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NUCLEAR REGULATORY COMMISSION

Title: Private Fuel Storage, LLC

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

Location: Salt Lake City, Utah

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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

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

On May 17, 2002 the above-entitled matter came on for hearing, pursuant to notice, before:

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

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

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

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I N D E X

E X A M I N A T I O N

E X H I B I T S

1 May 17, 2002 9:00 a.m.

2

3 P R O C E E D I N G S

4

5 JUDGE FARRAR: Morning everyone. We are
6 a few minutes late getting started because of a
7 coffee accident at the table Dr. Cornell is sitting
8 at. So we may have to look again at his testimony.
9 MR. SILBERG: That was "median"-sized
10 coffee.
11 MS. CHANCELLOR: And a "mean" accident.
12 JUDGE FARRAR: We met yesterday to
13 discuss future scheduling and wanted to put on the
14 record that we will be back here from the 3rd
15 through the 7th of June in this room and we are
16 looking for space on the 8th in case we have to
17 stay through Saturday. If we can't get space in
18 this room then we would adjourn for a week and
19 start up in the Board's hearing room in the NRC's
20 Rockville, Maryland headquarters for the week of
21 the 17th through the 21st, and then resuming the
22 next Monday, the 24th, until completion. That
23 would deal with what will be left after the seismic
24 testimony today, something like eight panels left
25 of the original 21. And then we would wrap up the

1 aircraft accidents. So that's the course of the
2 schedule. We have yet to decide how long the
3 parties will be given to file their briefs
4 afterwards; whether it will be six weeks for the
5 opening round and four weeks for the next, as had
6 been originally contemplated; or whether some
7 suggested yesterday, in view of the complexity of
8 the case, whether we would allow eight weeks and
9 five weeks, or something in between.
10 So with that, any preliminary matters?
11 All right then. The State, I believe, was going to
12 present Dr. Arabasz?
13 MS. CHANCELLOR: That's correct, your
14 Honor.
15 JUDGE FARRAR: Would you stand and be
16 sworn, sir. Raise your right hand.
17
18 Walter J. Arabasz,
19 having been called as a witness by the State
20 was examined and testified as follows:
21
22 EXAMINATION
23 BY MS. CHANCELLOR:
24 Q. Good morning, Dr. Arabasz.
25 A. Good morning, Ms. Chancellor.

1 JUDGE FARRAR: Do you have in front of
2 you a copy of your testimony and exhibits?
3 A. Yes, I do.
4 Q. I'd like to introduce the State's
5 testimony, State of Utah Testimony of Dr. Walter J.
6 Arabasz Regarding Unified Contention Utah L/QQ
7 dated 1, 2002. Dr. Arabasz, did you prepare this
8 testimony or was it prepared under your direction
9 and control?
10 A. Both.
11 Q. Do you have any changes to make to your
12 testimony?
13 A. No, I do not.
14 Q. Do you accept this testimony as your
15 sworn testimony in this proceeding?
16 A. I do.
17 MS. CHANCELLOR: I'd like to have
18 entered, as if read, the testimony of Dr. Arabasz.
19 JUDGE FARRAR: Any objection?
20 MR. GAUKLER: No objection, your Honor.
21 MR. TURK: No your Honor.
22 JUDGE FARRAR: All right. Then the
23 written testimony of Dr. Arabasz will be bound into
24 the record at this point as if read.
25 (Prefiled testimony of Dr. Arabasz follows.)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	)	Docket No. 72-22-ISFSI
PRIVATE FUEL STORAGE, LLC (Independent Spent Fuel Storage Installation)	)	ASLBP No. 97-732-02-ISFSI
	)	April 1, 2002

STATE OF UTAH TESTIMONY OF DR. WALTER J. ARABASZ REGARDING UNIFIED CONTENTION UTAH L/QQ (Seismic Exemption)

Q. 1: Please state your name, affiliation, and qualifications.

A. 1: My name is Dr. Walter J. Arabasz. I am a Research Professor of Geology and Geophysics at the University of Utah in Salt Lake City, Utah, and also Director of the University of Utah Seismograph Stations. I have more than 30 years' professional experience in scientific research, consulting, occasional teaching, and publishing articles in observational seismology, seismotectonics, and earthquake hazard analysis with a primary focus on Utah and the Intermountain West.

Since 1977 I have routinely provided professional consulting services on earthquake hazard evaluations for dams, nuclear facilities, and other critical structures and facilities. Since the mid-1980s I have been directly involved in methodology development and applications of probabilistic seismic hazard analysis. During the past decade I have had major involvement in assessing vibratory and fault-displacement hazards for the high-level nuclear waste repository at Yucca Mountain, including serving on a Peer Review Group for Early Site Suitability Evaluation, reviewing technical reports, and serving on expert teams for seismic source characterization for probabilistic hazard analyses.

My service on numerous national and state advisory boards and panels has included – relevant to this filing – serving on the National Research Council's Panel on Seismic Hazard Evaluation (1992-96), the Utah Seismic Safety Commission (1994 to present; chair, 1997-2001), and numerous panels and work groups under the National Earthquake Hazards Reduction Program since the early 1980s. My *curriculum vitae* is included as State's Exhibit 123.

Q. 2: What is the purpose of your testimony?

A. 2: The purpose of my testimony is to explain the basis for my professional opinion that, within my areas of expertise, the NRC Staff has presented a flawed rationale for recommending that Private Fuel Storage, LLC ("PFS") be granted an exemption from existing regulations and to elaborate on the rationale that PFS has recently presented to support its exemption request.

Q. 3: Describe, generally, your role in assisting the State in the PFS proceeding.

A. 3: I was designated one of the State's testifying experts with respect to Contention Utah L, Basis 2. This portion of the original geotechnical contention, Utah L, was incorporated into the unified contention Utah L/QQ as section B and has been resolved by stipulation. I have also been designated as a testifying witness for Section E of the unified contention; this portion of the unified contention is a consolidation of Utah L, Part B and it deals with PFS's request to the NRC to be exempted from basing their seismic design on the results of a deterministic seismic hazard analysis; instead PFS requests that it be allowed to base its seismic design on results from a probabilistic seismic hazard analysis for a 2,000-year return period.

