985)

As Principal Staff Engineer, Mr. Ebbeson was responsible for planning and supervising all structural seismic and hydrodynamic analyses for nuclear projects.

Field Assignment (March 1983 to June 1983)

Temporary assignment to Washington Public Power Supply System (WPPSS) offices in Richland, Washington. Mr. Ebbeson served as a consultant to WPPSS in the civil/structural area during final design reverification of a nuclear project.

River Bend Station - Unit 1 (July 1979 to May 1982)
Gulf States Utilities Company

As Principal Engineer, Mr. Ebbeson was responsible for the planning and supervision of the analysis and design of the reactor building concrete structures and steel containment as well as the dynamic analyses of all Category I buildings. Also responsible for preparing licensing documents, writing reports, and resolving construction problems.

STONE & WEBSTER ENGINEERING CORPORATION, BOSTON, MASSACHUSETTS - 1973 TO 1979

As Structural Engineer (Dec 1978 to July 1979), Mr. Ebbeson was responsible for analysis and design of nuclear power plant containment structures and internal structural components. Projects included Montague (miscellaneous studies), NYSE&G, and the EPRI breeder conceptual study (structural design of reactor building). Also worked on a special task force to re-analyze five nuclear plant shut down in March 1979.

As Support Engineer (Aug 1973 to Dec 1978), Mr. Ebbeson was responsible for working in the area of barrier designs for protection from tornado and accident generated missiles. Also responsible for development of computer programs, planning of a physical testing program, inspection of a tornado disaster area, and analysis and design of steel and concrete missile barriers. Also worked on analysis and design of structures on various projects. Projects included Shoreham, Philadelphia Electric (equipment drop impact problems), SWEC's Reference Nuclear Power Plant (RNPP) (conceptual design of containment internal structures and seismic analysis), and Beaver Valley - Unit 2 (seismic analysis and checking of containment internal structures design).

Oswego Steam Station - Units 5 and 6
Niagara Mohawk Power Corporation (June 1973 to Aug 1973)

As Career Development Engineer, Mr. Ebbeson was responsible for assisting Structural Engineers on a fossil fuel power plant project. Duties included helping with the preparation of specifications,

comparison of bids, and coordination of design and construction activities.

PHILADELPHIA WATER DEPARTMENT, PHILADELPHIA, PENNSYLVANIA - 1970 TO 1971

As Structural Design Engineer (June 1970 to Aug 1971), Mr. Ebbeson was responsible for design of steel and concrete structural elements, preparation of drawings, and checking of designs and drawings.

1 JUDGE FARRAR: And Mr. O'Neill, you'll
2 be doing the Staff's cross?
3 MR. O'NEILL: Yes.
4 JUDGE FARRAR: Go ahead.
5 MR. TRAVIESO-DIAZ: Mr. Chairman, I
6 wasn't quite done yet.
7 JUDGE FARRAR: Okay.
8 MR. TRAVIESO-DIAZ: Well, there are two
9 exhibits to Mr. Ebbeson's testimony, and which I
10 believe are Exhibits XX and YY, which are included
11 in the books that were delivered to you and to the
12 court reporter. And I would like to identify them
13 for the record and move that they be admitted. The
14 first one is Exhibit XX, is a copy of the cover
15 page of ASCE Standard 4-86. It's entitled ASCE
16 Standard Seismic Analysis of Safety-Related Nuclear
17 Structures and Commentary on Standard for Seismic
18 Analysis of Safety-Related Nuclear Structures dated
19 September 1986, and also by the American Society of
20 Civil Engineers.
21 And Exhibit YY is a --
22 JUDGE FARRAR: Wait. This XX is
23 excerpts, just has a number of different pages?
24 MR. TRAVIESO-DIAZ: It is a cover page
25 and several excerpts referred to in the testimony

1 of Mr. Ebbeson.

2 JUDGE FARRAR: Okay, fine.

3 MR. TRAVIESO-DIAZ: And Exhibit YY is a

4 document entitled Finite Element Analysis of

5 Canister Transfer Building. It's a calculation,

6 and again, the number of the calculation is SC-6

7 and it has -- I have Attachment No. 6 dated 4/1/02

8 consisting of three pages. And I would move that

9 these two documents be admitted into evidence.

10 JUDGE FARRAR: I think we've already had

11 these marked for identification as part of the big

12 black book you submitted. Any objection to their

13 admission?

14 MS. CHANCELLOR: Not at this time, Your

15 Honor.

16 MR. O'NEILL: No objection, Your Honor.

17 JUDGE FARRAR: Then the documents will

18 be admitted.

19 (EXHIBIT-XX & YY ADMITTED.)

20 MR. TRAVIESO-DIAZ: Now, the witness is

21 available for cross-examination.

22 JUDGE FARRAR: Thank you. Mr. O'Neill,

23 go ahead.

24

25

1 CROSS EXAMINATION

2 BY MR. O'NEILL:

3 Q. Good afternoon, Mr. Ebbeson.

4 A. Good afternoon.

5 Q. I'm Martin O'Neill, co-counsel for the

6 NRC Staff. I just want to ask you a few questions.

7 I'd like some clarification or explanation with

8 respect to several terms or concepts that you use

9 in your testimony.

10 A. Okay, I will try my best.

11 Q. In response to Question 15 on Page 7 of

12 your testimony, you refer to a reserve capacity for

13 the CTB and discuss factors that contribute to this

14 reserve capacity. My question is, is this a

15 standard industry term and how does it relate to a

16 factor of safety, if at all?

17 A. Well, the canister transfer building and

18 all of its components, safety-related components

19 are designed in accordance with the applicable

20 codes and standards. These codes limit stresses to

21 certain levels to ensure save structure.

22 Typically, the stresses are limited to values below

23 the yield strength of the material specified,

24 minimum yield strength of the material.

25 Structures, especially ductal

1 structures, which these structures are, have a lot
2 of capacity beyond the yield point of material, and
3 even up to their ultimate strength, and that's a
4 well-known fact. It's recognized in other codes
5 where they allow you to reduce your seismic loads
6 because of these factors. Because of these things,
7 there is a lot of additional margin. Some of the
8 components also of the structure in our design
9 didn't quite get up to their allowable loads. We
10 can't design everything to get right up to the
11 allowable load, we're not that efficient. So even
12 to get to the code specified allowable, we have
13 some margin.
14 Q. So it's comparable to a factor of
15 safety?
16 A. Yes. It's a factor of safety on
17 ultimate. You can think of it as a factor of
18 safety.
19 Q. By ultimate, you mean?
20 A. The ultimate -- until failure.
21 JUDGE FARRAR: Mr. Ebbeson, could you
22 bring the microphone a little closer, please and
23 make sure it's on.
24 MR. EBBESON: Sure. Is this better?
25 JUDGE FARRAR: Much.

1 Q. (By Mr. O'Neill) In Answer 17 on Page 9
2 of your testimony, you use the term free-field
3 ground motion. Could you just briefly define that
4 term for me?
5 A. Okay. I think a lot of people have been
6 maybe confusing this a little bit during these
7 hearings. The free-field ground motion is the
8 motion which would exist at the surface of the
9 ground where there are no buildings there. And the
10 term peak ground acceleration has been used to be
11 the peak of that free-field ground motion. Because
12 of soil-structure interaction effects, there are --
13 accelerations under the buildings will be different
14 than the free-field ground motion.
15 Q. In response to Question 18, it's on Page
16 9, as well, of your testimony, you use the term
17 soil shear modulus. This is a term that's come up
18 before and will continue to come up. Could you
19 define that or explain that term?
20 A. The shear modulus of any material is its
21 ability to resist shear deformation. The higher it
22 is, the stiffer it is, and the less deformation it
23 would be. Something has a higher shear modulus,
24 you put a shear of force on it, it would deflect
25 less. It's related to the term -- Youngs modulus

1 has also been going around, which is the elastic
2 modulus, and that's the modulus elasticity when you
3 want to stretch something. So one is the stiffness
4 when you're going that way, and one's the stiffness
5 stretching something. And they were related
6 through the Plasson's ratio.
7 Q. Plasson's Ratio okay. Could you explain
8 that in a little more detail?
9 A. Plasson's ratio is another material
10 property which relates how much volume change there
11 is during stressing of the material. Something
12 that's totally incompressible has a Plasson's ratio
13 of .25 and something that is somewhat compressible
14 will have a lower Plasson's ratio.
15 Q. Thank you.
16 A. And those are generally the soil
17 properties that you look for when you're doing this
18 analyses of the shear models, Plasson's ratio and
19 then damping and density.
20 Q. Another term I wanted to ask you about
21 was in Answer 19 on Page 10 of your testimony. You
22 refer to full composite action. I think this was
23 in a discussion pertaining to the CTB proof design.
24 A. Right.
25 Q. What does that mean?

1 A. There's some types of construction, we
2 have designed, it's used more in conventional
3 buildings than it is nuclear power plants, but it's
4 when you have a steel beam supporting a concrete
5 slab. And they put studs on the top of the beam or
6 some other kind of connector so the concrete
7 sitting on the steel beam and the steel beam act
8 together as one unit. And typically this is
9 efficient because on simply supported beams, the
10 top of it is in compression, which concrete is very
11 efficient and compression in the bottom is tension
12 and steel sufficient tension. So they work very
13 well together. But you have to put a certain
14 number of these shear connectors between the steel
15 and the concrete to make them behave compositely.
16 Q. The last thing I wanted to ask you about
17 was the depth to equivalent radius ratio. Could
18 you explain what that concept means and how this
19 parameter was calculated for the CTB? It's on
20 Answer 30, Page 16 of your testimony.
21 A. Okay. This is relating to embedment.
22 Ideally, in most of our analyses, we have the
23 analysis idealized as a structure sitting on top of
24 the soil profile. As a matter of practicality,
25 almost all structures are embedded somewhat into

1 the soil. In fact, local regulations usually
2 require that for frost protection. But for
3 practical reasons, sometimes especially nuclear
4 power plants, they're embedded quite a bit. And a
5 lot of times, there's a whole story or two, like a
6 raptor building is usually sometimes two stories
7 below ground.
8 There is a -- if the embedment is very
9 small, it has negligible effect on the results of
10 the analysis. But as you start getting substantial
11 embedments, you have to take into account the
12 embedment in your analysis. What I'm citing in
13 that answer is ASCE 4-96 and 4-98, allow you to
14 ignore the embedment effects if it's not too great.
15 And the limit they put is having an embedment depth
16 to equivalent radius of 0.3, I believe. And the
17 equivalent radius is just the radius of the circle,
18 which would have the same area as the footprint of
19 your building. In this case, our canister transfer
20 building is 279 feet by 240 feet. You get that
21 area and get a radius of the circle that has the
22 same area.
23 Q. And the foundation -- or the embedment
24 is five -- how many feet did you say?
25 A. The soil cement is five feet.

1 Q. Five feet, okay.
2 A. So the ratio of five feet, and I think
3 the equivalent radius comes out to 42 feet or
4 something like that, so it's a small percentage.
5 Q. I think you indicate the ratio for the
6 CTB was less than 0.04; is that correct?
7 A. Yeah. Let me get my calculator. I
8 think it's more than 42. It's a much bigger number
9 than that.
10 Q. I was referring to the final -- you
11 know, the ratio itself, the equivalent radius
12 ratio. That's in your testimony; correct?
13 A. Yes.
14 Q. 0.04?
15 A. Yes. I'm pretty sure I checked that
16 more than once.
17 Q. Could you calculate that number now that
18 I've asked about it?
19 A. Yes. Maybe I did make a mistake.
20 MS. CHANCELLOR: Could Mr. Ebbeson tell
21 us how he's calculating that number?
22 MR. EBBESON: Yes, it's 279.5 times 240,
23 and that's the area of the mat. Dividing that by
24 pie, taking the square root, I get 146, I'm sorry.
25 So a circle with a radius of 146 feet would have

1 the same area as the area of our canister transfer
2 building mat. And dividing five by that number --
3 whoops, I lost the number. What did I say, 143 or
4 something? It comes to .03 something.
5 Q. (By Mr. O'Neill) You said less than
6 0.04.
7 MR. O'NEILL: I have no further
8 questions at this point. Thank you, sir.
9 JUDGE FARRAR: Thank you, Mr. O'Neill.
10 Ms. Chancellor, you're doing the cross?
11 MS. CHANCELLOR: Yes, I am, Your Honor.
12 JUDGE FARRAR: Go ahead.
13
14 CROSS EXAMINATION
15 BY MS. CHANCELLOR:
16 Q. Good afternoon, Mr. Ebbeson, I'm Denise
17 Chancellor representing the State of Utah.
18 A. Good afternoon.
19 Q. I believe we spoke on the phone once in
20 a phone deposition.
21 A. That was a long time ago.
22 Q. Everything in this case has been a long
23 time ago.
24 You first started working on the PFS
25 project in about the summer of '98; is that

1 correct?

2 A. Yes.

3 Q. And --

4 A. Thereabouts. I went back and tried to

5 find out exactly when, and I couldn't pinpoint it,

6 but it's very close.

7 Q. That's just fine. And you're a civil

8 and structural engineer; is that correct?

9 A. Yes, I am.

10 Q. And you don't consider your area of

11 expertise to be in soils; is that correct?

12 A. It's not my area of expertise, no.

13 Q. And are you responsible for the design

14 of the CTB, canister transfer building?

15 A. Yes, the analysis and design.

16 Q. And I'd just briefly for background like

17 to go over the operations in the CTB. The HI-STAR

18 transportation casks are first taken to the unload

19 bay in the CTB; is that correct, as they come into

20 the facility?

21 A. Yes.

22 Q. And then they're taken from the unload

23 bay to the transfer cell in the CTB?

24 A. Yes.

25 Q. And then from there, the HI-STAR

1 transportation cask comes in horizontally. Is it
2 then moved into a vertical position in the --
3 A. I'm not familiar exactly with the cask
4 transfer operations.
5 Q. Then it's fair to say that the cask
6 transfer operations do occur in the CTB? Are you
7 aware of that?
8 A. Oh, yes, in the cells, the transfer
9 cells. I wasn't sure what you were talking about
10 coming in horizontally. I wasn't -- I mean they
11 come in on trucks and trains horizontally, yes.
12 Q. And can you describe the transfer
13 operations inside the transfer cell?
14 A. Again, this isn't my area of expertise,
15 but I think I can do it decently.
16 Q. Just generically is fine.
17 A. They bring the shipping cask in, set it
18 down and they bring the storage cask in and set it
19 down in the same cell. They bring the transfer
20 cask and set it down on the shipping cask, take the
21 canisters transferred from the shipping cask to the
22 transfer cask. When that's complete, the transfer
23 cask is listed and put on top of the storage cask
24 and the canister is transferred from the storage
25 cask -- or to the transfer cask down into the

1 storage cask.

2 Q. And just so we can go over a little

3 terminology. The transportation cask is the Holtec

4 HI-STAR transportation cask; is that right?

5 A. I don't know for sure. I heard -- I

6 think I heard Dr. Tseng say that the other day, but

7 I'm not sure.

8 Q. And the storage cask is the HI-STORM?

9 Do you know whether that's the case?

10 A. Yes, I believe so. No. It was

11 something 100.

12 Q. HI-STORM 100.

13 A. Yeah.

14 Q. And the transfer cask that's used to

15 transfer the canister, the multi purpose canister

16 from the transportation cask to the storage cask is

17 another cask?