My involvement in the PFS proceeding as a technical expert for the State has included review of the Applicant's SAR sections, and updates thereof, relating to its earthquake hazards investigation of the proposed site and relevant reports and other documents prepared by the Applicant or its contractors and submitted to the NRC or produced to the State in discovery; assisting the State in answering and preparing discovery; review of the NRC Staff's preliminary, final and supplemental Safety Evaluation Report ("SER") for the PFS facility[1] as well as the Staff's Position on Utah L (April 28, 2000).

In response to PFS's request to be exempted from 10 CFR § 72.102(f)(1), I assisted the State in preparing late filed contentions to modify basis 2 of Contention Utah L.[2] I was deposed by Private Fuel Storage, LLC ("PFS") on October 31, 2001 and I was present when, shortly thereafter, the State deposed PFS witness, Dr. C. Allin Cornell, on the appropriateness of using probabilistic seismic hazard methodology with a 2,000-year return period. When PFS filed for Summary Disposition of Utah L, Part B (November 9, 2001), I gave my primary attention to PFS's Motion, its Statement of Material Facts, and the attached declaration of Dr. C. Allin Cornell, and I provided a declaration in support of the State's

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[1] Dated December 15, 1999, September 29, 2000 and December 21, 2001 respectively.

[2] The State filed modification requests on January 26, 2000 and November 9, 2000.

December 7, 2001 Response and Opposition thereto.

Q. 4: Please describe the evolution of the seismic design basis ground motions at the PFS site?

A. 4: I first became involved in providing technical expertise to the State of Utah regarding seismic hazards at the PFS facility in August 1998. Since then, considerations by both the Applicant and the NRC Staff regarding the seismic design basis ground motions – or, for simplified reference, the design basis earthquake ("DBE") – for the PFS facility have continually evolved, providing a "moving target" for critical evaluation. Some of the noteworthy stages in this process include:

1. PFS's submission of its Safety Analysis Report in 1997 in which a "deterministic" approach was used for establishing the DBE aimed at meeting requirements of 10 CFR 72.102(f)(1).

2. PFS's Request for Exemption to CFR 72.102(f)(1) (April 2, 1999) in which PFS requested to calculate the DBE using a probabilistic seismic hazard analysis ("PSHA") and a 1,000-year recurrence interval.

3. The Staff's review of the PFS's request and finding that use of a 1,000-year return-period value was not acceptable – but that use of a PSHA with a 2,000-year return-period value could be acceptable for reasons provided by the Staff (Staff's Preliminary SER ("PSER") (December 15, 1999) at 2-44 to 2-45.

4. The Staff's finding the PSHA with a 2,000-year return period acceptable (Final SER, "FSER", September 29, 2000, at 2-41 to 2- 42);

5. PFS's changes in site-response modeling for the PFS site in March 2001, which resulted in significant changes to the 2,000-year return-period ground motions, including an increase in the peak horizontal acceleration from 0.528 g to 0.711g (*see* SER Supplement No. 2, "SSER", December 21, 2001) at 7 and 21-23).

6. PFS's Motion for Summary Disposition of Utah L Part B (November 9, 2001) in which PFS has presented, for the first time in a documented way, its own case for justifying a DBE with a 2,000-year mean return period ("MRP").

7. The Staff's continued reliance on the same rationale in its SSER as in the FSER to find acceptable a PSHA with a 2,000-year return period – despite many concerns raised by the State regarding non-conservatism in the engineering design of the PFS facility.

Q. 5: Please describe the framework of your testimony.

A. 5: I will frame my testimony as follows. First, I will briefly revisit the original issue of a deterministic seismic hazard analysis ("DSHA"). Then I will address those issues, within my scope of expertise and testimony, associated with unified Contention Utah L/QQ, Section E. In my testimony I will address issues that arose directly from arguments put forward by the Staff to justify a seismic exemption for the PFS facility (allowing a probabilistic DBE with a 2,000-year MRP) as well as new issues, relevant to my area of expertise, raised in PFS's Summary Disposition Motion. I might add that PFS's Motion for Summary Disposition provides the latest rationale offered by PFS for its seismic exemption request.

Q. 6: Do you have any comments about the Deterministic Seismic Hazard Analysis for the PFS site?

A. 6: In previous submissions to the NRC, I stated that PFS had not conducted a fully deterministic seismic hazard analysis ("DSHA") as required by 10 CFR § 72.102(f)(1) and, by reference, 10 CFR 100 Appendix A. The NRC Staff has acknowledged that the DSHA performed by Geomatrix Consultants, Inc. for the PFS facility and reported in the 1997 SAR and the updated DSHA reported in April 1999 "did not meet the deterministic requirements in 10 CFR 100 Appendix A."[3]

A later updated DSHA by Geomatrix Consultants, Inc. reported in April 2001 follows the same methodology as earlier and presumably would also not meet the deterministic requirements of 10 CFR 100 Appendix A.

The relevance of a valid DSHA, other than being required by current NRC regulations, is that it establishes a benchmark to which results of any probabilistic seismic hazard analysis can correctly be compared to evaluate the conservatism of the PSHA results, such as earlier done for the NRC Staff by Stamatakos et al.[4]

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[3] NRC Staff's Objections and Responses to the "State of Utah's Sixth Set of Discovery Requests Directed to the NRC Staff (Utah Contention L)" (February 14, 2000), Response to Requests for Admissions 1 and 2 at 7-8.

[4] *See* Stamatakos, Chen, McCann & Chowdhury, *Seismic Ground Motion and Faulting Hazard at Private Fuel Storage Facility in the Skull Valley Indian Reservation, Tooele County, Utah – Final Report* (September 1999) at 2-46.