18 A. Yes.

19 Q. And you don't know if that's called

20 HI-TRAC?

21 A. I don't know what it's called.

22 Q. Okay, that's fine. So these transfer

23 operations occurring in the canister transfer

24 building and then the canister containing the fuel

25 and the storage casks is then moved onto the

1 storage pad; is that correct?

2 A. Yes, there's a transporter that comes

3 through a tornado missile protected door, picks it

4 up and carries it out of the canister transfer

5 building out to the pads.

6 Q. And the canister transfer building

7 foundation mat is about 240 by 280 feet; is that

8 correct?

9 A. Roughly, yes.

10 Q. And the soil cement is one building

11 width around the perimeter of the building; is that

12 correct?

13 A. Approximately, yes.

14 Q. Does the soil cement extend about 240

15 feet in each direction east and west?

16 A. I believe so. You'd have to ask Paul

17 Trudeau to get the exact numbers, but I believe

18 that's approximately correct.

19 Q. And about 280 feet in each direction

20 north and south?

21 A. I believe so, but again, I'm not sure.

22 Q. And the foundation mat is five foot

23 thick; is that right?

24 A. It's five feet thick and it has a one

25 and a half foot thick shear peak around the

1 perimeter.

2 Q. And what's the unconfined compressive

3 strength of the concrete in the five-foot mat of

4 the CTB foundation?

5 A. It's not called unconfined compressive

6 strength. It's just compressive strength. It's

7 3,000 psi minimum.

8 Q. Isn't 3,000 psi for drain concrete?

9 A. No. It's 28-day strength. There's

10 3,000 psi.

11 Q. And the soil cement around the perimeter

12 of the CTB, do you know what compressive strength

13 that will have?

14 A. I've heard the number tossed around, but

15 I don't want to venture a guess.

16 Q. Would that number --

17 A. It might be 250,000 psi.

18 Q. How about 250?

19 A. 250, yes. Psi, okay. No. Okay. As I

20 said, I didn't know.

21 Q. That's okay.

22 In Answer 7 of your testimony on Page 3,

23 Mr. Ebbeson, you state that the seismic design of

24 the CTB are those used to make the safe shutdown

25 earthquake loads in accordance with NRC Standard

1 Review Plan, NUREG-0800, to the extent those
2 criteria are important to ISFSIs. And isn't it
3 true that the -- what is the -- NUREG-0800 is
4 applicable to nuclear power plants?
5 A. Correct.
6 Q. And the design basis earthquake for
7 nuclear power plant is based on a, is it a
8 10,000-year return period earthquake?
9 A. I don't know that.
10 Q. Do you know what accelerations a nuclear
11 power plant would see if it were located where the
12 CTB is located?
13 A. No, I don't.
14 Q. Do you know what accelerations the CTB
15 would see if it were based on a 10,000-year return
16 period earthquake?
17 A. I know what the 10,000 return period
18 earthquake accelerations are. They were developed
19 by Geomatrix.
20 Q. And what are they for the PFS site?
21 A. They vary from direction to direction,
22 but they're roughly 1.2 to 1.3 gs, peak ground
23 acceleration.
24 Q. So in Answer 11 on Page 6, for example,
25 where you state that the design of the CTB is

1 highly effective in resisting earthquake forces, if
2 we were looking at a predicted 10,000-year
3 earthquake, we'd be looking at 1.2 to 1.3 g;
4 correct?
5 A. Correct.
6 Q. And the minimum factor of safety against
7 sliding for the CTB is 1.1; is that correct?
8 A. That's the minimum allowable value, yes.
9 Q. In Answer 12 of your testimony on Page
10 6, you state that -- you refer to the Uniform
11 Building Code 1994?
12 A. Yes.
13 Q. And you state that Uniform Building Code
14 1994 was in effect at the time PFS submitted its
15 application to the NRC; is that correct?
16 A. Yes.
17 Q. And isn't it true that in Utah, that
18 they have -- that today the Uniform Building Code
19 in effect is the 2,000-year Uniform Building Code,
20 IBC 2000?
21 A. It's International Building Code I
22 believe.
23 Q. IBC. That in Utah, it has adopted the
24 newer 2,000-year IBC?
25 A. I don't know that, but I suspect it's

1 probably true.

2 Q. How did you -- what was the basis of

3 your understanding that the 1994 building code was

4 in effect when PFS submitted its application?

5 Where did that information come from?

6 A. I'm not quite sure. I think I heard it

7 from someone.

8 Q. Isn't it true that the 1994 building

9 code is structured on seismic zones one, two, three

10 and four?

11 A. Correct.

12 Q. And isn't it true that the 2,000

13 building code does not use that same seismic

14 building zone?

15 A. No, they have little graphs like this.

16 Q. And the 2,000 IBC --

17 JUDGE FARRAR: Wait a minute. Little

18 graphs like what?

19 MR. EBBESON: Well, these are excerpts

20 from the IBC 2,000.

21 JUDGE FARRAR: And what are you waving

22 at us there?

23 MR. EBBESON: I'm just saying, I realize

24 they have zones like this.

25 JUDGE FARRAR: I'm asking what the

1 document is.

2 MR. EBBESON: These are pages from IBC

3 2,000.

4 MR. TURK: Could we ask what the graph

5 shows, what the axes is on the graph?

6 MR. EBBESON: I can give you the

7 figures. They're little maps and they show contour

8 lines for seismic accelerations.

9 Q. (By Ms. Chancellor) And under IBC

10 2,000, isn't it correct that you use the maximum

11 considered earthquake with an average return period

12 of 2500 years?

13 A. I do not know how they're developed.

14 That's probably correct. I don't think the code

15 tells you how they're developed. They just tell

16 you what to use.

17 Q. In Answer 16 of your testimony on Page

18 8, you state that the factor of safety for the CTB

19 is 1.95 under design basis 2,000-year return period

20 earthquake loadings; correct?

21 A. Yes.

22 Q. Isn't it true that without the use of

23 soil cement around the perimeter of the CTB, that

24 the CTB would slide?

25 A. It may or may not.

1 Q. What is the purpose of using soil cement
2 around the CTB?
3 A. The purpose of using soil cement was to
4 get a factor of safety against sliding greater than
5 1.1 using conservative estimates of soil
6 properties.
7 Q. Isn't it true that without the 240- foot
8 by 280-foot perimeter of soil cement around the
9 CTB, the factor of safety against sliding would be
10 less than 1.1?
11 A. Depending on what you assume for soil
12 cements.
13 Q. So it could be, is that the answer?
14 A. It could be, yes, depending on the
15 issues involved, such as dynamic strength versus
16 static, so forth.
17 Q. Do you know whether you or anybody else
18 has conducted a dynamic analysis at the interface
19 of the foundation and the soil cement?
20 A. Nobody has as far as I know.
21 Q. In Answer 16, you mention that you
22 analogize from Holtec's 10,000-year analysis of the
23 storage pad, that the CTB could withstand a
24 10,000-year earthquake. Is that a fair
25 characterization?

1 A. No.

2 Q. No.

3 A. What I'm saying by comparing it to the

4 Holtec analysis, the canister transfer building

5 will not tip over during an earthquake -- or

6 overturn, excuse me.

7 Q. And for this opinion, do you rely on the

8 10,000-year analysis that Holtec conducted for the

9 pads?

10 A. That and common sense. The canister

11 transfer building, it is a short squat structure.

12 You saw the picture of the casks the other day.

13 They're twice as high as they are wide. The

14 canister transfer building is the other way around.

15 It's twice as wide as it is high, more than twice

16 as wide. Much of its mass is concentrated at the

17 bottom where it has the five-foot thick mat. So

18 it's bottom heavy and very resistant to tipping

19 over. I think it's, you know, obvious by

20 inspection that it will not overturn, but I use

21 this comparison with the -- basically, if you use

22 the comparison, if the Holtec casks won't tip over,

23 certainly the canister transfer building won't tip

24 over.

25 Q. Other than the Holtec pad analysis for

1 the 10,000-year and common sense, is there anything
2 else that you relied upon for this conclusion?
3 A. No.
4 Q. Wasn't the Holtec 10,000-year analysis a
5 nonlinear analysis?
6 A. Correct.
7 Q. Isn't it the CTB analysis a linear
8 analysis?
9 A. Okay. We are saying in a 10,000-year
10 earthquake, as far as overturning is concerned, the
11 canister transfer building would behave
12 nonlinearly. In other words, it would get to a
13 point where it had a factor of safety of
14 overturning of less than one. But that does not
15 mean it would overturn. Obviously, every time --
16 in the movie that Holtec showed, every time you saw
17 one of those casks start to move, to tip, that was
18 when it got to the point where the factor of safety
19 against overturning got below 1.0 and it started to
20 tip. That does not mean it overturns.
21 Q. Compared to the analysis for the pads,
22 isn't it true that the cask would slide more in a
23 10,000-year event than the CTB would move? Do you
24 expect the CTB to move as much as the casks?
25 A. Well, it would take a higher

1 acceleration to make it move, but once it moved,
2 I'm not saying -- I can't say how far it would
3 move.
4 Q. So you're saying the CTB will take off
5 once --
6 A. I don't think anything will take off.
7 You saw the casks, they didn't take off, they just
8 moved around a bit. They don't start sliding and
9 head off into the sunset.
10 Q. But I saw them wobbling around. I mean
11 do you expect this of the CTB?
12 A. Not nearly as much. Wobbling was
13 tipping, that's not sliding.
14 Q. Okay. So the CTB won't wobble, but it
15 may slide?
16 A. It may slide, and it may wobble a small
17 amount, but, you know, you wouldn't be able to see
18 it like you can with the casks.
19 Q. Isn't it true that in Holtec's
20 10,000-year analysis, the casks begin to slide at
21 .8 g?
22 A. At .8 g?
23 Q. Yes. Coefficient of friction is .8.
24 Doesn't it take .8 g to get the --
25 A. Well, it depends on -- they did several

1 analyses. They had some with --

2 Q. You're correct. The .8 g bounds the

3 Holtec analysis; is that correct? At .8

4 coefficient of friction?

5 A. That's the highest they use in their

6 analysis, which I believe they picked that because

7 it was higher than the range normally reported for

8 that case.

9 Q. Isn't it true that if the cask

10 wobbled --

11 MR. TURK: I'm sorry.

12 MS. CHANCELLLOR: I'm sorry, I didn't

13 realize --

14 MR. TURK: I just need a clarification

15 on the record. We're talking about the 2,000-year

16 earthquake now?

17 MS. CHANCELLOR: 10,000.

18 MR. TURK: And the question I thought

19 was that .8 g bounds the Holtec analysis?

20 JUDGE FARRAR: Yeah.

21 MR. TURK: I'm confused, I'm sorry.

22 JUDGE FARRAR: Wasn't there one of the

23 Holtec analyses that had random --

24 THE WITNESS: Yeah, random up to one.

25 JUDGE FARRAR: Up to one.

1 MR. O'NEILL: But are we referring to
2 the coefficient of friction or are we referring
3 to --
4 MR. EBBESON: I think she's referring to
5 the coefficient of friction but she said .8 g,
6 which is an acceleration.
7 MR. O'NEILL: That's was the confusion.
8 Are you referring to accelerations or coefficent of
9 friction?
10 MR. TURK: I think the question was
11 confused, Your Honor. Perhaps if Ms. Chancellor
12 would ask the question the way she meant it, the
13 record would be more clear.
14 MS. CHANCELLOR: I'll rephrase the
15 question.
16 Q. (By Ms. Chancellor) Isn't it true that
17 when the casks slide on the pad, that the inertial
18 load to the pad is reduced?
19 A. It's limited.
20 Q. Is limited any different from reduced?
21 I mean is there less force?
22 A. It goes up to a certain value, and once
23 it gets to that value it slides and doesn't exceed
24 that value. But it doesn't go down.
25 Q. So when the cask is sliding, does the

1 pad see the same force as when the cask is
2 resting -- is at rest on the pad?
3 A. If it has the same acceleration at that
4 point.
5 Q. Do you know whether it will have the
6 same acceleration?
7 JUDGE FARRAR: Wait, wait, wait, hold
8 on.
9 MR. EBBESON: It's more complicated than
10 that.
11 JUDGE FARRAR: Wait. The question or
12 the answer said it would have the same
13 acceleration. What's it?
14 MR. EBBESON: The cask.
15 JUDGE FARRAR: The cask would have the
16 same as?
17 MR. EBBESON: It would have the same
18 force applied -- from the cask to the pad as it was
19 sliding. But it wouldn't necessarily be .8 times
20 the weight of the cask. Because the friction
21 coefficient would -- the downward force would be
22 changed because of the vertical acceleration. So
23 the net download may not be the weight of the cask
24 at all times.
25 Q. (By Ms. Chancellor) Isn't it true,

1 Mr. Ebbeson, that you can't make a direct
2 correlation between Holtec's analysis of the cask
3 sliding on the pads to what will happen to the
4 small sliding that will occur at the CTB during an
5 earthquake?
6 A. I didn't say anything in my testimony
7 relative to the sliding of the CTB. I discussed
8 overturning of the CTB. I believe Paul Trudeau has
9 discussed at length the sliding of the CTB.
10 Q. Maybe I'm still back on Mr. Trudeau.
11 Sorry.
12 If you would turn to Answer 18 on Page 9
13 of your testimony. And isn't it true in the
14 last -- second paragraph of this answer, you will
15 say that the CTB will exhibit nonlinear behavior
16 during a 10,000-year return period earthquake?
17 A. Yes.
18 Q. And that it will act essentially like a
19 base isolated structure behaves under seismic
20 loadings?
21 A. I believe I said similar to, but yes.
22 Q. You're right, you did say similar to,
23 you're correct.
24 Isn't it true that a true base isolation
25 structure is an engineered structure -- engineered

1 system?

2 A. Yes, it is.

3 Q. And it would have fabricated material

4 such as rubber and steel plates?

5 A. Correct.

6 Q. And that a true base isolation structure

7 doesn't use a natural clay system; is that correct?

8 A. That's correct.

9 Q. In a base isolation -- in an engineered

10 base isolation system, the building moves back and

11 forth; is that correct?

12 A. No, actually the building stays in one

13 place and the ground moves back and forth under it.

14 Q. So in the case of your answer where

15 you --

16 A. And I think that's one of the concepts

17 that there's a little confusion on here is when

18 there's sliding, the building or the pads or the

19 casks on the pad aren't really moving away from the

20 ground. It's more they're staying there and the

21 ground is -- I think Dr. Soler the other day talked

22 about the sheet of ice was a coefficient of zero

23 where the ice was shake and if you had a cask

24 sitting on the ice, the cask would just remain in

25 one place.

1 Q. So are you saying, then, that the clays
2 are moving back and forth underneath --
3 A. If this slippage is between the bottom
4 of the building and the ground, that's what would
5 happen.
6 Q. The ground is moving, but the building
7 isn't?
8 A. Or if it is partial slippage, which this
9 isn't an engineered base isolated system, so it
10 wouldn't be completely free to move. So it would
11 move with the ground, but it wouldn't move all the
12 way. There would be some slippage as it moved. So
13 it would -- the building would move but not as much
14 as the ground.
15 Q. In Answer 18 on Page 9, you state that
16 soil strains will be higher under higher
17 accelerations. Do you have any calculations to
18 support that statement?
19 A. I do not have them.
20 Q. Do you know what the magnitude of
21 strains would be?
22 A. No, I do not. I'm sure Dr. Youngs
23 knows.
24 Q. These strains you mentioned, are they
25 elastic deformations or shear deformations?