Q. 7: Please describe your concerns about Subsection E.1 of the Unified Contention Utah L/QQ.

A. 7: Unified Contention L/QQ, Sub-section E.1 states:

> The requested exemption fails to conform to the SECY-98-126 (June 4, 1998) rulemaking plan scheme, i.e., only 1000-year and 10,000-year return periods are specified for design earthquakes for safety-important systems, structures, and components (SSCs) – SSC Category 1 and SSC Category 2, respectively – and any failure of an SSC that exceeds the radiological requirements of 10 C.F.R. § 72.104(a) must be designed for SSC Category 2, without any explanation regarding PFS SSC compliance with section 72.104(a).

The scope of my testimony with respect to subsection 1 excludes radiological dose consequences. Subsection 2, which also deals with radiological dose limits, is similarly outside the scope of my testimony.

The State has challenged the NRC Staff's proposal to grant an exemption request to PFS that would allow use of a DBE with a 2,000-year return period; the State argued, in part, that the NRC Rulemaking Plan set forth in SECY-98-126 (June 4, 1998) provides only two alternatives for design basis ground motions: a 1,000-year return period or a 10,000-year return period.[5] The Staff has rejected the use of a 1,000-year return period. FSER at 2-41. The Commission has instructed that the State "may not rely solely on the rulemaking plan [SECY-98-126] to prove its contention." CLI-01-12, 53 NRC 416 (June 14, 2001), slip op. at 16. At the same time, the Commission instructed that "PFS is not bound by the rulemaking plan, but it does have the burden to show that the 2000-year design standard is sufficiently protective of public safety and property." Id.

In its Motion for Summary Disposition PFS argued, in part, that non-compliance of a 2,000-year return period with SECY-98-126 is now mooted because the Staff has recommended a Modified Rulemaking Plan in which use of a DBE with a 2,000-year MRP is proposed for dry-cask ISFSIs. Whether the latter indeed moots the issue is questionable in light of the Commission's recent issuance of Staff Requirements Memorandum[6] relating to SECY-01-0178 (September 26, 2001), wherein the Commission writes:

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[5] State of Utah's Request for Admission of Late-filed Modification to Basis 2 of Utah Contention L (November 9, 2000) ("Request for Modification of Utah L") at 6-7.

[6] Staff Requirements Memorandum to William D. Travers dated November 19, 2001, included as State's Exhibit 124.

> Central to this rulemaking is the determination of the mean annual exceedance probability of an earthquake at a proposed ISFSI. The proposed rule should solicit comment on a range of probability of exceedance levels from 5.0E-04 through 1.0E-04. Staff should undertake further analysis to support a specific proposal.

Q. 8: What do you consider to be the key issue in subsection 1?

A. 8: The key contested issue linked to subsection 1 is the validity of PFS's claim that it has met the Commission's requirement to show that "the 2000-year design standard is sufficiently protective of public safety and property."[7] PFS's claim fundamentally rests on the proposition that sufficient protection "depends on both the probability of occurrence of the seismic event (often expressed as the mean annual probability of exceedence or "MAPE" of a given earthquake level) and the level of conservatism incorporated in the design procedures and criteria."[8] I agree with the proposition – but the latter critical part of PFS's claim of sufficient protection is challenged by the State's engineering and dynamic analyses experts, who dispute PFS assertions that it has demonstrated adequate conservatism in design of SSCs at the PFS facility. Here, and ultimately at the end of my testimony, I defer to these experts for more complete discussion of their disputes, which go the heart of "appropriately conservative" and "sufficiently protective" design of the PFS facility. *See* Testimony of Dr. Steven F. Bartlett and Dr. Farhang Ostadan (Dynamic analysis); Dr. Ostadan and Dr. Mohsin R. Khan (Cask stability), and Dr. Ostadan and Dr. Bartlett (Lack of design conservatism) (hereafter "Engineering and Dynamic Analyses Expert Testimony").

Q. 9: Please describe your concerns about Subsection E.3 of the Unified Contention Utah L/QQ.

A. 9: Subsection E.3 of the unified Contention Utah L/QQ, states:

> The staff's reliance on the reduced radiological hazard of stand-alone ISFSIs as compared to commercial power reactors as justification for granting the PFS exemption is based on incorrect factual and technical assumptions about the PFS facility's mean annual probability of exceeding a safe shutdown earthquake (SSE), and the relationship between the median and mean probabilities for exceeding an SSE for central and eastern United States commercial power reactors and the median and mean

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[7] PFS's Motion for Summary Disposition at 10.

[8] Id. at 6.

probabilities for exceeding an SSE for the PFS facility.

In its Request for Modification of Utah L, the State evaluated the rationale put forward by the Staff in its September 2000 SER to justify a DBE with a 2,000-year return period for the PFS facility and characterized the Staff's reasons as *ad hoc* and either flawed or not compelling.[9] Subsection 3 concerns a series of three statements made by the Staff leading to the conclusion: "On the basis of the foregoing, the mean annual probability of exceedance for the PFS Facility may be less than [sic] 10^{-4} per year." FSER at 2-42. The Staff's flawed reasoning, as presented, was to posit that a design ground motion (for an SSE) at the PFS site which had a median reference probability of exceedance of 10^{-5} as defined in Regulatory Guide 1.165 would be the same as a design ground motion with a mean annual probability of exceedance of 10^{-4}.