1 A. They're not elastic. They're inelastic
2 shear deformations.
3 Q. If you would turn to Answer 20. If
4 you'd go over to Page 11 on Answer 20, you talk
5 about some facts you learned from a consultant of
6 Stone & Webster with more than 20 years experience
7 in the design of cranes. What is the name of this
8 person?
9 A. Paul Trudeau -- Steve Parkhurst. I keep
10 saying Paul Trudeau.
11 Q. Steve who?
12 A. Parkhurst.
13 Q. Parkhurst. And when did you have --
14 when did you consult -- when did you talk with
15 Mr. Parkhurst?
16 A. Mr. Parkhurst provided this information
17 to Stone & Webster on my behalf prior to my
18 deposition in November, the last time we spoke.
19 Q. And did he provide it directly to you or
20 to somebody else at Stone & Webster?
21 A. He provided it to someone else at Stone
22 & Webster.
23 Q. And who was that someone else?
24 A. Mr. Jerry Cooper.
25 Q. And did you get it from Jerry Cooper or

1 did you get it from someone else at Stone &
2 Webster?
3 A. I got it from Jerry Cooper.
4 MS. CHANCELLOR: For the record, I'll
5 make an objection that this is double hearsay, Your
6 Honor.
7 MR. TRAVIESO-DIAZ: May I comment? Of
8 course, we are saying that hearsay is admissible.
9 It goes only to the reliability of the testimony,
10 to the weight of the testimony regarding
11 admissibility. And I think it's related to the
12 question if Ms. Chancellor doesn't do it, as to how
13 that change, whether that change is a customary
14 change of the information itself. So I believe
15 it's both without basis and premature to move to
16 strike the testimony.
17 JUDGE FARRAR: The question is the
18 reliability, Ms. Chancellor. Do you want us to
19 pause and check this chain within the company for
20 reliability or ordinary course of business?
21 MS. CHANCELLOR: No, I just want to
22 preserve the objection on the record, Your Honor.
23 If you wish to rule, that's fine, I'll move on.
24 JUDGE FARRAR: The objection is
25 overruled.

1 MR. EBBESON: If it has anything to do
2 with it, I faxed this page to Mr. Parkhurst
3 yesterday just to make sure he concurred with it.
4 JUDGE FARRAR: We'd overrule the
5 objection, unless you want to proceed further into
6 whether -- further inquiry about how regular this
7 course of business was and so forth.
8 MS. CHANCELLOR: I'm sorry, Your Honor,
9 are we moving on?
10 JUDGE FARRAR: Right, the objection is
11 overruled.
12 MS. CHANCELLOR: Okay, sorry.
13 JUDGE FARRAR: Or was it a motion to
14 strike?
15 MR. TRAVIESO-DIAZ: I'd be happy to have
16 it overruled.
17 MS. CHANCELLOR: Whatever it was, it's
18 over.
19 JUDGE FARRAR: It's overruled.
20 Q. (By Ms. Chancellor) And if you would
21 turn to Answer 24 on Page 13. In the second
22 paragraph, you state that you have reviewed the CTB
23 base mat displacement results from Stone & Webster
24 calculation SC-6 Finite Element Analysis of
25 Canister Transfer Building Revision 1; is that

1 correct?

2 A. Correct.

3 Q. And that you state that this document is

4 in the final stages of completion?

5 A. It is complete at this time.

6 Q. Your testimony states, is it correct --

7 A. Right. It was in the final stages of

8 completion when I produced the testimony. It is

9 complete now.

10 Q. And is this calculation similar to the

11 calculation that Dr. Wen Tseng from ICEC did for

12 the storage pads?

13 A. It is vaguely similar. Obviously, the

14 building is much more complex than the storage pad.

15 He used the finite element model and we used the

16 finite element model, and I guess that's really the

17 only similarity. He used a computer program CESAP,

18 we used ANSYS. He did a dynamic analysis using the

19 input loads from Holtec, we did a static analysis

20 using the accelerations that we got from the

21 canister transfer building seismic analysis. He

22 modeled the soil with springs, we modeled the soil

23 with finite elements. So I guess the only real

24 difference -- the only similarities in the analysis

25 is that we used finite elements.

1 Q. And this is the ICEC calculation, it's
2 about two inches thick, I guess. Would your
3 calculation be similar in quantity of --
4 A. Yes. With many CDs full of computer
5 input and output.
6 Q. And you state that Exhibit YY, which
7 consists of four pages; is that correct?
8 A. Yes, it's the cover sheet, and again
9 it's stamped draft because the entire calculation
10 hadn't been proved at that time.
11 Q. And Exhibit YY --
12 A. And in an Attachment 6 which as you can
13 see had been prepared by me, checked by someone
14 else, independently reviewed by a third person.
15 Q. So these four pages are from SC-6; is
16 that correct?
17 A. Yes. The cover sheet is obviously Page
18 1 of that calculation, and these other three pages
19 comprise Attachment 6 of that calculation.
20 Q. And I notice on the first page of
21 Exhibit YY, that in Revision 0, that was originally
22 prepared by somebody called Snyder, maybe?
23 A. Tom Snyder.
24 Q. On 11/25/98; is that correct?
25 A. Correct.

1 Q. And Revision 1 doesn't have a date?
2 A. Right, because at the time it had not
3 been completed. It will be the same preparer, but
4 he didn't date it because he had not completed it
5 at the time.
6 Q. Do you have any involvement in this
7 calculation SC-6?
8 A. Well, obviously, I was the preparer of
9 Attachment 6. I had some other minor inputs, and
10 ultimately, I guess it was done under my
11 supervision.
12 Q. Will your name appear as a reviewer or
13 independent reviewer of the final calculation?
14 A. No, my name will appear as a preparer in
15 addition to Mr. Snyder's.
16 Q. It will or it will not?
17 A. It will appear as a preparer. Again,
18 there was Attachment 6 which I was the preparer of,
19 and I think there are a few other pages in the
20 calculation which I prepared. But the bulk of it
21 was prepared by Mr. Snyder.
22 Q. And one of the purposes of this
23 calculation is to compute the dynamic loads to
24 the -- dynamic loading to the CTB mat?
25 A. The way this works is we have a series

1 of calculations. SC-4 and 5 are the calculations
2 that produced the seismic analysis, which develop
3 accelerations in the building, the different
4 elevations, and also develop the amplified response
5 spectra at the crane level that we provide to the
6 crane manufacturer in order to qualify the crane.
7 SC-6, we create a finite element model
8 of the building. Unfortunately, I don't have the
9 whole calculation. There's little pictures of it
10 in the calculation. But it's a very large involved
11 model. We apply -- we evaluate all loads in this
12 calculation including seismic loads, tornado loads,
13 dead loads, live loads, regular wind loads,
14 whatever loads in the load combination that we have
15 to design the building for, and we end up analyzing
16 something like 23 different load cases. And we
17 ended up with forces in the walls and in the beams
18 and in the columns and in the roof slabs, and
19 basically, that's it. We tabulate them. Then we
20 have a subsequent calculation which will be SC-6
21 which designs the reinforcing steel for all of the
22 concrete walls and base mat, loose slab. And also,
23 then there's another calculation in which we
24 used -- it has a different number where we design
25 the steel beams. So all the results of this -- the

1 results of this analysis are used to design the
2 building, basically.
3 MR. O'NEILL: Excuse me, was that last
4 calculation would have been SC-7?
5 MR. EBBESON: Yes, that's a subsequent
6 calculation. It switched designs of the
7 reinforcing steel in the building. It makes sure
8 the walls are adequate thickness and whatever.
9 Q. (By Ms. Chancellor) But from SC-6,
10 would you compute the foundation damping, for
11 example?
12 A. No.
13 Q. Well, what's the purpose of this
14 Attachment 6? Doesn't this --
15 A. Attachment 6, all that does is under
16 seismic loadings, load case of seismic loads, we
17 are calculating or just tabulating basically what
18 the displacements of the mat are. And the purpose
19 of doing that is to show that under vertical
20 seismic loading, the relative displacements of the
21 mat are very small, which, in effect, show that the
22 mat is indeed rigid.
23 Q. Do you know whether SC-6 has been
24 submitted to the NRC?
25 A. That's similar to the question I think

1 Paul was asked this morning. I work in the Cherry
2 Hill, New Jersey office and when I complete a
3 calculation, I submit it to our Denver office and
4 they make necessary copies and do whatever they do
5 with it.
6 Q. And --
7 A. And I'm not sure how that works, whether
8 we submit calculations to the NRC only if they ask.
9 But I think this is one they already have. So we
10 may not send any revision to that calculation to
11 them. I'm not sure how that works. Mr. Donnell
12 would probably know.
13 Q. So SC-6 Revision 1 is now finalized; is
14 that correct?
15 A. Yes.
16 MS. CHANCELLOR: Your Honor, we would
17 object to this Exhibit YY. We've never seen
18 Revision 1 one of SC-6. I don't even know if we've
19 seen Revision 0.
20 MR. TRAVIESO-DIAZ: Mr. Chairman, I can
21 not conceivably think of any basis for objecting to
22 this calculation. One could question the basis for
23 objecting to the calculation that its face says
24 what it is, is self-contained, available to be
25 examined. The witness testified that the entire

1 calculation is not only hundreds and hundreds of
2 pages, but a number of CD roms with all kinds of
3 information that have no connector material to
4 Attachment 6. I'd be happy to have the witness
5 answer any question on Attachment 6, but why does
6 the rest of the calculation have any bearing on
7 this?
8 MS. CHANCELLOR: Because I think that
9 Mr. Ebbeson's testimony refers to SC-6 and it talks
10 about the loading combination with full vertical
11 earthquake acting downward, the maximum variation
12 of displacement. I think it's another case, Your
13 Honor of -- we don't know what we can rely on. We
14 don't know -- it's one thing to present something
15 as a stand-alone calculation, but this states that
16 it's part of a larger calculation that we have
17 never seen.
18 MR. TRAVIESO-DIAZ: Well, Mr. Chairman,
19 the calculation Attachment 6, I believe is
20 self-contained. It has all the information that
21 Ms. Chancellor would need to ask him questions
22 about. And if there's any information that she
23 needs that relates to her understanding of what
24 this attachment is, I will ask her what it defines.
25 The fact that it is part of SC-6 doesn't mean that

1 every single document in SC-6, computer rom, CD Rom
2 or calculation has to be produced or is even
3 relevant.
4 JUDGE FARRAR: Mr. --
5 MR. TRAVIESO-DIAZ: I believe this
6 objection is without absolutely any basis.
7 JUDGE FARRAR: Can you show us every
8 place in the testimony where it refers to this
9 calculation?
10 MR. EBBESON: I believe it's on Page 13,
11 Answer A24.
12 JUDGE FARRAR: That's the only place
13 it's referred to?
14 MR. EBBESON: I believe so.
15 (Board conferred off the record.)
16 JUDGE FARRAR: Vicki, would you read
17 back the objection.
18 (Objection Read.)
19 JUDGE FARRAR: Would you elaborate a
20 little bit on the objection.
21 MS. CHANCELLOR: I can ask a few more
22 questions if it would help, Your Honor.
23 JUDGE FARRAR: That would help.
24 Q. (By Ms. Chancellor) In Answer 24, you
25 state that the calculation shows that for the

1 loading combination with the full vertical
2 earthquake acting downward. Where did you obtain
3 the loading for the full vertical earthquake acting
4 downward?
5 A. That was one of the load cases in our
6 finite element analyses.
7 Q. SC-6?
8 A. In SC-6, yes.
9 Q. The calculation we're talking about;
10 correct?
11 A. Yeah, we have a number of load cases and
12 the load cases which have seismic loads involved,
13 we have different combinations where we apply the
14 vertical acceleration upward or downward and we
15 maximize sometimes the vertical earthquakes. And
16 as Paul Trudeau this morning alluded to this .4
17 Rule in the ASCE 4, we put the maximum acceleration
18 in one direction and four tenths of the maximum
19 direction in the other two directions. So we have
20 different permutations with the maximum vertical
21 and the two horizontals at .4 and one of the
22 directions of horizontals is at maximum and the
23 vertical and the other horizontal at .4. So
24 there's a whole bunch of permutations.
25 Q. And there's all described in SC-6?

1 A. Yes.

2 Q. And in SC-6 Revision 1, did you consider

3 concrete cracking on the design of the mat and the

4 structure?

5 A. We considered it but did not adjust our

6 properties for that.

7 Q. Any calculations to support that?

8 A. No. We did consider cracking obviously

9 in designing the reinforcing steel for the

10 building. We did not consider it in adjusting the

11 properties of our finite elements.

12 Q. Is there anything in the calculation

13 that describes why you didn't consider concrete

14 cracking on the design of the mat?

15 A. No, I approved the calculation, but I

16 didn't look at every page. I don't know whether it

17 has any description or not. But I don't think it's

18 relevant anyway.

19 Q. Stone & Webster has a separate

20 calculation for the estimation of foundation

21 settlement of the CTB; correct?

22 A. I believe so.

23 Q. How did you apply total and differential

24 short-term and long-term settlement in the design

25 of the mat?

1 A. Deformation of the mat is controlled by
2 the -- how it reacts to the loads which are applied
3 to it. The mat in the model is supported on a
4 finite element mesh which has the properties of the
5 soil incorporated. So when they -- when the loads
6 are applied, the loads go down through the walls --
7 from the roof down through the walls to the mat,
8 and the mat presses down on the finite element mesh
9 representing the soil, and the soil deforms under
10 the mat and the mat takes whatever deformed shape
11 it comes to, and that's shown on this -- these two
12 plots that are Attachment 6 for this particular
13 load combination.
14 Q. And the effects of differential
15 short-term and long-term settlement are included in
16 the way in which you have performed your analysis
17 and SC-6 Revision 1; is that correct?
18 A. Yes, and this particular load case we're
19 talking about is a seismic load and these are
20 short-term deflections under seismic loading.
21 Q. When you obtained the structural design
22 stresses, did you use a set of springs under the
23 building model?
24 A. No, as I said, we added finite element
25 mesh under the building rather than springs.