Q. 10: Do you believe there has been a misperception about the issue the State has raised in Sub-section 3?

A. 10: Yes I do.

In support of PFS' Motion for Summary Disposition, Dr. Cornell challenges Subsection 3 – formerly Utah L, Part B, Basis 3 – on various grounds and concludes that "the argument raised by the State in Basis 3 is inconsequential and irrelevant to the issue whether a 2,000-year earthquake should be used at the PFSF." Declaration of C. Allin Cornell ("Cornell Dec.") at ¶40. What remains relevant is the benchmark for an SSE at the PFS site if the DBE for an ISFSI is to be compared to that benchmark, as was done by the Staff in its September 2000 SER. Absent a determination by the Staff along the lines of Dr. Cornell's beliefs of what the Staff "today would both select and prefer" (Cornell Dec. ¶35), or "can reasonably be expected to revert to" (id. ¶37), or "would likely conclude" (id. ¶38), or "would today not only accept but prefer" (id. ¶39), the State relied on guidance in Regulatory Guide 1.165 and on corresponding commentary by the Staff. Murphy et al., *Revision of Seismic and Geologic Siting Criteria*, Transactions of the 14th International Conference on Structural Mechanics in Reactor Technology (August 17-22, 1997), 1-12, included as State's Exhibit 125.

Dr. Cornell states that "The provision in Regulatory Guide 1.165 that a median value of 10^{-5} could be used is only the result of historical circumstances . . . [involving] a significant discrepancy in the assessment of the mean estimates between the two major CEUS seismic hazard studies then available . . . [which has] since been resolved . . ." (Cornell Dec. ¶36). This assertion is at odds with the following commentary by the Staff in 1997:

It should be noted that this RP [Reference Probability of 1E-5/yr] is

[9] Request for Modification of Utah L at 7.

> calibrated with the past design bases, it is not derived directly from any quantitative risk or safety goals. In fact, one of the reasons for using the median hazard curve in the regulatory guide approach is that the controlling earthquakes resulting from the de-aggregation of the median hazard curve are very similar to those used in the past licensing from the deterministic procedures.

Murphy et al. (1997) op. cit. at 7.

A similar commentary by the Department of Energy notes the following:

> In developing Regulatory Guide 1.165, NRC staff considered whether to define the reference probability as a mean or median value. The mean value has the advantage of better reflecting the uncertainty in the seismic hazard evaluation (i.e., it is sensitive to the range of interpretations of seismic source zone configurations, earthquake magnitude recurrence relationships, and ground motion attenuation relationships). However, precisely because the median is less sensitive to uncertainties, it provides a more stable regulatory benchmark than does the mean. Another consideration leading to the staff's preference for the median was the finding that, when median hazard curves were disaggregated, the magnitudes and distances of the controlling earthquakes tended to be more sharply defined and to agree better with the safe shutdown earthquakes of the selected plants than when mean hazard curves were disaggregated (Bernreuter et al. 1996).

DOE Topical Report YMP/TR-003-NP, 1997) at §3.1.2.1; *see* Exh. 3 to Cornell's Dec. in PFS's Motion for Summary Disposition at pages 2-3 of 7.

From the above discussion, it is not the State's argument that a median estimate should be used "in lieu of the mean estimate for the design of nuclear power plants, and similarly for ISFSIs . . ." PFS's Statement of Material Facts on Which No Genuine Dispute Exists at ¶19. Rather, the argument rests with the Staff's guidance in Regulatory Guide 1.165. Therein the procedure is specified for determining the reference probability, the annual probability of exceeding the SSE, at future nuclear power plants: "This reference probability [median annual exceedance probability of 1.0E-05] is also to be used in conjunction with sites not in the Central and Eastern United States (CEUS) . . . However, the final SSE at a higher reference probability may be more appropriate and acceptable . . . for some sites . . . Reference B.4 includes a procedure to determine an alternative reference probability on the risk-based considerations; its application will also be reviewed on a case-by-case basis." Regulatory Guide 1.165 at 12.

Q. 11: Please describe your concerns about Subsection E.4 of the Unified Contention Utah L/QQ.

A. 11: Subsection E.4 of the unified contention Utah L/QQ, states:

> In supporting the grant of the exemption based on 2000-year return period, the staff relies upon United States Department of Energy (DOE) standard, DOE-STD-1020-94, and specifically the category-3 facility SSC performance standard that has such a return period, notwithstanding the fact the staff categorically did not adopt the four-tiered DOE category scheme as part of the Part 72 rulemaking plan.

The Staff's reliance on DOE-STD-1020-94 in its December 1999 PSER, its September 2000 FSER and its December 21, 2000 SSER to justify a DBE with a 2,000-year return period for the PFS facility suffers from two circumstances. First, DOE-STD-1020-94 was fully available to, and was referenced by, the Staff when it drafted its 1998 Rulemaking Plan (SECY-98-126). Yet the Staff chose in its 1998 Rulemaking Plan not to propose the use of a 2,000-year return period for ISFSIs. Second, the Staff cited the 2,000-year return period (mean annual probability of exceedance of 5×10^{-4}) for Performance Category-3 ("PC3") SSCs without acknowledging that in the design approach of DOE-STD-1020-94, the MAPE for PC3 is fundamentally coupled to a target seismic performance goal of 1×10^{-4} (the annual probability of exceedance of acceptable behavior limits). DOE-STD-1020-94 at B-7 to B-8.

PFS's Motion for Summary Disposition is replete with acknowledgments that, just as in the overall design approach of DOE-STD-1020-94, there should be a coupling of the hazard exceedance probability and a level of conservatism in design procedures that together ensure a desired performance goal. For example:

> [T]he risk of failure of a facility or structure depends on both the probability of occurrence of the seismic event (often expressed as the mean annual probability of exceedence or "MAPE" of a given earthquake level) and the level of conservatism incorporated in the design procedures and criteria. Cornell Dec. ¶13.

PFS's Motion for Summary Disposition at 6.

> As discussed above, the level of safety achieved depends on both the earthquake threat definition and the design procedures and criteria utilized to protect against that threat; thus, looking only at the earthquake return period is incorrect.

Id. at 15.

> Two factors are relevant to determining the likelihood of seismic failure of a facility or structure due to an earthquake event. These are (1) the seismic design basis earthquake ("DBE") for the facility or structure and (2) the conservatisms embodied in the codes and standards applicable to its seismic design. Cornell Dec. ¶¶18-19; see also Arabasz Dep. at 41-42, 81-84, 115-117.

PFS's Statement of Material Facts on Which No Genuine Dispute Exists, ¶12.

> While the risk-graded approach is implemented in somewhat different ways in the various fields of seismic design, the standards of practice almost invariably utilize a DBE defined at some mean annual probability of exceedance and a set of design procedures and acceptance criteria.

Cornell Dec. ¶18.

> Both the MAPE of the DBE and the level of conservatism incorporated in the design procedures and criteria affect the failure probability of seismically-designed facilities and structures. . . . [I]t is important to understand that both the MAPE and the level of conservatism in the design procedures and criteria must be considered when assessing and comparing the safety implications of various seismic design standards.

Cornell Dec. ¶19.

The discovery and deposition process for Contention Utah L, Part B, has led me to the opinion that determination of the mean annual exceedance probability (or equivalent return period) of a DBE for the proposed PFS facility, and whether it ensures sufficient protection, cannot be made independent of an evaluation of conservatism (or non-conservatism) in design procedures.

Q. 12: Do you have any comment on DOE Standard 1020-01?

A. 12: A final point of particular relevance to Subsection 4 is the recent release of Revised DOE Standard 1020-2001 for review and comment. Memorandum from Richard L. Black to Technical Standards Program Managers dated August 22, 2001. For PC3 the revised standard changes the MAPE from 5×10^{-4} (2,000-year return period) to 4×10^{-4} (2,500-year return period) while retaining the same target seismic performance goal of 1×10^{-4} per year for sites not near tectonic plate boundaries. Revised DOE-STD-1020-2001,

Table C-3 at C-6, included as State's Exhibit 126. The new DOE-STD-1020-2001 was released before the Staff issued the SSER yet the Staff makes no mention of it and still relies on the 1994 version.

Q. 13: Please describe your concerns about Subsection E.5 of the Unified Contention Utah L/QQ.

A. 13: Subsection E.5 of the unified contention Utah L/QQ, states:

> In supporting the grant of the exemption based on 2000-year return period, the staff relies upon the 1998 exemption granted to DOE for the Idaho National Engineering and Environmental Laboratory (INEEL) ISFSI for the Three Mile Island, Unit 2 (TMI-2) facility fuel, which was discussed in SECY-98-071 (Apr. 8, 1998), even though that grant was based on circumstances not present with the PFS ISFSI, including (a) existing INEEL design standards for a higher risk facility at the ISFSI host site; and (b) the use of a peak design basis horizontal acceleration of 0.36 g that was higher than the 2000-year return period value of 0.30 g.

In my opinion, circumstances specific to the seismic exemption awarded to DOE for the TMI-2 ISFSI at INEEL (SECY-98-071, April 8, 1998) do not justify using the exemption as a compelling precedent for the PFS exemption request.

The design basis of an existing higher risk facility, namely the Idaho Chemical Processing Plant ("ICPP"), at the host site for the TMI-2 ISFSI was a definite consideration in DOE's proposal of a DBE for the ISFSI.[10] Under existing DOE design standards at INEEL, based on DSHA results from the 1970s, the peak design basis horizontal acceleration for the ICPP was set at 0.36 g, including effects of soil amplification.[11] DOE proposed to use the same acceleration for the DBE for the TMI-2 ISFSI. In an analysis for the NRC, the regulatory problem was stated this way:

> [T]he DOE-proposed design PHA of 0.36 g does not bound the most recent 84th-percentile deterministic value of 0.56 g and 10,000-yr return period probabilistic value of 0.47 g. Therefore, a judgment

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[10] Chen and Chowdhury, *Seismic Ground Motion at Three Mile Island Unit 2 Independent Spent Fuel Storage Installation Site in Idaho National Engineering and Environmental Laboratory – Final Report* (June 1998), excerpts included as State's Exhibit 127, at 4-1.

[11] Id.

> of whether the DOE-design approach is acceptable depends on whether there are regulatory and technical bases to accept an ISFSI-design value that bounds the 50th-percentile deterministic value and the 2,000-yr return period probabilistic value.[12]

Ultimately, DOE was allowed to use a design earthquake with 0.36 g peak horizontal acceleration (together with an appropriate response spectrum) for the TMI-2 ISFSI. SECY-98-071 at 3. What the NRC approved in terms of a design-basis ground motion was a design value higher than the 2,000-year return period mean ground motion from the PSHA. In their analysis for the NRC, Chen and Chowdhury provided information showing that the 0.36 g horizontal design value for the ISFSI soil site lies between the 2,000-year probabilistic value of 0.30 g and the 10,000-year probabilistic value of 0.47 g. Id. at 3-5 (State's Exh. 127). Although the report by Chen and Chowdhury does not contain sufficient information to identify precisely the return period corresponding to 0.36 g on soil, the bounding probabilistic values for 2,000 years (0.30 g) and 10,000 years (0.47 g) suggest that 0.36 g corresponds to a return-period value on the order of three to four thousand years (the precise return period would have to be determined from the original PSHA data). Thus, a 2,000-year return period for the PFS facility would be significantly lower than what was approved for the INEEL ISFSI.

Another factor that significantly influenced the Staff's approval of the TMI-2 ISFSI exemption was a site-specific radiological risk analysis coupled with "the lack of a credible mechanism to cause a failure." SECY-98-071 at 3.

On April 8, 1998, the NRC informed the DOE, "Since the rulemaking to revise the Part 72 seismic requirement for ISFSIs is unlikely to be completed before issuance of the TMI-2 ISFSI license, the staff intends to grant the exemption as requested if the Environmental Assessment (EA) is favorable." SECY-98-071 at 3. Two months later in June 1998, the Part 72 Rulemaking Plan (SECY-98-126) was released with allowance only for design basis ground motions with mean annual probabilities of exceedance corresponding to return periods of 1,000 years or 10,000 years, depending on risk. This sequence of events, in my opinion, does not support PFS's assertion that "there is no doubt that at the time the INEEL exemption was approved, the NRC Staff and the Commission expected (and intended) that it would serve as a precedent towards the granting of similar exemptions in the future." PFS's Motion for Summary Disposition at 14.