1 MS. CHANCELLOR: Your Honor, I think
2 that this series of questions illustrates why it's
3 important for the State to have a copy of SC-6
4 Revision 1. We don't know the load combinations,
5 for example, which Mr. Ebbeson testifies directly
6 to in his testimony. We don't know the effects of
7 concrete cracking, the effects of short and
8 long-term settlement. He states that he uses a
9 finite element model. Our experts have some
10 questions about soil springs. I don't know if
11 that's relevant or not. I think that there is
12 significant amount of information that is contained
13 in SC-6, and as I said, if we've got the ICEC
14 calculation for the storage pads, then I don't --
15 it seems that it's fair game that we should also
16 have a similar calculation for the CTB storage mat.
17 And all we're asking for is a level playing field.
18 We want the information so we can analyze it. It's
19 hard to make our case with documents that the
20 Applicant has generated.
21 MR. TRAVIESO-DIAZ: Mr. Chairman, I
22 believe that the questions that Ms. Chancellor
23 asked prove absolutely the opposite. The questions
24 prove that to the extent that she can impeach the
25 results in Attachment 6, she can do it if she's

1 successful by asking the kind of questions that she
2 just asked. And whether, in fact, she can convince
3 the Board that taking or not taking account the
4 factors that Mr. Ebbeson testified that he didn't
5 take into account, he didn't consider, whether that
6 reduces the credibility of the exhibit. It doesn't
7 go in any way, shape or form as to whether this
8 exhibit is admissible. She can ask -- she knows
9 what questions to ask, obviously. And as to the
10 calculation those are also in the SAR. But they
11 have been testified to amply here what the loads
12 are. They're the seismic loads for the design
13 basis for the soundness during the design basis
14 earthquake.
15 So I don't think that her objection is
16 well taken at all. She can, and the witness is
17 available to be asked questions at length as to how
18 he did this and that, what factors went into it.
19 But if she's going to tell me that in order to
20 question a witness on any of the calculations that
21 he does, she needs to have a trace of all the
22 declarations in this project, then we're going to
23 have to produce a whole lot more witnesses to
24 answer the State, which has absolutely no
25 relevance. My problem is very simple. This

1 attachment I believe stands by itself, and if she
2 has things that she believes make this computation
3 invalid or not credible, she's free to ask those
4 questions as she just did.
5 JUDGE FARRAR: Let me ask you this: You
6 said she already has many of these supporting
7 documents, and that was done through discovery?
8 MR. TRAVIESO-DIAZ: I believe so. I do
9 not know whether she ever asked for SC-6.
10 Certainly if she had asked for SC-6, she would have
11 it. I have no idea because quite frankly, this has
12 been going on for five years. So I don't know the
13 extent of discovery. If she realizes today that
14 she wishes she could have SC-6, we can provide it
15 to her. But I don't think that has anything to do
16 with A, this particular exhibit is admissible or B,
17 whether she needs to see SC-6 to question the
18 witness on it.
19 JUDGE FARRAR: And I think we're more
20 concerned not with the admissibility but with her
21 ability to question it, which may have been
22 something the State should have done during
23 discovery or may not have been --
24 MS. CHANCELLOR: If I may comment, Your
25 Honor. The way in which we have received

1 calculations from PFS is that every time it submits
2 a calculation to the Staff of the NRC, we also get
3 a copy of that calculation. We're now told that
4 this calculation is in the final stages and our
5 experts have been asking me forever -- for a long
6 time, where's the calculation for the CTB mat? And
7 I keep on looking for it because I knew that we had
8 the ICEC calculation, and I don't believe I
9 specifically asked PFS for that calculation, but I
10 believe PFS has opened the door in their answer to
11 24 when they talk about the -- they quote the
12 calculation. Mr. Ebbeson has now testified that
13 that calculation is final. That calculation is not
14 just for the design, it's not, you know, what color
15 should the CTB be? It has technical data that go
16 to the seismic analysis of the safety of the CTB,
17 and we believe that this is a licensing document
18 needed to support the licensing of the PFS
19 facility. The Staff may take a different point of
20 view, but from our point of view, this calculation
21 is as important as this one here that ICEC did. I
22 think PFS shoots itself in the foot when it relies
23 on the ICEC calculation in this proceeding and then
24 there's no corresponding calculation for the CTB.
25 MR. EBBESON: May I say one thing.

1 MR. TRAVIESO-DIAZ: Mr. Chairman, I need
2 to make a correction to a statement that
3 Ms. Chancellor made that may create confusion. The
4 witness testified that the seismic analysis
5 calculations for the CTB are SC-4 and SC-5, which
6 the State has had for years. SC-6 is a detailed
7 design calculation. He just testified that it's
8 used for further refinement and the design of rebar
9 and design concrete, thicknesses and so on. This
10 is not an analysis calculation. This is a design
11 calculation for which the engineers who actually
12 put sizes on rebar and lifts of concrete can get
13 numbers from which they can decide. So we're
14 talking again apples and bananas.
15 MS. CHANCELLOR: Well, we have the
16 banana for the pad, and that's the ICEC
17 calculation.
18 JUDGE FARRAR: Wait. You just said this
19 is more detailed than is necessary to support the
20 license application, then I guess we would ask you
21 why is it in here at all?
22 MR. TRAVIESO-DIAZ: May I have the
23 question again? I didn't hear you.
24 JUDGE FARRAR: In other words, I think
25 -- I thought I understood what you just said was

1 this is details about design and/or construction
2 that aren't really necessary to support the license
3 application. And so therefore, she doesn't need
4 the backup. But what you just -- if I read
5 correctly what you just said, then Answer 24
6 shouldn't -- isn't necessary to be in the testimony
7 at all.
8 MR. TRAVIESO-DIAZ: Well, perhaps the
9 question should be asked of the witness. I cannot
10 testify to what the genesis of this calculation is
11 and why it is where it is. I'd rather not testify
12 myself.
13 JUDGE FARRAR: Does the Staff want to be
14 heard before I ask the witness a question, or after
15 I ask the witness a question?
16 MR. TURK: We'd like to be heard
17 whenever is convenient for you.
18 JUDGE FARRAR: Let the record note the
19 lack of sincerity in that answer.
20 MR. TURK: There was full sincerity,
21 Your Honor. I certainly don't want to interfere
22 with your question. I ask you to go ahead, we'll
23 come after.
24 JUDGE FARRAR: Mr. Witness, you've heard
25 the discussion here. Can you help us with what the

1 role of Answer 24 is here in the scheme of things?
2 MR. EBBESON: Okay. First off, I just
3 heard Ms. Chancellor say that she needs the results
4 of this calculation to assess the seismic analysis.
5 That's backwards. This is a calculation that takes
6 off after we complete the seismic analysis. The
7 ICEC calculation is a combined calculation which
8 does both analysis and design in the same
9 calculation. And again, you can do that because
10 it's a much simpler structure. It's just one pad.
11 We did it in multi steps. And they did it kind of
12 because of the nonlinear way, and Holtec was
13 involved, there was, you know, two companies both
14 involved in doing the same analysis. And analyzing
15 the same things, the pads. So our calculations 4
16 and 5 are the calculations that do the seismic
17 analysis.
18 Now, listening to all the testimony
19 previously, all of their questions that they
20 addressed towards the ICEC calculation, were
21 related to the analysis portion of that calculation
22 not the design part. They didn't get into
23 reinforcing the steel and so forth, things like
24 that. I didn't hear any questions of that nature.
25 The reason we put this attachment in

1 this deposition -- or testimony is because we are
2 trying to use this -- the results of this
3 calculation to demonstrate that the mat is not
4 flexible, which is one of the issues raised, and
5 certainly looking at the results, you can see that
6 the deflections are very small under seismic
7 loadings. We put it in here because during my
8 deposition, I was asked, have you checked the
9 displacements of the mat under seismic loadings,
10 and I didn't think there was any need to. And, in
11 fact, I got reprimanded because I said why would I?
12 And so I thought during the testimony, then I would
13 include it.
14 But this attachment would have never
15 been in this calculation had I not been writing
16 this testimony.
17 JUDGE LAM: Are you saying, Mr. Ebbeson,
18 that your answer to Question 24 really do not rely
19 on the second paragraph which makes reference to
20 SC-6? You would have answered Question 24
21 adequately without making references to SC-6?
22 MR. EBBESON: Well, there is -- there's
23 the issue, the same issue that they had with the
24 pad which was, if the pad is flexible and the
25 canister transfer building mat is flexible, there's

1 an allegation that the -- that could affect the
2 results of the seismic analysis. Now, the only way
3 we can verify that -- first off, you know, we
4 have -- we're trying to combat that allegation with
5 three different arguments in this case. One of
6 them is, there's no requirement to do that.
7 There's a direct quote right out of ASCE 486 and
8 it's also in 498, which clearly it's clear as day,
9 as far as I'm concerned, said the effect of mat
10 flexibility for mat foundations affect the wall
11 flexibility for embedded walls need not be
12 considered in the SSI analysis. As far as I'm
13 concerned, that's clear as day.
14 But the second paragraph is just to
15 provide further demonstration that our mat use for
16 all intents and purposes is rigid and I think
17 somewhere in here, I also did this other
18 calculation which was Attachment MM in Dr. Wen
19 Tsang's testimony, which was for the pad, and I
20 think somewhere in here, I say this is -- that
21 calculation supports this argument, as well, for
22 the canister transfer building mat. Because this
23 mat is stiffer than the storage pads.
24 I mean as far as I'm concerned, the
25 first paragraph should end that issue entirely, but

1 we're trying to provide as much information as
2 possible so that we can make a more convincing
3 argument.
4 JUDGE LAM: I see. So your answer to my
5 question is yes and no, right?
6 MR. EBBESON: Right. It's called
7 defense in-depth.
8 JUDGE LAM: Then my question to the
9 Applicant counsel is this: Let's take his answer
10 as no. He did, in fact, under advisement from you,
11 he would put in SC-6, then how could you have it
12 both ways? If you rely on SC-6 to dismiss the
13 State's claim in contention Paragraph D-2A1, if
14 reliance plays on that document, how could you have
15 it both ways? You rely on it, now you don't want
16 to provide that document. Now, if the witness's
17 answer is yes, he did not rely on this, then your
18 interest would not be harmed by striking the second
19 paragraph to Answer 24.
20 MR. TRAVIESO-DIAZ: Let me clarify. We
21 have no objection to providing the calculation,
22 although I believe it will be a massive amount of
23 documentation and totally irrelevant to this
24 proceeding. So let me make it clear that we're not
25 objecting to providing the information. We are

1 objecting to its relevance.

2 But putting that aside, whether this

3 particular calculation was physical and made part

4 of Calculation SC-6, is not the point at all here.

5 Because this calculation doesn't refer to SC-6. It

6 is, I believe self-standing, doesn't refer to the

7 bulk of the calculation. It's self-standing, and

8 quite frankly, the reason that this calculation was

9 performed and prepared and submitted with this

10 witness's testimony is because the State's

11 witnesses continue to insist that if this man is

12 flexible and proved that he is flexible, you have a

13 mode to determine where the displacements are.

14 This attachment shows what the displacements are

15 and they are intended to rebut the claim by the

16 State that the only way to prove whether this is

17 rigid and flexible is to show it is flexible.

18 Which we don't believe is the case which the

19 witness just testified.

20 So I don't think that there should be a

21 confusion as to the physical location of this

22 document, this calculation with this attachment to

23 be a calculation has any bearing on whether the

24 rest of the calculation is needed to analyze every

25 weight and determine the nature and value of this

1 particular document.

2 JUDGE LAM: But how could you argue

3 about irrelevance? When I read the paragraph, it

4 said something about calculation SC-6, and then the

5 next sentence say, that calculation shows that.

6 MR. TRAVIESO-DIAZ: Yes, I think that

7 what he's referring -- and you can ask the witness.

8 He's referring to the Attachment 6. Perhaps it

9 will be clarified if you ask the witness whether he

10 in this second paragraph, he is referring to entire

11 bulk of the calculation or whether that reference

12 in that paragraph is just to this attachment.

13 JUDGE LAM: So maybe a better solution

14 is to modify your prefiled testimony.

15 MR. TRAVIESO-DIAZ: We'd be perfectly

16 amenable to modify, to clarify that when he says

17 here calculation SC-6, he refers only to Attachment

18 6 to the calculation, when I believe is what he

19 intended.

20 MS. CHANCELLOR: Your Honor, I

21 believe --

22 JUDGE FARRAR: Wait, wait, wait.

23 Mr. Turk, notwithstanding my facetious remark, we

24 do appreciate your willingness to take a position

25 on this at the appropriate time. Do you have

1 something to offer that might be helpful.

2 MR. TURK: I think Mr. O'Neill will

3 address in the first instance. If I have anything

4 to add, I'll ask for permission.

5 JUDGE FARRAR: All right.

6 MR. O'NEILL: Well, I would note I guess

7 at the outset that the Staff -- my understanding is

8 that the Staff doesn't rely on this specific

9 version of the calculation per se. Based on the

10 Staff's review of the prior version of this

11 calculation for its method analysis, that I believe

12 the Staff is satisfied with the various methods and

13 assumptions that go into the calculation.

14 JUDGE FARRAR: But do either - in your

15 opinion, do either your clients or we need this

16 paragraph to decide the case?

17 MR. O'NEILL: No. I don't think we need

18 this specific paragraph, no. But I would note, you

19 know, also, it seems to me that the State might

20 have had prior access. I mean would have access to

21 the prior version of the calculation and that the

22 testimony has been available to the parties for a

23 month.

24 MS. CHANCELLOR: I don't know that

25 Mr. O'Neill can testify whether we have Revision 0

1 of SC-6.

2 MR. O'NEILL: I didn't say you had it.

3 JUDGE FARRAR: Wait, wait, wait, talk to

4 me.

5 Let me ask a different question. We, as

6 the Board, don't track your discovery efforts

7 closely. We get copies of them, but we don't focus

8 closely on them unless there's a dispute that we

9 have to resolve. Assuming you've done diligent

10 discovery and then you prefiled testimony a month

11 before the hearing is to start, is there then an

12 opportunity for either -- is there the opportunity

13 and is there the time for further discovery if the

14 prefiled testimony raises new issues? Mr. Turk,

15 maybe that's a question you could answer as a

16 matter of long standing. Recognizing, Mr. O'Neill,

17 your newness to this kind of thing, maybe Mr. Turk

18 could answer as a matter of practice. Did you hear

19 the question?

20 MR. TURK: Yes. First of all, Your

21 Honor, I think already in this proceeding, we've

22 had reference to the cherry on top of the cake. I

23 think this is some icing under the cherry. And I

24 say that because I think the Applicant threw in

25 this extra verification paragraph as a way of

1 proving that their initial claim in the proceeding
2 is a correct one. It's really their attempt to
3 show we've now gone further and we have further
4 verification of what we already had concluded.
5 As a matter of licensing, the Staff had
6 reviewed in the consolidated SER, the CTB methods
7 of analysis. We had approved the Revision 0 of
8 this calculation. The State -- I don't know what
9 the discovery responses in questions have been, but
10 the State has been receiving all matters on the
11 docket from the get-go. In fact, early on in the
12 proceeding, Judge Bollwerk made a point of
13 requiring the Applicant to serve copies on the
14 State of all licensing submittals submitted to the
15 NRC.
16 JUDGE FARRAR: So if this came to you,
17 the State got it?
18 MR. TURK: I can't tell you precisely
19 the date, but they should have got it. And in
20 fact, it's in the PDR. It's a matter of public
21 record. Everything is available to the State. But
22 I believe beyond that, Judge Bollwerk was very
23 precise to require the Applicant to make transition
24 to the State of each and every one of their
25 submittals to NRC.