Q. 14: Please describe your concerns about Subsection E.6 of the Unified Contention Utah L/QQ.

A. 14: Subsection E.6 of the unified contention Utah L/QQ, states:

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[12] Id. at 4-2.

> Because (a) design levels for new Utah building construction and highway bridges are more stringent; and (b) the PFS return period is based on the twenty-year initial licensing period rather than the proposed thirty- to forty-year operating period, the 2000-year return period for the PFS facility does not ensure an adequate level of conservatism.

PFS's witness, Dr. Cornell, addresses the relative comparison of a DBE with a 2,000-year mean return period proposed for the PFS facility with the higher return period value of approximately 2,500 years required by the International Building Code 2000. Cornell Dec. ¶46. He states:

> One should not draw the erroneous conclusion, however, that this difference in the definition of the DBE implies a lower probability of failure for SSCs designed to IBC-2000 versus those, such as the PFSF, designed to the 2,000-year MRP and the NRC's SRP design procedures and criteria.

Id. Granting that "the safety achieved depends on *both* the DBE MRP and the design procedures and criteria utilized" (id.), the contested issue once again becomes the conservatism (or non-conservatism) in design of SSCs at the PFS facility. As in Answer No. 8 above, I defer the latter issue to the State's engineering and dynamic analyses experts (including implications for the analogous situation of comparing a 2,000-year MRP DBE for the PFS facility with a 2,500-year MRP DBE for new highway bridges in Utah). *See* Engineering and Dynamic Analyses Expert Testimony.

I might add that the Staff's comparison between probabilistic ground motions used for the design of new Interstate 15 highway bridges in the Salt Lake Valley and those proposed for use at the PFS site is partially erroneous and, in any case, irrelevant due to the many differences between the two sites. *See* SSER at 18.

Part (b) of Subsection 6 (the significance of a 20-year initial licensing period versus a 30- to 40-year total operational period) concerns a metric the Staff put forward for justifying the adequacy of a 2,000-year return period for seismic design of the PFS facility, namely, a 99-percent probability that the DBE not be exceeded in the 20-year licensing period of the facility. The Staff wrote:

> Considering the radiological safety aspects of a dry spent fuel storage facility, conservative peak ground motion values that have a 99 percent likelihood of not being exceeded in the 20-year licensing period of the facility are considered adequate for its seismic design. This exceedance probability corresponds to a return period of 2,000 years.

PSER at 2-45. The Staff again relies on this same metric in its recent Modified Rulemaking Plan as one basis to justify the proposed mean annual probability of 5×10^{-4} (return period of 2,000 years) for a DBE for dry-cask ISFSIs. Attachment to SECY-01-0178 at 7. Therein, the Staff argues:

> The total probability of exceedance for a design earthquake at an ISFSI facility with an operational period of 20 years (20 years x 5.0E-04 = 1.0E-02) is the same as the total probability of exceedance for an earthquake event at the proposed pre-closure facility at Yucca Mountain with an operational period of 100 years (100 years x 1.0E-04 = 1.0E-02).

Id. Using this metric, a facility with an operational life of 40 years would have to have a DBE with a mean return period of 3,980 years. State of Utah's Objections and Responses to Staff's First Set of Formal Discovery Requests to State of Utah (November 5, 2001), Answer to Interrogatory No. 1 at 8-10.

PFS's witness, Dr. Cornell, attacks Subsection 6(b) of Utah L (now E.6(b) of Unified Contention Utah L/QQ) stating:

> This contention is unfounded because in virtually all areas of public safety hazards are measured as annual probabilities (or frequencies) of occurrence, regardless of the length of the activity in question, the exposure time, the estimated facility life, or the licensing duration [Ref. 12 (Paté-Cornell paper)].

Cornell Dec. ¶49. In my deposition, I deferred to probability experts, including Dr. Cornell, when asked, "Do you have an opinion as to whether risks should be expressed on an annual basis or the total life of a facility?" Arabasz Dep. at 51-52. However, I beg to differ with Dr. Cornell's statement above and will elaborate.

Q. 15: Please elaborate on how considerations of seismic hazards in areas of public safety commonly take into account the exposure time and not just the annual probabilities (or frequencies) of occurrence.

A. 15: One of the well-established standards for portraying ground-shaking hazard in the United States is the suite of national seismic hazard maps published by the U.S. Geological Survey. "The hazard maps depict probabilistic ground motions and spectral response with 10%, 5%, and 2% probabilities of exceedance (PE) in 50 years." *National Seismic-Hazard Maps: Documentation June 1996, USGS Open-File Report 96-532* at 1. These maps provide reference ground motions for the International Building Code 2000. Dr. Cornell and I were co-members of a Review Panel for the USGS national maps in 1996.

Another well-established standard linked to building codes is the *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures, 1997 Edition (FEMA 303)* ("Provisions"). The Commentary to the Provisions states:

> In past editions of the *Provisions*, seismic hazards around the nation were defined at a uniform 10 percent probability of exceedance in 50 years . . . . While this approach provided for a uniform likelihood throughout the nation that the design ground motion would not be exceeded, it did not provide for a uniform margin of failure for structures designed to that ground motion. . . . The approach adopted in these *Provisions* is intended to provide for a uniform margin against collapse at the design ground motion. . . . For most regions of the nation, the maximum considered earthquake ground motion is defined with a uniform likelihood of exceedance of 2 percent in 50 years (return period of about 2500 years.)

Provisions, Part 2— Commentary at 37.

The National Research Council's Panel on Seismic Hazard Analysis noted the following:

> [A]TC-3 (Applied Technology Council, 1978) has suggested the design seismic hazard level should have a 10 percent probability of exceedance in 50 years, which corresponds to an annual exceedance probability of about 2×10^{-3}. . . . The proposed Department of Defense tri-services seismic design provisions (Joint Departments of Army and Air Force, USA, 1985) suggests [sic] for category II facilities a dual level for the design seismic hazard. Such facilities should remain essentially elastic for seismic hazard with about a 50 percent probability of exceedance in 50 years or about a 1×10^{-2} annual exceedance probability and should not fail for a seismic hazard that has about a 10 percent probability of exceedance in 100 years . . ."

Panel on Seismic Hazard Analysis, *Probabilistic Seismic Hazard Analysis*, National Academy Press, Washington, D.C. (1988) at 31-32.

Procedures for estimating the probability of exceeding some level of ground motion during an exposure period of interest are commonly given for design guidance. For example, DOE-STD-1020-94 includes such a procedure at A-1, and Leon Reiter in his text, *Earthquake Hazard Analysis*, similarly includes such a procedure, including a graph from NUREG/CR-1582, 2 (1980), for relating return period, period of interest and desired

probabilities of exceedance during the period of interest. L. Reiter, *Earthquake Hazard Analysis*, Columbia University Press (1990) at 185.

The cited paper by Paté-Cornell does not convincingly establish as a norm for public safety that "hazards are measured as annual probabilities (or frequencies) of occurrence, regardless of the length of the activity in question, the exposure time, the estimated facility life, or the licensing duration." Cornell Dec. ¶49. First, in the context of noting that "current PRA [probabilistic risk analysis] methodology tends to focus on the technical causes of system failure" (while ignoring human and organizational factors), Paté-Cornell writes: "Classical technical PRA's tend to focus on the probability that an extreme value of the loads to which a system may be exposed (during a given year or lifetime) exceeds its capacity." Paté-Cornell paper at 148, footnote 4, underlining added. Second, while hardly a commentary on "virtually all areas of public safety," the paper reviews five precedents as examples of safety targets: (a) nuclear power plants in the U.S., (b) cancer risks in the U.S., (c) offshore oil and gas industry in Norway, (d) fatality accident rate in the U.K., and (e) the Dutch government standards. Significantly, cases (b) and (d) involve risk measured per individual or worker lifetime. In case (c) the Norwegian Petroleum Directorate temporarily adopted a severe-accident criterion in terms of an annual probability of major initiators of platform failure but "recently backed away from their severe-accident criterion . . . because this criterion was leading to a 'numbers game' that seemed to be distracting both the industry and the regulators from fundamental safety issues. . ." Id. at 150. Third, after discussing issues that have emerged in recent years in safety debate, Paté-Cornell proposes an approach to a global safety strategy, of which one element (of six) is that "it should be ensured that the *annual probability of catastrophic failure* (the severe accident criterion) is less than a specified threshold, e.g., 10^{-4} per year." Id. At 151. Fourth, the cited paper includes discussion of "time horizon" as a relevant risk factor, albeit in the context of shorter lifetime of aging facilities versus new ones.

Dr. Cornell attempts to bolster his argument by noting that "risk acceptance guidelines promulgated by the NRC" (for nuclear power plants) are in terms of annual risk for Core Damage Frequency and Large Early Release Frequency. Nevertheless, within a context of evolving regulatory guidance for ISFSIs, the Staff itself uses the metric of total probability of exceedance during a 20-year operational period to justify a DBE with a 2,000-year mean return period for dry-cask ISFSIs. Attachment to SECY-01-0178 at 7, included as State's Exhibit 128.

Finally, Dr. Cornell explains the reasons for focusing on annual risks in making safety decisions, in part, because "any facility providing a needed service will, at the end of its operating life, most likely be replaced by some other facility used for the same purposes with its own, similar risks." Cornell Dec. ¶49. While consideration of risk involving where spent fuel is now stored or may eventually be stored in the future at Yucca Mountain may be relevant for a societal global safety strategy (such as described in the Paté-Cornell paper), the issue at hand is a risk-acceptance decision specific to the PFS site.

Q. 16: Do you have anything further to add?

A. 16: In my testimony I have attempted to systematically address each of the subsections, within my scope of expertise and testimony, associated with unified contention Utah L/QQ, Section E. In my opinion, the key contested issue is the validity of PFS's claim that it has met the Commission's requirement to show that "the 2000-year design standard is sufficiently protective of public safety and property" as called for by the Commission in CLI-01-12. PFS's claim fundamentally rests on the proposition that sufficient protection "depends on both the probability of occurrence of the seismic event (often expressed as the mean annual probability of exceedence or "MAPE" of a given earthquake level) and the level of conservatism incorporated in the design procedures and criteria."[13] I agree with the proposition – but the latter critical part of PFS's claim of sufficient protection is challenged by the State's engineering and dynamic analyses experts, who dispute PFS assertions that it has demonstrated adequate conservatism in design of SSCs at the PFS facility. I defer to these experts for more complete discussion of their disputes, which go the heart of "appropriately conservative" and "sufficiently protective" design of the PFS facility. *See* Engineering and Dynamic Analyses Expert Testimony.

Q. 17: Does this conclude your testimony?

A. 17: Yes.

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[13] PFS's Motion for Summary Disposition at 6.

1 (EXHIBITS-123-128 WERE MARKED.)

2 Q. And then attached to Dr. Arabasz's

3 testimony, Exhibits 123 through 128. I will

4 describe all of those. 123 is Dr. Arabasz's

5 curriculum vitae. Is this correct, Dr. Arabasz?

6 A. It is.

7 Q. Exhibit 124 is a one-page memorandum

8 dated November 19, 2001 from the NRC. William

9 Travers to the secretary of the NRC. The subject

10 is the Staff requirements memo for SECY 01-178.

11 Exhibit 125 is a paper that Dr. Arabasz

12 refers to in his testimony. It is a paper by

13 Andrew Murphy, et al, 14th International Conference

14 on Structural Mechanics in Reactor Technology,

15 Lyon, France, August 17-22, 1997, Paper Number 717,

16 consisting of the cover sheet, pages 717-1 through

17 717-12.