1 MR. GAUKLER: Yeah, whenever we sent
2 something to the NRC, Mr. Donnell's office would
3 automatically send a copy to the State, as well.
4 That was our practice. And I think a couple of
5 times, it may have been a day or two late, but I
6 think the State will agree we ran pretty good on
7 that.
8 MS. CHANCELLOR: We worked out a system
9 Your Honor, and yes, we did get it. Mr. Donnell has
10 been very good that way.
11 MR. TURK: Now, the Staff -- if I may
12 continue. The Staff has concluded in its
13 consolidated SER which -- in fact, in the revisions
14 to that document previously, this issue was
15 addressed in December of 2001, in Revision 2. We
16 had stated our conclusion that it left us without
17 Licensing Board hearings, we have sufficient
18 information to reach a licensing decision. And it
19 was based on the Revision 0. We had at that time
20 reviewed the FEA method of analysis and had
21 determined that it was an appropriate basis for
22 licensing.
23 If the Applicant has now made some
24 fine-tuning or some changes to the outcomes of that
25 FEA analysis, that would not affect our need to see

1 it before licensing. In fact, the Staff's
2 testimony concludes that we're satisfied with
3 licensing, and we have not yet received that
4 revision. As the witness indicated, they've just
5 finished it now, and not only has the State not
6 received it, we have not received it. But that
7 doesn't affect our ability to reach a licensing
8 decision, nor should it affect yours. And I think
9 in terms of the fairness of whether the applicant
10 should be able to include it in their testimony,
11 that's a separate issue apart from what is needed
12 in order to reach a licensing decision.
13 MS. CHANCELLOR: With respect to the
14 discovery, Your Honor, we have a general -- we
15 agreed to some general discovery interrogatories at
16 the beginning of this proceeding, and as a general
17 discovery request that states that for any witness
18 testifying, that he state the basis of the facts
19 and the opinions -- the facts and the opinions that
20 he holds. And as a general document discovery
21 request that states that any documents that the
22 testifying witness is going to rely upon has to be
23 turned over to each side. So there's this general
24 discovery request and there's also under NRC
25 regulations, a duty to supplement discovery.

1 Mr. Ebbeson when I was questioning him,
2 stated that the loading combination for Exhibit YY
3 comes from SC-6 Revision 1. Attachment 6 has no
4 reference whatsoever to any loading combinations.
5 This attachment gives us no information other than
6 a little picture diagram, and there's -- and
7 there's not enough information to analyze the
8 accuracy or completeness of Attachment 6. And the
9 purpose of Exhibit YY, as Mr. Ebbeson testified, is
10 to refute the State's claim as to whether the CTB
11 mat is flexible. And he's using this exhibit,
12 Exhibit YY, to refute one of the State's claims in
13 this proceeding.
14 And Mr. Ebbeson also testified that ASCE
15 is as clear as the day. And he seemed to be
16 suggesting that this was, as Mr. Turk said, the
17 cherry on the top of the cake, the second
18 paragraph, and I see no reason why we can't strike
19 the second paragraph and strike Exhibit YY, because
20 it lacks the foundation.
21 MR. TRAVIESO-DIAZ: This seems to be the
22 case of the desert shifting sands. Now, she's
23 saying it lacks foundation. I believe that
24 Mr. Ebbeson, has amply testified what this document
25 is, how he prepared it and what it's intended to

1 do. I don't think this goes to foundation. I
2 don't think this goes to admissibility. At most,
3 it would go to the weight that you give it, and
4 that is partly, I suppose, based on the questions
5 that she can ask the witness.
6 JUDGE FARRAR: As usual, we're more
7 concerned about fairness than anything else. Let
8 me -- let us consult a moment.
9 (Board conferred off the record.)
10 JUDGE FARRAR: It seems to us we have a
11 little bit of an unusual situation here. We have a
12 piece of testimony that seems not highly probative
13 or highly necessary given what I think I've heard
14 people say, and it seems to us the best course is
15 to leave to the Applicant the choice, if, in fact,
16 this is not all that significant to the case, you
17 could agree to withdraw the second paragraph of
18 Answer 24 and the related Exhibit YY, or you could
19 agree, as I think you've offered to do, to provide
20 all the backup to counsel for the State. And then
21 they'll have an opportunity to review that and
22 challenge it.
23 MR. TRAVIESO-DIAZ: Before I answered
24 your --
25 JUDGE FARRAR: Well, maybe you have

1 another choice.

2 MR. TRAVIESO-DIAZ: What I believe is

3 the Sophie's Choice for us, if you know what that

4 means. I think it's a Sophie's Choice because what

5 hasn't been discussed so far is the actual

6 underlying controversy between the parties with

7 respect to this issue. If I could elaborate on

8 that, and you'll see why it's a Sophie's Choice.

9 Even though Mr. Ebbeson is convinced, and I think

10 the record will show clearly that ASCE 486 allows

11 them to assume that the back of the mat is rigid.

12 The State's witness in this issue, Dr. Roseland,

13 has said that that prohibition shouldn't apply here

14 because of the special conditions. So he may or

15 may not be enough for the Applicant to rely on 486.

16 The reason we have --

17 JUDGE FARRAR: You don't know what we're

18 going to decide on that issue.

19 MR. TRAVIESO-DIAZ: Exactly. So I

20 believe that not being able to provide evidence as

21 to what these displacements are or produce and

22 potentially cause a great disruption and delay in

23 this proceeding to produce a massive irrelevant

24 calculation, to me puts us in a Sophie's Choice.

25 It would not be fair to us to be able to answer the

1 claim which is the only way to prove that this is
2 not as flexible is to view it as a displacement.
3 This shows the displacement.
4 Now, if the State can poke holes into
5 this particular calculation or show that these
6 displacements prove that it is flexible, so be it.
7 But I think that it is a Sophie's choice for us to
8 either pull this particular element and leave us to
9 the vague area of whether we prevail or whether 486
10 allows it or not, or again, as I said, my concern
11 is not providing the calculation, even though I
12 don't know how big it is, I'm sure the Applicant
13 will provide it. What that entails and all the
14 potential delay in these hearings and all the
15 potential examination on irrelevant issue, bringing
16 Mr. Ebbeson back, I just don't think this is fair
17 to either us or necessary for the proceeding. So I
18 beg you to reconsider this Sophie's Choice that
19 you're presenting us with.
20 JUDGE FARRAR: Let me say two things.
21 We do have a concern while we want to be fair to
22 everyone, that you all predicted a two-week
23 hearing, and leaving aside the basic inaccuracy in
24 that, you would have predicted a much, much longer
25 hearing if we were going to have this kind of

1 debate over every piece of information. So we are
2 concerned about the length of the hearing. Your
3 reference to the movie Sophie's Choice was a much
4 better citation to Hollywood than I tried on the
5 opening day with trying to calm the crowd with
6 Spartacus. So I commend you for a very accurate
7 analogy.
8 Let me ask the State to respond. In
9 other words, we want to be fair to you, but at some
10 point, tracing some of these things to their -- to
11 the very end, gets us in an extraordinarily long
12 hearing that none of you contemplated. If you told
13 us this was going to be a year-long hearing, I'd
14 say, yeah, here's why it's a year-long hearing,
15 we're going to pursue all these avenues until we
16 come to a dead end. But this -- I mean this
17 strikes me that this is just not as keen to the
18 case as some of the things we said this morning
19 you're entitled to documents on.
20 MS. CHANCELLOR: Your Honor, I don't
21 think we should have to prove our case before we
22 can get a document, a major calculation from PFS.
23 PFS does view this calculation, and the Staff, I
24 believe, a little differently than we do. We are
25 concerned that there are so many different

1 calculations out there that everything is this sort
2 of interconnecting web, and there are --
3 Mr. Trudeau is right, we are developing a library
4 of calculations. But if PFS decides to put these
5 things in various boxes as to who does what
6 calculations and what steps along the way they do
7 those calculations, then I think it is fair game
8 for the State to have access to those calculations.
9 And as I said, the loading combinations come from
10 SC-6 Revision 1. That's what Mr. Ebbeson testified
11 to.
12 I think that we could save some time by
13 just moving on, giving us the calculation. If need
14 be, we'll bring Mr. Ebbeson back, we can do this by
15 phone. There are ways in which I think that we can
16 resolve this. We just seem to be bogged down
17 because for some reason, we don't have that
18 calculation. My experts have told me that that is
19 an important calculation, and this Exhibit YY is
20 meaningless without knowing any of the load
21 combinations, and the flexibility or rigidity of
22 the pad pervades this entire -- pervades not only
23 our concerns about the CTB, but also with the pads.
24 So the pad flexibility, rigidity has effects on
25 damping, soil impedance functions, has effects on

1 other aspects of the seismic analysis. And without
2 the whole panoply of calculations, it's -- I don't
3 think it's a Sophie's choice, I think it's
4 something that the State under its discovery rules,
5 under Mr. Ebbeson's answer, is entitled to. I can
6 move on and we can revisit this later, and I'd be
7 willing to do this by telephone if need be. But I
8 do insist that we get a copy of that calculation so
9 that we can use it in this proceeding if need be.
10 MR. TRAVIESO-DIAZ: I have a very brief
11 response. If what Ms. Chancellor needs -- I
12 believe she knows what the pages are. But I'll be
13 happy to provide those to her, but that is one page
14 or two pages of again what I'm concerned about is
15 rounding up what Mr. Ebbeson fairly described, and
16 I have never seen it. As a massive calculation,
17 you might think the pad -- the calculation for the
18 pad was that thick, how big the calculation for
19 this building will be. And I can assure that
20 99.999 percent of it will be absolutely irrelevant,
21 and if we were to ask questions about that, 99.999
22 percent will lead to new issues, expand the
23 proceeding. If she wants local pages, she can have
24 them tomorrow.
25 MS. CHANCELLOR: Your Honor, I have a

1 suggestion. If PFS is willing to give us the index
2 to the calculation, we'll identify the specific
3 pages that we think are relevant and we can make
4 that choice.
5 MR. TRAVIESO-DIAZ: Perhaps we can work
6 this among ourselves in some fashion, and I would
7 then ask the Board to defer ruling on this, ruling
8 on this motion. Again, I know -- I have no
9 position or problem to providing the calculation,
10 but I'm talking about the practicality of it.
11 JUDGE FARRAR: Unless the Staff has
12 something more to contribute, we're ready to accept
13 that deal.
14 MR. TURK: Sounds fine.
15 JUDGE FARRAR: Okay, then let's do that.
16 We've been at it an hour and 45 minutes.
17 Let's take a -- I'm sorry, Ms. Chancellor, are you
18 close to being finished with this?
19 MS. CHANCELLOR: I think I'd like a
20 break, but it won't take too long to finish
21 Mr. -- we'll get through Mr. Ebbeson today.
22 JUDGE FARRAR: That's fine. No, we have
23 the court reporter change ready to do, so if you
24 were going to be more than one question or so, then
25 let's take a --

1 MR. TRAVIESO-DIAZ: Excuse me, counsel,
2 but you said we will finish with Mr. Ebbeson today?
3 MS. CHANCELLOR: Well, I didn't mean to
4 say we. I mean that I will be finished. I don't
5 know about Mr. Travieso-Diaz. I certainly did not
6 mean to speak for him or for the Staff.
7 MR. TRAVIESO-DIAZ: No, the reason I'm
8 asking is that on the expectation that Mr. Ebbeson
9 will be able to leave here tonight after his
10 testimony, he can change his travel arrangements.
11 So if there is a chance he may have to stay
12 over --
13 JUDGE FARRAR: No, no, we'll finish.
14 Let's take a -- it's 3:30. Let's take a 15-minute
15 break and switch reporters.
16 (A break was taken.)
17 JUDGE FARRAR: Before we resume with the
18 State's cross-examination, let me just make an
19 observation about that last argument. I want to
20 compliment all counsel, the State, Applicant and
21 the Staff, for very effective, powerful, cogent and
22 brief arguments that served your clients' interests
23 very well and which deal with kind of an overriding
24 problem which we have to be concerned about in this
25 case and future cases. And let me also compliment

1 you for again finding a way to a solution
2 yourselves.
3 So, again, great job. Your clients are
4 being well served, we're being well served, and I
5 thought the record should reflect that.
6 Go ahead, Ms. Chancellor.
7 MS. CHANCELLOR: Thank you for those
8 compliments, Your Honor.
9 (A discussion was held off the record.)
10 Q. (By Ms. Chancellor) Mr. Ebbeson, in
11 Answer 25 on page 14 of your testimony, you state
12 that the potential effect of mat flexibility is
13 accommodated by the factor of safety applied in the
14 seismic stability calculations. Do you see that?
15 It's towards the end of Answer 25, the next to last
16 sentence. One, two, three -- five lines from the
17 bottom of Answer 25.
18 A. I see that. I was trying to read
19 beforehand.
20 Q. Oh, that's fine. I didn't mean to rush
21 you.
22 A. Could you repeat the question? I'm
23 sorry.
24 Q. It was just isn't that what your
25 testimony says?

1 A. Yes.

2 Q. Okay. And isn't it true that the CTB

3 requires soil cement in order to resist sliding and

4 meet the factor of safety of 1.1?

5 A. I think the same question was asked

6 previously, and I said it depends on what

7 assumptions you make about the soil strength below

8 the CTB foundation.

9 Q. How many nuclear structures do you know

10 of that use soil cement to resist sliding?

11 A. I don't know of any.

12 Q. In Answer 26 you state there's a

13 sufficient margin in the factor of safety to

14 compensate for overestimation of foundation

15 damping, correct?

16 A. Yes.

17 Q. And there will be radiation damping

18 under the canister transfer building foundation,

19 correct?

20 A. Hopefully, yes.

21 Q. Isn't it true that soil cement

22 surrounding the canister transfer building is a

23 much stiffer layer -- let me back up.

24 There are Bonneville clays under the

25 canister transfer building, correct?

1 A. Yes.

2 Q. There's no soil cement under the

3 canister transfer building, it's just around the

4 canister transfer building?

5 A. Yes.

6 Q. Isn't it true that the soil cement

7 surrounding the canister transfer building is a

8 much stiffer layer than the Bonneville clays under

9 the canister transfer building?

10 A. Yes.

11 Q. Isn't it true that some of the

12 earthquake wave energy will be trapped by the soil

13 cement layer?

14 A. I don't believe so.

15 What do you mean by trapped?

16 Q. Won't there be less radiation damping

17 under the soil cement than there will be under the

18 CTB?

19 A. The energy of the CTB will be radiated

20 downward from the bottom of the mat where it's in

21 contact with the clay, and outward. It won't be

22 directed toward the soil cement.

23 Q. Won't the presence of the soil cement

24 affect that radiation damping such that the damping

25 may be deflected and --

1 A. It won't be deflected because it's not
2 directed towards the soil cement.
3 Q. Just a point of clarification. Will the
4 radiation damping be affected by the presence of
5 soil cement?
6 A. I do not believe so.
7 Q. You don't believe that the soil cement
8 will essentially act as an adjacent mat to the CTB
9 mat?
10 A. It will not act as a mat of a building.
11 It's much less massive.
12 Q. Much less massive? Isn't it 280 feet?
13 A. No, no. It will not affect it as an
14 adjacent building would affect it. In other words,
15 the soil cement is not -- will not affect the
16 canister transfer building as an adjacent building
17 would. It would be more like if it was a layer of
18 topsoil. Instead of being maybe 5 feet, it might
19 be 10 feet, because it's stiffer.
20 Q. But isn't the soil cement significantly
21 stiffer than the Bonneville clays?
22 A. Yes.
23 Q. And the eolian silt on top?
24 A. The eolian silt's being removed.
25 Q. In Question 27 you refer to a study that

1 you performed of the storage pads to demonstrate
2 the effect of pad flexibility on impedance
3 functions as not being significant, and you refer
4 to Exhibit MM. In PFS Exhibit MM, you used a paper
5 by Iguchi and Luco, correct?
6 A. Correct.
7 MS. CHANCELLOR: I'd like to have marked
8 as State's Exhibit 177 . . .
9 JUDGE FARRAR: Would you just give us
10 the title of that document?
11 MS. CHANCELLOR: Yes, I was just waiting
12 for people to get a copy in front of them.
13 It is a two-page exhibit. And the first
14 page is "Calculation of impedance functions of the
15 CTB mat Using the method in SC-21, PFS Ex. MM," and
16 page 2 is a one-page sheet from CEC, Calculation
17 Sheet 8, Table 1, Dynamic Soil Properties of SASSI
18 Model Upper-Bound Properties.
19 JUDGE FARRAR: All right. We'll have
20 the reporter mark that as State 177 for
21 identification.
22 (State's Exhibit-177 was marked.)
23 MR. TURK: Your Honor, I don't believe
24 we've seen this before. Am I mistaken?
25 MS. CHANCELLOR: This is similar to one

1 I handed out before, but this deals with a
2 comparison of the storage pad to the CTB mat. You
3 haven't seen it before.
4 MR. TURK: Could we have a few minutes
5 to look at it to try to understand it before
6 questions proceed?
7 JUDGE FARRAR: Certainly. Let me know
8 when you've had the necessary time.
9 MR. TURK: Thank you.
10 MR. TRAVIESO-DIAZ: Your Honor, I think
11 it more better it would be to figure out how much
12 time this witness needs to review this exhibit. I
13 think it's a new document.
14 JUDGE FARRAR: The witness hasn't seen
15 it either?
16 MS. CHANCELLOR: No. I was going to
17 walk the witness through it, Your Honor. That's
18 the whole purpose of the exhibit, so that he would
19 have something in front of him rather me just doing
20 an oration.
21 THE WITNESS: I've reviewed it already.
22 MS. CHANCELLOR: Good.
23 Mr. Turk, do you need more time?
24 MR. TURK: Considering that about 25
25 seconds has passed so far, yes.

1 MS. CHANCELLOR: I think my clock runs
2 faster than yours.
3 (A discussion was held off the record.)
4 MR. TURK: Thank you.
5 JUDGE FARRAR: While we were off the
6 record, I think that we made arrangements that will
7 allow us to proceed.
8 Go ahead, Ms. Chancellor.
9 Q. (By Ms. Chancellor) Mr. Ebbeson, in
10 Answer 27 you state that "The significance of mat
11 flexibility hinges on the relative stiffness
12 between the mat and the surrounding soil," and then
13 you cite to the literature and you mention Iguchi
14 and Luco. That's correct, right?
15 A. Yes.
16 Q. And then you state that you performed an
17 analysis with the storage casks -- storage pads to
18 demonstrate that the effects of pad flexibility on
19 the impedance functions are not significant,
20 correct?
21 A. Yes.
22 Q. And because of the thickness of the
23 5-foot CTB mat and the stiffening effect of the
24 interior and exterior walls, you state that you
25 would expect the effect of potential flexibility on

1 the impedance to be even less significant on the
2 CTB mat, correct?
3 A. Correct.
4 Q. Exhibit 177 that I've placed in front of
5 you is an attempt to use the Iguchi and Luco paper
6 for the CTB mat as you did for the storage pads.
7 A. I see that.
8 Q. First of all, if you would look at
9 MM -- PFS Exhibit MM, under assumptions, isn't it
10 correct that one of the assumptions is that the --
11 that it relates to an elastic half space of uniform
12 properties?
13 A. Correct.
14 Q. And do you agree that the soils at the
15 PFS site are variable?
16 A. Definitely.
17 Q. Looking at Exhibit 177 and on page 5 of
18 Exhibit MM --
19 JUDGE FARRAR: Ms Chancellor, help me
20 for a minute. The first page of State 177, who did
21 that? Who created this? I mean is this --
22 MS. CHANCELLOR: What we did,
23 Your Honor, is --
24 JUDGE FARRAR: No. I mean this is a
25 State --

1 MS. CHANCELLOR: This is a State-created
2 document, that's correct.
3 Q. It's a State-created document, and it
4 consists of three columns at the top of the
5 exhibit. It's got the storage pad per SC-21, which
6 is Exhibit MM, it's got the assumptions that relate
7 to the calculation and then it's got a comparison
8 of the CTB mat.
9 And in Exhibit MM you've used a length
10 of the pad of 67 by 30; is that correct?
11 A. Correct.
12 Q. And the CTB is approximately 24 feet by
13 80 feet, correct?
14 A. 240 --
15 Q. 240, yes, right, by 280.
16 And for the E for the Young's modulus --
17 let me just back up. The purpose of the
18 calculation in MM is to calculate the dimensional
19 property of delta which is given by the equation
20 delta equals (E t cubed) divided by (mu a cubed(1-v
21 squared)), and that will give you relative
22 stiffness, correct?
23 A. Correct.
24 Q. And for E - Young's modulus of the mat,
25 you have used 450,000 kfs for 3,000 psi concrete,

correct?

A. Yes.

Q. And that same value you see is also used for the CTB mat in exhibit -- State's Exhibit 177.

A. That's correct.

Q. t for the pad thickness is 3 feet, and for the CTB it's 5 feet, correct?

A. Yes.

Q. And --

A. Except around the perimeter where we have shear keys.

Q. Skipping over mu for a moment, a equals the square root of (L x B) divided by 4 which is -- in the case of the --

A. I see you've got your parentheses in the right places.

Q. Yes. We went over this, thankfully.

For the case of the storage pads, it's 22.4 feet, and for the CTB mat, you agree that if we use the values for the CTB, it would be 229.6 feet?

A. 129.6 feet.

Q. 129, yes.

A. That's probably right, but if you want me to check it, I can.

1 Q. And that the unit weight of soil is
2 correct -- is the same?
3 A. That may not be true. I used kind of an
4 average value, and I think it gets denser as it
5 goes down. But, anyway, it's approximate.
6 Q. And then for Mu, the values are the same
7 except V sub s squared, so rho, we have used the
8 same values for the mat as the -- the CTB mat as
9 the storage pad, correct?
10 A. You said rho?
11 Q. Yes. Isn't it rho? Yeah, rho. Mu
12 equals rho times V sub s squared, correct?
13 A. Yes. That's mass density, correct.
14 Q. And for the shear wave velocity V sub s,
15 we have used for the CT -- you have used 750 feet
16 per second squared, correct, for the storage pad?
17 A. That is correct. Yes, that's what I
18 used.
19 Q. For the CTB mat -- isn't the dimension
20 of entrance for the CTB the length of the -- the
21 depth of the length of the building for the shear
22 wave velocity?
23 A. Could possibly be, with interest.
24 Q. And the weighted average of the shear
25 wave velocity could be obtained, correct, from ICEC

1 Table 1 on page 2 of Exhibit 177, correct?
2 A. I would say an estimate of the
3 equivalent shear wave velocity could be obtained.
4 I wouldn't use the term "weighted average."
5 Q. Okay. If we use an estimate of the
6 shear wave velocity from ICEC -- and if you would
7 like time, you could go through those calculations
8 or we could just assume a number of 2327 feet per
9 second.
10 A. Yes, I disagree with that number, the
11 way it was formulated.
12 Q. How would you formulate it?
13 A. I had the same comment on the one you
14 gave out to Dr. Wen Tseng the other day. You had
15 the same type of weighted average calculated for
16 the storage pads, and I have the same comment on
17 that.
18 First, the obvious first thing is you
19 have -- the first term in that weighted average is
20 the soil cement, and there is no soil cement under
21 the CTB building.
22 Secondly, this weighted average treats
23 all layers of soils the same, regardless of depth,
24 and the -- very obvious that the soils near the
25 surface have much more influence on the impedance

1 functions than the soils down deep. So when you
2 get down deep -- like that last layer, you have 135
3 feet of soil with 2900 feet per second shear wave
4 velocity. That soil down there, while it could be
5 of interest, certainly is not contributing nearly
6 as much as the soil in the top 50 feet. So this
7 weighted average approach I don't agree with at
8 all.
9 Q. Isn't it true that Geomatrix used the
10 presence of soil cement to calculate the free field
11 ground motion?
12 A. Yes, they did.
13 Q. While I understand that you disagree
14 with the weighted average for the velocity -- let's
15 not characterize it -- with the velocity value that
16 we used, just as a hypothetical, if delta were much
17 less than the 0.735 that you arrived at with the --
18 for the value for the storage pad, if delta is a
19 low number such as .002, what would that do on the
20 Iguchi and Luco Attachment A to MM with respect to
21 soil impedance functions?
22 A. Delta calculated this way would have no
23 effect. If you read my testimony -- what page is
24 that on?
25 Q. On page 15, Mr. Ebbeson.

1 A. If you read carefully, it says, "Because
2 of the greater thickness (five feet) of the CTB mat
3 and the stiffening effect of the interior and
4 exterior walls" -- now, that phrase is key. If you
5 read the commentary to the -- well, first off, the
6 pad itself, if you think of this as it's analogous
7 to a -- say, a steel plate which -- or say you have
8 a steel plate an inch thick, and by itself it's
9 fairly flexible. Now, when you come and start
10 welding stiffeners onto that steel plate, as we
11 often do in designs of steel structures, that
12 increases the stiffness tremendously.
13 So this may be -- except for my
14 disagreements with your using the weighted average
15 and using the soil cement, may be appropriate if
16 the canister transfer building were just a flat
17 slab with no stiffening walls. But I think the
18 stiffening walls increase the stiffness of the mat
19 tremendously, and that's reflected in those
20 displacements that we presented that we may or may
21 not be allowed to include.
22 Q. Okay. In response to Question 33, you
23 state that ASCE 4-86 with respect to either -- you
24 can use either nonvertically propagating waves or
25 consider a 5-percent eccentricity of mass, and that

1 -- you chose to use the eccentricity of mass; is
2 that correct?
3 A. We are incorporating the eccentricity
4 mass, yes, 5 percent.
5 Q. Can you explain how you actually applied
6 the 5-percent mass eccentricity?
7 A. Okay. Again, this is done in
8 calculation SC-7, which is not complete at this
9 time. And I think if you read the ASCE 4
10 carefully, it specifically states you include the
11 mass eccentricity in the design, not in the
12 analysis, so we have not incorporated this
13 eccentricity in this seismic analysis. This will
14 -- or we will or are developing torsional loads
15 which will be included in the -- as additional
16 shear forces in the shear wall of the canister
17 transfer building in the design.
18 Q. So will -- the 5-percent eccentricity
19 factor, will that be moved as a mass artificially
20 of 5 percent or --
21 A. Yes. Well, we'll take the -- basically
22 the shear force at each elevation, which is a
23 function of the mass times the acceleration, and
24 multiply that by 5 percent of the building
25 dimension, and that will give us a torsional moment

1 which can be resolved into shear forces in the
2 individual walls. And typically this is done, and
3 it's these -- these loads are relatively negligible
4 compared to the other loads.
5 Q. I just have a couple of general
6 questions, and then I'm done.
7 Based on your experience, can you name
8 any one nuclear facility for which soil cement has
9 been used to resist seismic loadings from the
10 structure?
11 A. No. No, I haven't.
12 Q. Can you name one nuclear project with a
13 similar design motion intensity as PFS when the
14 structures have shallow or no embedment?
15 A. Did you say with ground accelerations
16 similar to these?
17 Q. That's correct.
18 A. I don't know of any other plants, except
19 possibly Diablo -- Diablo Canyon, which has
20 accelerations of this level. So I guess my answer
21 is no, because I don't know whether Diablo Canyon
22 has shallow embedments or not.
23 Q. The CTB will settle about 3 inches,
24 correct --
25 A. From what I've heard -- and I didn't do

1 that calculation, but in this testimony, I've heard
2 that. That's my only way of knowing, is what I've
3 heard of this testimony.
4 Q. How many nuclear buildings are designed
5 for up to 3 inches of settlement?
6 A. I typically do not calculate building
7 settlements. That's done by our geotechnical
8 engineers. I can only refer to the testimony of
9 Mr. Trudeau this morning, and he said it's not
10 common. But that's just my hearing what he said.
11 Q. Isn't it true that even though PFS has
12 found a major active fault dipping under the site,
13 its design has remained essentially the same except
14 for the use of soil cement around the CTB?
15 MR. TRAVIESO-DIAZ: Your Honor, I'm
16 going to object on the very same basis that I
17 objected this morning when the very same question
18 was asked of Mr. Trudeau. It's outside the scope
19 of this contention.
20 JUDGE FARRAR: We'll overrule the
21 objection for the same reasons.
22 The witness may answer.
23 MR. TURK: Your Honor, may I offer one
24 other objection?
25 JUDGE FARRAR: The question asks whether

1 the design has essentially been unchanged. We are
2 aware of design changes that have been made. I
3 think the use of the word "essentially" may need
4 amplification or clarification.
5 MS. CHANCELLOR: Let's limit it to
6 the --
7 JUDGE FARRAR: Reask the question in
8 light of the point the Staff has made.
9 Q. (By Ms. Chancellor) Isn't it true the
10 PFS claims numerous conservatisms in its design?
11 A. Yes.
12 Q. Isn't it true that the foundation design
13 of the CTB has remained the same except for the use
14 of soil cement after PFS discovered a seismic fault
15 dipping under the site?
16 A. I don't think that's correct. We also
17 added shear keys around the perimeter of the
18 canister transfer building.
19 Q. Okay. With those two caveats, the
20 design of the foundation is the same, isn't it, as
21 prior to discovery of the seismic fault dipping
22 under the site?
23 A. No, I don't -- I believe we also
24 increased the width of the building and added
25 stiffening walls in the mat to stiffen the mat in

order to resist overturning moments. I don't -- I'm not sure whether that's before or after the fault was discovered, but certainly, when the earthquake went up, we increased the width of the building. It used to be only somewhere around 200 feet, and now it's 240 feet wide.

MS. CHANCELLOR: Okay. Thank you very much, Mr. Ebbeson. I have no further questions at this time.

JUDGE FARRAR: Thank you, Ms. Chancellor.

Judge Lam has some questions.

JUDGE LAM: Mr. Ebbeson?

THE WITNESS: Yes, sir.

JUDGE LAM: Is it fair to categorize your testimony that most, if not all, the analyses performed were performed to examine the 2,000-year return earthquake and beyond that you offer opinions on stronger earthquakes?

THE WITNESS: Correct. All of our calculations are design basis calculations using the design basis earthquake.

JUDGE LAM: In your answer to Question 12, you mentioned that the canister transfer building has been designed for seismic forces 5

1 times those for which a conventional structure
2 would be designed under the Uniform Building Code
3 of 1994. Would you -- is that true?
4 THE WITNESS: Yes.
5 JUDGE LAM: Would you describe for us,
6 just as examples, how robust this canister transfer
7 building is relative to a conventional building?
8 THE WITNESS: Well, it's -- you'd have
9 to look at a drawing of it. But basically it's
10 a -- as we've said, 240 feet by 280 feet.
11 There's -- all the perimeter walls are 2-feet-thick
12 reinforced concrete with much reinforcing, believe
13 me.
14 The roof slabs are 8 inches thick,
15 supported on steel beams, and they're primarily
16 that thickness for Tornado Missile protection,
17 which obviously normal buildings are designed for
18 Tornado Missile Protection. As we said, the base
19 mat is 5 feet thick and has shear keys around the
20 perimeter.
21 We have some Tornado Missile doors that
22 open into the canister transfer cells. They're
23 1 foot thick with half inch plate on either side to
24 prevent Tornado Missiles from going -- hitting the
25 casks while the transfer operation is going on, or

1 hitting the canister.

2 Again, you're not going to see --

3 really, to get an appreciation of it, you'd have to

4 look at the drawings. But it is very robust. It's

5 equivalent in robustness, if you want to call it

6 that, to -- probably more so than any building in

7 nuclear power plants except for containment

8 buildings.

9 JUDGE LAM: But in comparison, what

10 would a conventional building look like. For

11 example, you mentioned 2-feet-thick walls for this

12 particular building. What would a conventional

13 building look like?

14 THE WITNESS: Probably 1-foot-thick

15 walls with much less reinforcing. A conventional

16 building is often -- you know, a building this

17 size, you might even make it of masonry rather than

18 use a cast-in-place concrete. But, of course, a

19 lot of buildings, office buildings and things are

20 steel frame buildings and not concrete shear wall

21 buildings. It's -- you know, I don't think you can

22 see a building that looked anything like this

23 except for a nuclear facility.

24 JUDGE LAM: I see.

25 THE WITNESS: I mean the same

1 mechanism -- when I'm comparing -- comparing --
2 when I say similar building, it wouldn't end up
3 looking the same, I mean a building that had
4 similar safety implications and was this reinforced
5 shear concrete -- reinforced concrete shear wall
6 building. It wouldn't look like this because it
7 would be designed for much smaller forces, so it
8 wouldn't end up being as big. But it's the same
9 building type of -- building type classification.
10 JUDGE LAM: Are there components in the
11 building more critical than others? I mean are you
12 designing it to the uniform --
13 THE WITNESS: No. All the components
14 are designed to -- well, the critical components in
15 the building are the -- are the crane, which is
16 designed to the ASME NOG-1 code, which is the same
17 code as used for -- in nuclear power plants,
18 including in the reactor building.
19 The roof steel is designed to the
20 requirements of the standard review plan, NUREG
21 0800. One of the things we looked at is if the
22 building were going to have a failure, what are the
23 failure mechanisms? And one of them could be the
24 collapse of the roof while we're, you know, doing
25 the canister transfer operation, so we looked at

1 that as a critical system.

2 All of the building itself, the

3 concrete, is designed in accordance with the same

4 rules and regulations that would be used for a

5 nuclear power plant.

6 Another critical item is the seismic

7 struts which keep the -- the casks in place while

8 the canister transfer operation is going on, and

9 those are designed to the same as ASME NF code

10 which would be used for safety-related equipment

11 supports in nuclear power plants.

12 JUDGE LAM: I'm glad you mentioned

13 seismic strut. In that regard, I ask you to look

14 at your answer to Question 20.

15 THE WITNESS: Okay. That's a long one.

16 JUDGE LAM: Right. In your second

17 paragraph to Answer 20, you mention seismic struts.

18 You mention the normal design capacity is 400 kips,

19 and then for a 2,000-year earthquake, the maximum

20 low experience is 395 kips. And you further went

21 on to elaborate you had performed an evaluation to

22 find and ultimately determine the capacity is 517

23 kips.

24 THE WITNESS: Correct.

25 JUDGE LAMB: Now, two questions on this

1 issue here. If you don't do the extra evaluation,
2 aren't you coming pretty close to the limit, about
3 1 percent?
4 THE WITNESS: Yes.
5 JUDGE LAM: And then may I ask you what
6 type of further evaluation you have performed to
7 claim that, indeed, you have much more excess
8 capacity?
9 THE WITNESS: The 390 -- the 400-kip
10 capacity is based on code allowable stresses, and
11 previously in here -- and I think earlier in the
12 testimony -- obviously the codes themselves have
13 factors of safety. So under the 2,000-year ground
14 motion, seismic ground motion, we fulfill the code
15 capacity or code requirements, but just barely
16 making it, which is called an efficient design.
17 If we went beyond that, obviously, went
18 far beyond that, had an earthquake much bigger than
19 the 2,000-year ground motion, we wouldn't satisfy
20 code requirements, but that doesn't mean it's going
21 to fail. If we happen to have an earthquake that
22 went over the 2,000-year earthquake, yeah, we
23 wouldn't -- we would no longer satisfy code
24 retirements, but that doesn't mean the structure
25 would fail and the canisters would topple, any of

1 that.

2 JUDGE LAM: But to be fair to the

3 intervenor, if one were to assume that there's some

4 calculational uncertainty associated with your

5 calculation, perhaps a plus/minus 2 percent, then

6 one would see the result of maximum loading of 395

7 plus minus 10 kips, then one -- is it fair that one

8 may assume that your maximum load may not meet the

9 code requirement for the calculation stated?

10 THE WITNESS: That's correct, but

11 that's -- that's true of every nuclear power plant

12 also. I mean you can go into the design of any

13 nuclear power plant and look at the design

14 calculations, and you'll find hundreds of designs

15 which are 99.9 percent of the allowable.

16 JUDGE LAM: Right, right. All --

17 THE WITNESS: In fact -- in fact, if you

18 go and look at calculations, you'll see ones that

19 go under 2 percent of the allowable, and they'll

20 say that's close enough.

21 JUDGE LAM: Right, right. I think we

22 are close enough to say either you barely meet the

23 code requirement or you barely exceed the code

24 requirement. Isn't that a fair statement here?

25 THE WITNESS: Yes. And, again, there's

1 judgment involved.

2 JUDGE LAM: Right. Now, how --

3 THE WITNESS: You think your loads are

4 conservative and you're closely allowable, and, you

5 know, as an engineering you make a judgment.

6 JUDGE LAM: Right. Well, then how

7 confident are you on this further evaluation that,

8 indeed, you have 571 kips?

9 THE WITNESS: Well, I -- the 571 kips is

10 what we think is the minimum of what it would take

11 to cause the strut to fail or the connections of

12 the strut to the canister or whatever, to the cask.

13 JUDGE LAM: Right, because, you know, in

14 your testimony there are critical components like

15 the tie rod, the tie rod welds, the strut pins, the

16 strut pipe, the strut pipe and welds and bracket

17 welds --

18 THE WITNESS: Right. We looked at all

19 the individual components of that strut assembly,

20 and we looked at what the -- what we thought that

21 -- each of those, what the ultimate capacity was.

22 Like there were some welds we evaluated and there's

23 the struts themselves and there's the connections

24 of the -- of the strut to an embedment plate and

25 also the embedment plate itself, because these are

1 tied back to the walls of the canister transfer
2 building.
3 JUDGE LAM: Okay. Thank you,
4 Mr. Ebbeson.
5 JUDGE FARRAR: What are the largest
6 number of casks that could be in the canister
7 transfer building at any one time under -- under
8 the most crowded scenario?
9 THE WITNESS: I'm not sure how many --
10 whether they use all 3 cells at once. I think
11 there's -- Wayne Lewis is going to be testifying.
12 I believe he's the expert in the operations, how
13 the transfer operations are. But, I mean,
14 obviously the maximum it could be is -- there's 3
15 cubicles, and you could have 3 shipping casks, 3
16 storage casks and 3 transfer casks, so the upper
17 bound is 9. Okay. There could be -- maybe there
18 could be some sitting on trucks somewhere.
19 JUDGE FARRAR: When I said cask, I meant
20 the multipurpose cask holding the fuel rods leaves
21 -- as it leaves the reactor, how many of those
22 could be in the building at one time?
23 THE WITNESS: I -- I don't know that.
24 You'd have to ask Mr. Lewis.
25 JUDGE FARRAR: Okay. Ms. Chancellor,

1 before we turn to the other parties to our
2 questions, does it trigger any further cross, or
3 would you rather to hear everybody's?
4 MS. CHANCELLOR: If I could wait until
5 after the end, I think I could just tie it all up
6 together.
7 JUDGE FARRAR: Okay, fine.
8 Then the Applicant's redirect now.
9 MR. TRAVIESO-DIAZ: If I could have
10 two minutes?
11 JUDGE FARRAR: To --
12 MR. TRAVIESO-DIAZ: Five minutes to
13 consult my notes and think about it for a second.
14 JUDGE FARRAR: Okay. And then you said
15 you only need two minutes?
16 MR. TRAVIESO-DIAZ: Two minutes to think
17 about it and three minutes to come up with the
18 question. That's five. And I suspect that my
19 cross-examination will be no more than ten.
20 JUDGE FARRAR: Okay. Should we just
21 stay here and wait until you're ready?
22 MR. TRAVIESO-DIAZ: Yes.
23 JUDGE FARRAR: Okay.
24 (A discussion was held off the record.)
25 JUDGE FARRAR: All right. I understand

1 we're ready to proceed. Go ahead, sir.

2 MR. TRAVIESO-DIAZ; Yes, Mr. Chairman.

3 I only have very few questions. The first question

4 that perhaps we all would appreciate is that I

5 believe there are a number of terms whose -- whose

6 meaning might be have left unclear, and if you

7 don't mind, I'm going to ask the witness to define

8 several things.

9 JUDGE FARRAR: That's fine. Thank you.

10

11 REDIRECT EXAMINATION

12 BY MR. TRAVIESO-DIAZ:

13 Q. I think the most important one that I

14 don't think has been defined is the term "shear

15 key." Could you explain what a shear key is?

16 A. Shear key is a -- is -- you know, the

17 mat is a rectangle, 5 feet thick, just a big plate,

18 and around the edges we have extend -- made it a

19 foot and a half thicker, sticking down into the

20 ground. And the reason for that, probably Paul can

21 explain it better than I could, but my

22 understanding is it's to get down to make sure you

23 engage the clay layer in the shear failure plane.

24 JUDGE FARRAR: Is that an extra foot

25 just to have it an extra foot or because there's

1 different soil at a lower --

2 THE WITNESS: Yeah, it's to -- well,

3 Paul should answer that.

4 JUDGE FARRAR: Okay.

5 THE WITNESS: It was going to be a foot,

6 and we made it a foot and a half, and the only

7 reason we made it a foot and a half instead of a

8 foot is because we needed the extra 6 inches to

9 develop the reinforcing steel that extends down

10 into it.

11 Q. (By Mr. Travieso-Diaz) Could you say a

12 little more what the design purpose of that shear

13 key -- what is it intended to do?

14 A. It's intended to shift the shear failure

15 plane down that amount to get into the clay where

16 we have higher strength.

17 Q. Would that be intended to provide

18 additional resistance -- would that be intended to

19 provide additional resistance against sliding?

20 A. Yes. That was what it was done for.

21 Q. Now, there was also an awful lot of use

22 of several terms at various times, including

23 tip-over, overturning, wobbling and several others

24 of the same nature. Could you just run down the

25 list of those related terms and explain what they

1 are?

2 A. Okay. When we get back to the

3 discussion that was going on this morning about

4 overturning and there was a factor of safety of 1.1

5 which is defined as the resisting moment divided by

6 overturning moment, and there's a requirement you

7 stay below 1.1, when that goes below -- if you

8 think of a load --

9 MS. CHANCELLOR: Objection, Your Honor.

10 This is beyond the scope of cross-examination.

11 We're getting into Mr. Trudeau's testimony. If

12 they want to put on rebuttal testimony, that is

13 fine, but this is not -- this is not where -- we've

14 had one witness on who has described the resistance

15 against sliding, and this is not Mr. Ebbeson's

16 testimony.

17 MR. TRAVIESO-DIAZ: Again, I'm offering

18 these questions for the benefit of everybody so

19 that he can explain what the terms mean and how

20 they're being used in the various calculations. I

21 don't intend to give them any measure of weight per

22 se. It's just an explanation.

23 JUDGE FARRAR: The objection's

24 overruled. We've tended to be very liberal on all

25 parties being heard on matters like this.

1 So you may answer.

2 THE WITNESS: I'm not answering this

3 relative to the canister transfer building or the

4 pads or casks or anything else. It's just a

5 general discussion because I felt there was some

6 confusion this morning.

7 When this factor of safety gets down to

8 1, if the load is, say, a continuous load such as a

9 wind load on a -- again, just -- I don't want to

10 say cask, but if you had just some rigid body

11 sitting there and the wind was blowing on it and

12 once this overturning moment caused by the wind

13 exceeded the resisting moment which is the weight

14 of the -- based on its weight, it would just start

15 to tip over, and it would tip. And that would be

16 -- it would overturn.

17 It would start -- I guess we call --

18 when it starts to go up, it's tipping, and once it

19 gets to the point where I think Mr. -- Dr. Soler

20 called it cg over tip or something. Once it gets

21 to that point, it's the point of no return. It

22 will just plop over. So it tips and then gets it

23 up to a point, and then it will plop over.

24 What happens in the -- and you saw it in

25 the movie that Dr. Soler presented. Whenever you

1 saw those casks sitting on the pad, they -- when
2 the earthquake started, they would just sit there,
3 and you wouldn't see anything. At that point in
4 time the factor of safety against overturning was 1
5 or greater. So, then, to this -- they're not going
6 anywhere.
7 Then all of a sudden you can start to
8 see them start to go up. They're starting to tip.
9 But that does not mean it's overturning, all right?
10 It has to get to cg over tip in order to overturn.
11 So it starts to tip, and then it tips over. And
12 it got bigger and bigger and bigger, and I guess
13 when they start spinning on their axis, they're
14 wobbling. But when it gets to the point where the
15 factor of safety gets less than 1, it will start to
16 tip.
17 Now, in an earthquake, it's not like a
18 wind force where it continues acting continuously.
19 It changes direction over and over again. So it
20 starts to tip, and at that point, you know,
21 you've -- even when you get below 1.1, even before
22 it starts to tip, you've violated the Section
23 3.5 -- 7. -- what a minute -- 3.7.5 of the standard
24 review plan where they give you the factor of
25 safety of 1.1. So you never even get to the point

1 where it even tips.

2 But, as you can see with the casks, in

3 real life, even once it starts to tip, that does

4 not mean it's going to tip over because as soon --

5 because the load changes directions. So it will

6 just go back, and it will start to wobble and

7 wobble and wobble. And it may or may not -- if it

8 continues long enough and the forces gets big

9 enough, eventually it will tip over.

10 But having a factor of safety in a

11 dynamic load less than 1 against overturning does

12 not mean it's going to overturn. It means it's --

13 has a tendency to overturn or it will start to tip,

14 but it will not overturn necessarily.

15 Q. (By Mr. Travieso-Diaz) Thank you,

16 Mr. Ebbeson.

17 On Answer 12 you contrasted the design

18 of the canister transfer building against a

19 building the size -- against the provisions of the

20 Uniform Building Code, 1994 version. Do you

21 remember that?

22 A. Yes, I did.

23 Q. And Ms. Chancellor brought up the fact

24 that that particular code is no longer in effect

25 and that -- and now we have IBC 2000, International

1 Building Code 2000.

2 A. Yes.

3 Q. Did you go back and review IBC 2000 to

4 see if the discussion that you have in Answer 12

5 would still be applicable?

6 A. Yes. It still has similar results.

7 Q. How similar?

8 A. It's roughly the same thing, a factor of

9 5.

10 Q. So there's no material difference in the

11 amount of conservatism --

12 A. I think what we said in -- in Utah I

13 think we've said -- in the testimony we said it

14 would be 5. If it were anywhere in the United

15 States, it would be 7. If it was in Utah -- and I

16 wrote that using the IBC 2000. It's 5 if it's in

17 Utah. So --

18 Q. All right. Now, there was also a

19 question about your testimony on the crane and how

20 you obtained the values that you cite in your

21 testimony. Now, you mentioned two names, a

22 Mr. Parkhurst, I believe --

23 A. Yes.

24 Q. -- and a Mr. Cooper.

25 Could you please first tell who these

1 two gentlemen are?

2 A. Mr. Parkhurst is a mechanical engineer

3 who's a crane specialist, and I think he's on maybe

4 some of the crane committees who write the

5 regulations. He used to be a Stone & Webster

6 employee, and he was our crane specialist, Stone &

7 Webster's crane specialist. And he was involved

8 in -- Mr. Lewis also was involved in it. But

9 Mr. Lewis and Parkhurst are the ones who wrote the

10 specifications to procure the crane. He has since

11 left Stone & Webster, and he has his own consulting

12 company. And we use him off and on as a

13 consultant.

14 Q. Now, who's Mr. Cooper?

15 A. Mr. Cooper is the project engineer for

16 the PFS project.

17 Q. Now, what is the normal process -- in

18 the normal course of business for -- for Stone &

19 Webster, when you need to obtain information from

20 an outside consultant, how is it done?

21 A. Well, I can't ask for information

22 directly because I have no authority to authorize

23 payment of them. That has to go through the

24 project team.

25 Q. So would you say that in this case, when

1 Mr. Cooper asked Mr. Parkhurst for the information,
2 it was because of the way that the project -- a
3 Stone & Webster procedure required that it be done
4 that way?
5 A. Yes. I needed the information, and I --
6 you know, if we want Mr. Parkhurst to do work for
7 us, we have to pay him. And I don't have the
8 authority to do that, so I have to go and tell
9 Mr. Cooper, who probably goes to Mr. Donnell and --
10 MR. TRAVIESO-DIAZ: Well, you can see
11 Mr. Donnell is behind everything.
12 JUDGE FARRAR: I hope he's not going to
13 charge me for the air conditioning.
14 Q. (By Mr. Travieso-Diaz) I have one last
15 question. I got the sense that a number of people
16 in this room were confused a moment ago or a little
17 while ago during Ms. Chancellor's examination when
18 you began describing what happens when the casks
19 begin to slide. Could you repeat the explanation
20 in a little bit more -- in more detail so we
21 understand what you are saying?
22 A. Yeah. When a cask starts to
23 slide, well, the cask will have some acceleration,
24 and the -- obviously the sliding force is its mass
25 times its acceleration. When that acceleration

1 gets large enough so that that inertial force
2 exceeds the capability to resist sliding, which is
3 the vertical force times the coefficient of
4 friction, it will start to slide. At that time the
5 only force acting on it is the friction force at
6 the bottom of the cask which is going to slow it
7 up, all right? Then -- then it will slow up in the
8 pad and by that time will start going back the
9 other way. And it will go back the other way and
10 then maybe start to slide again and then slow up
11 again, and you can see that on the video. You
12 know, they move around, but they don't go far.
13 They don't go rushing off. And, really, they're
14 not sliding. They're staying still, and the pad is
15 moving away from it.
16 And I think, again, Dr. Soler made that
17 analogy with a -- you know, putting something on a
18 sheet of ice and shaking the ice.
19 JUDGE FARRAR: If I was sitting on top
20 of that cask with my eyes closed, I wouldn't know I
21 was moving?
22 THE WITNESS: Right.
23 JUDGE FARRAR: I would think I was not
24 moving --
25 THE WITNESS: Right. And that was --

1 JUDGE FARRAR: -- because I'm not
2 moving.
3 THE WITNESS: -- if the coefficient of
4 friction were 0. And then I think Dr. Soler said,
5 or somebody made the analogy, that if you were
6 sitting in the building -- a building, you wouldn't
7 know you were in an earthquake unless you looked
8 out and saw the ground moving.
9 MR. TRAVIESO-DIAZ: That's all I have.
10 Thank you, Mr. Ebbeson.
11 JUDGE FARRAR: Mr. O'Neill?
12 MR. TURK: May we have just one moment,
13 Your Honor?
14 JUDGE FARRAR: Certainly.
15 MR. TURK: Your Honor, with permission,
16 might I ask a few follow-up questions?
17 JUDGE FARRAR: Yes.
18
19 RECROSS-EXAMINATION
20 BY MR. TURK:
21 Q. Mr. Ebbeson, you were talking about the
22 factor of safety possibly being below 1.1. I think
23 the question was if there was no soil cement there,
24 could the factor of safety drop below 1.1, and your
25 answer was that would depend upon the soil strength

1 that you assume?

2 A. Yes.

3 Q. Are you thinking -- when you gave that

4 answer, were you thinking in terms of the static

5 analysis that you had conducted?

6 A. Well, the only place where the factor of

7 safety was calculated was by Mr. Trudeau, and I

8 think one of the issues was -- and I think he had

9 alluded to this -- that the dynamic shear strength

10 of the clay is up -- I think he said 50 to a

11 hundred percent higher than the static. And I

12 believe he used the static value in his sliding

13 analysis. I'm not sure -- again, I haven't

14 reviewed his calculation -- whether he used the

15 dynamic value, which he admitted we did not use

16 because we haven't done any testing to determine

17 what that is. But it's possible that if he used

18 the dynamic strength we may have been able to do it

19 without soil cement. I'm don't -- I'm not sure

20 about that. That's why I said it may -- may be or

21 may not be.

22 Q. Are you familiar with, though, the

23 standard review plan when it speaks in terms of a

24 factor of safety is -- speaking in terms of a

25 static analysis or a dynamic analysis?

1 A. It doesn't say one way or the other.
2 Historically it's been done using static loads,
3 which is part of the problem where -- you know, I
4 mean, obviously, if you did it based on static
5 loads, you would say, Okay, look, the Holtec cask
6 is going to overturn. But they don't overturn, as
7 we saw. But everything I've seen typically has
8 been done based on static loads.
9 Q. You had provided some testimony about
10 how many casks might be inside the canister
11 transfer building at any one time, and I believe
12 you had stated that there might be -- in each of
13 the three cells there could be a transfer cask, a
14 storage cask and a shipping cask.
15 A. Right.
16 Q. Did you mean to suggest that each of
17 those might be loaded with an MPC at the same time?
18 A. No, no. There would only be 1. The
19 most there could be is 1 canister in each cell,
20 but -- and I'm not even sure whether they would be
21 doing 3 at one time. And, again, you're going to
22 have to ask Mr. Lewis that.
23 MR. TURK: Thank you, Your Honor.
24 That's all I have.
25 JUDGE FARRAR: Thank you, Mr. Turk.

1 Ms. Chancellor, recross?

2

3 RECROSS-EXAMINATION

4 BY MS. CHANCELLOR:

5 Q. Mr. Ebbeson, you stated that if you were

6 in a building during an earthquake, you wouldn't

7 know that the building was moving?

8 A. No. If you were in a building that was

9 completely base isolated.

10 Q. So it's not a correct statement that if

11 you were in a building and there was an earthquake,

12 you wouldn't experience the building moving?

13 A. I was referring to a statement made by

14 Dr. Soler, I believe, and it was in the context of

15 what example he was using. It wasn't in any

16 building specifically.

17 Q. So if you were Judge Farrar and sitting

18 on top of a cask, would you be aware that the cask

19 is moving if there was a design basis earthquake at

20 the PFS site?

21 A. Definitely.

22 Q. You testified that -- in response to one

23 of the Panel's questions that at Nuclear power

24 plants frequently their calculations equal or

25 exceed seismic codes, for example, for the seismic

1 struts. I think that was where the discussion came
2 up, correct?
3 A. I said occasionally you will see one --
4 you'll frequently see them close to the allowable
5 value, like 95 percent or 98 percent or whatever,
6 and occasionally you will see ones where they're
7 slightly over the code allowable and they're
8 accepted.
9 And a lot of times what they'll do --
10 this happens particularly quite often in existing
11 plants where they make a modification, where it's
12 very difficult to get into areas to make
13 modifications. And a lot of times what they'll do
14 is they'll go over the code allowables slightly,
15 and then they'll go back and get the material
16 certifications to show that the actual strength of
17 that particular piece of steel is greater than the
18 minimum specified value, and do things like that.
19 Q. Isn't it true that -- other than Diablo
20 Canyon, that ground motions at any nuclear facility
21 are not as great as those at the PFS site?
22 A. Correct.
23 Q. And so, therefore, wouldn't it be
24 correct that at most nuclear facilities there is a
25 greater design margin than at the PFS site, given

1 the ground motions they have to design against?
2 A. No. The code -- the same codes are
3 used. I mean you will come up with the same
4 margins. The only thing is you end up with smaller
5 steel beams and less reinforcing steel, and
6 whatever. But they all have the same margin
7 because they're all designed to the same codes.
8 Q. But the design basis ground motions that
9 they have to design against are different, correct?
10 They're less?
11 A. Yes.
12 MS. CHANCELLOR: Okay. I have no
13 further questions. Thank you.
14 MR. TRAVIESO-DIAZ: If I could ask a
15 follow-up question to the last question that was
16 asked.
17
18
19 FURTHER REDIRECT EXAMINATION
20 BY MR. TRAVIESO-DIAZ:
21 Q. When you said that there are no
22 facilities other than Diablo Canyon with high
23 accelerations, earthquake accelerations, you mean
24 that you are not aware of any yourself; is that
25 correct?

1 A. That is correct.

2 MR. TURK: May we have just one moment,

3 Your Honor?

4 JUDGE FARRAR: Yes.

5 MR. TURK: Your Honor, I just have one

6 clarification question.

7

8 FURTHER RECROSS-EXAMINATION

9 BY MR. TURK:

10 Q. Mr. Ebbeson, I think Ms. Chancellor had

11 asked you whether, aside from this, there were any

12 nuclear plants or nuclear facilities with higher

13 ground motions. I understood the question to be a

14 reference to Diablo Canyon. Did you understand it

15 the same way?

16 A. I understood the question as being,

17 other than Diablo Canyon, are there any other

18 plants.

19 Q. Do you know whether the design ground

20 motion for Diablo Canyon is greater or less than

21 the design ground motion for this facility with the

22 2,000-year return period?

23 A. I don't know for sure, but I believe it

24 is -- I believe it's greater, but I'm not sure of

25 that.

1 Q. The Diablo Canyon, you believe, is
2 greater than the --
3 A. Yes.
4 Q. -- the 2,000-year return period design
5 basis here?
6 A. Yes, that's my understanding, but,
7 again, I don't know that for sure.
8 MR. TURK: I just wasn't sure what the
9 record showed at the time.
10 JUDGE FARRAR: Are you aware of what the
11 design ground motion is for the other California
12 nuclear power plants? If you're not aware, that's
13 fine.
14 THE WITNESS: I'm not aware, but I'm
15 quite sure they're lower than this facility.
16 JUDGE FARRAR: Don't say that.
17 MS. CHANCELLOR: He already did.
18 That's --
19 MR. TURK: Maybe we'll just ask if he's
20 familiar with those plants such as San Onofre,
21 Rancho Seco --
22 JUDGE FARRAR: We'd really no answer
23 than a -- if you're not aware, that's a sufficient
24 answer.
25 I assume if this becomes important, the

1 Staff will have someone who can address this?

2 MR. TURK: We don't think it's

3 important, Your Honor. It's really a matter of

4 having a clear record. But in terms of whether

5 this facility is licensed or not, it doesn't matter

6 whether some other facility has a different ground

7 motion. It's whether this facility is safe.

8 That's the question.

9 JUDGE FARRAR: Any further go-rounds?

10 MS. CHANCELLOR: No, Your Honor.

11 MR. TRAVIESO-DIAZ: No.

12 JUDGE FARRAR: Well, this is a new

13 record. We've completed a witness in the afternoon

14 session before 5:00.

15 We've now done -- and you're excused,

16 sir. We appreciate your testimony.

17 THE WITNESS: Thank you.

18 JUDGE FARRAR: You're not scheduled to

19 come back?

20 THE WITNESS: Not for sure.

21 JUDGE FARRAR: You're not on another

22 witness panel?

23 THE WITNESS: Right. I don't think so,

24 no.

25 JUDGE FARRAR: All right. We thank you.

1 We've now done four panels in four days.
2 The plan would be Mr. Pomerenius and Dr. Ofoegbu
3 tomorrow?
4 MR. TURK: Yes, Your Honor.
5 JUDGE FARRAR: Is it worth taking a few
6 minutes now to get them sworn in, get the exhibits
7 in place so we can start -- have a good start
8 tomorrow, or would you rather wait?
9 MR. TURK: I think the witnesses have
10 been busy listening to all the other testimony and
11 they need to prepare now for their own, so we
12 prefer to start in the morning.
13 JUDGE FARRAR: Okay. And our plan is to
14 finish them tomorrow. Then you would take
15 Dr. Luk's deposition on Saturday, and we'd start
16 with his panel on Monday?
17 MR. TURK: That's my understanding.
18 And Ms. Nakahara has requested that we
19 start the deposition tomorrow at the attorney
20 general's office at 10:00 a.m., and that's
21 acceptable to me.
22 MR. GAUKLER: Saturday.
23 MR. TURK: Well, I'll do Saturday.
24 JUDGE FARRAR: And then, just so
25 we're -- we're clear on what our weekend assignment

1 is, so we do the two Staff panels, one on Friday
2 and one on Monday, then the three State panels?
3 MS. CHANCELLOR: That's correct.
4 MR. GAUKLER: I believe there's only two
5 State panels.
6 MS. CHANCELLOR: It's --
7 MR. GAUKLER: Oh, right, right.
8 JUDGE FARRAR: So we do the three of
9 those, and we'll finish those one a day?
10 MS. CHANCELLOR: Mr. Solomon will take
11 half an hour.
12 JUDGE FARRAR: Okay.
13 MS. CHANCELLOR: Unless the Board has
14 questions, or the Staff.
15 JUDGE FARRAR: The other two might be
16 longer?
17 MS. CHANCELLOR: Guaranteed to be
18 longer.
19 JUDGE FARRAR: Okay. We'll finish them
20 next week.
21 And what is our plan next week -- are we
22 working through -- there was some discussion of
23 switching Friday and Saturday --
24 MR. GAUKLER: Yes. We're going to have
25 Dr. Cornell testify on Saturday.

1 JUDGE FARRAR: Cornell's starting
2 Section E?
3 MR. GAUKLER: Yes.
4 MS. CHANCELLOR: When are we going to do
5 the Staff panel?
6 MR. GAUKLER: We had discussed doing the
7 Staff panel Monday morning, or I don't know how
8 much it will take. Now maybe we can start the
9 Staff panel Saturday afternoon.
10 JUDGE FARRAR: We're not talking about
11 this Saturday?
12 MR. GAUKLER: No. I'm talking about the
13 May 11th.
14 JUDGE FARRAR: Right.
15 MS. CHANCELLOR: And also possibly
16 Dr. Arabasz.
17 JUDGE FARRAR: We're assuming --
18 notwithstanding counsel's concern about the State
19 witnesses on Section D, assuming we get through
20 those by Friday morning?
21 MS. CHANCELLOR: Do you want to go off
22 the record, Judge?
23 JUDGE FARRAR: Why don't we go off the
24 record.
25 (A discussion was held off the record.)

1 JUDGE FARRAR: Then we're back on the
2 record.
3 We've just discussed some scheduling
4 matters. We seem to be moving toward a good plan
5 to get this finished in a timely fashion, so we'll
6 keep working on that and see you at 9:00 tomorrow
7 morning for the first Staff panel.
8 (The proceedings adjourned at 5:08 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: Salt Lake City, Utah

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.

/s/ Diana Kent

Diana Kent
Official Reporter
Neal R. Gross & Co., Inc.