18 Exhibit 126, memorandum dated August 22,

19 2001 from the Department of Energy from a Richard,

20 I guess it is "Black". Richard L. Black, director.

21 And table -- with attachment page C-6 which is

22 Table C-3.

23 Exhibit 127 is an excerpt from CNWRA

24 98-007, Seismic Ground Motion at Three Mile Island

25 Unit 2 ISFSI, by Chairman Chowdhury; cover pages

1 plus pages 3-5, 4-1, and 4-2.

2 Exhibit 128 is Rulemaking Issue SECY

3 01-178 dated September 26, 2001, consisting of a

4 cover page and pages -- the cover page of the

5 Modified Rulemaking Plan, and Page 7.

6 I'd like to offer these exhibits into

7 evidence, your Honor.

8 JUDGE FARRAR: Any objection?

9 MR. TURK: I have some objections, your

10 Honor.

11 JUDGE FARRAR: Okay. Mr. Gaukler, will

12 you have some?

13 MR. GAUKLER: I will not have any beyond

14 the Staff.

15 THE WITNESS: Am I allowed to comment at

16 this point?

17 JUDGE FARRAR: If your counsel asks you

18 to, which she just did.

19 MS. CHANCELLOR: Why don't we wait and

20 see what Mr. Turk's objections are and maybe we can

21 focus the comments.

22 JUDGE FARRAR: Well, 123 was the resume.

23 I take it that is no problem?

24 MR. TURK: No objection.

25 JUDGE FARRAR: Okay. That will be

1 admitted.

2 (EXHIBIT-123 WAS ADMITTED.)

3 Q. Exhibit 124 is the Staff Requirements,

4 the Modified Rulemaking. Any objection?

5 MR. TURK: Your Honor, it's in evidence

6 already. Both that and the SECY paper, Number 128,

7 are part of a Staff exhibit in full. The State is

8 proffering certain pages of it.

9 JUDGE FARRAR: Does the State testimony

10 refer to these?

11 MS. CHANCELLOR: Yes, it does, your

12 Honor.

13 JUDGE FARRAR: Mr. Turk, then we have

14 the same problem we have had before; that if the

15 testimony refers to it, then if we don't have it

16 in, the record will lack some semblance of order.

17 I suppose if --

18 MR. TURK: For the record --

19 JUDGE FARRAR: The remedy for this in

20 future cases might be in some of these documents

21 that are an essential part or background of the

22 case, that we should have them all admitted early

23 on as -- no, that still wouldn't solve it. You

24 would still have to refer to it in your testimony.

25 Go ahead, Mr. Turk.

1 MR. TURK: I would note that if you do
2 admit it, even though it is duplicative and
3 repetitious, that we should note that these
4 documents are part of Staff Exhibit U which is a
5 letter from Chairman Meserve to Dr. Nielson and Mr.
6 Silberg dated November 27, 2001.
7 JUDGE FARRAR: At this point I think
8 even though it is duplicative, the way we have been
9 doing this it makes the record clearer, because the
10 testimony refers to it, to let it in. But we will
11 have in mind that the full document is in Staff
12 Exhibit U. So we will let the exhibit in on that
13 basis.
14 (EXHIBITS-124 AND 128 WERE ADMITTED.)
15 MS. CHANCELLOR: I'd like to make a
16 comment, your Honor, about State's Exhibit 126, and
17 maybe this was what Dr. Arabasz was going to get
18 at. At the time we filed our testimony, this was a
19 draft of the DOE guidance document 1020, and since
20 this time there is a final draft of this document.
21 JUDGE FARRAR: Wait a minute.
22 MS. CHANCELLOR: 126? We are not up to
23 that yet?
24 JUDGE FARRAR: No.
25 MS. CHANCELLOR: Sorry.

1 JUDGE FARRAR: 125 is the international
2 paper. Any objection on that?
3 MR. TURK: Yes, your Honor. I believe
4 we objected to this in our motion in limine. And
5 if I may conduct one or two questions in the way of
6 Voir Dire?
7 JUDGE FARRAR: Okay. Is the Applicant
8 also going to object?
9 MR. GAUKLER: I believe so. We'll
10 follow the Staff in this one.
11 JUDGE FARRAR: Okay.
12 MS. CHANCELLOR: Could I explain to
13 Dr. Arabasz what voir dire is?
14 JUDGE FARRAR: Yes.
15 MS. CHANCELLOR: Dr. Arabasz, Mr. Turk
16 will ask you a few questions about this exhibit to
17 understand the basis of why this is being attached
18 to your testimony.
19 THE WITNESS: May I comment now?
20 MS. CHANCELLOR: No. You need to --
21 THE WITNESS: If I may explain, my
22 request to comment goes back to your
23 characterization of my authorship or direction of
24 my testimony.
25 MS. CHANCELLOR: I beg your pardon.

1 THE WITNESS: And it also includes the
2 attachments.
3 MS. CHANCELLOR: Go ahead and comment.
4 THE WITNESS: The characterizing that my
5 testimony is authored by me and parts of it, that
6 under my direction and control is completely my
7 responsibility to acknowledge here, and I do that.
8 With the attachments, the attachments prepared by
9 Counsel, they weren't directed by me to be
10 constructed or entered. But I acknowledge
11 responsibility insofar as they are included in my
12 testimony.
13 JUDGE FARRAR: Right. We appreciate
14 that. Then maybe on this specific one, Ms.
15 Chancellor, where is the reference --
16 MS. CHANCELLOR: It's on Page 7,
17 Question 10, your Honor, of the testimony. And
18 this deals with the difference between -- this gets
19 back to our old friend the reference probability,
20 meeting a need.
21 JUDGE FARRAR: Ms. Chancellor, I'm not
22 sure at this point how this ties in. So why don't
23 we do this. Mr. Turk, why don't you ask your
24 questions, and Ms. Chancellor, you can do your Voir
25 Dire, and we will see exactly how the reference

1 ties in here.

2 Dr. Arabasz, your name is not on this

3 report, the proposed Exhibit 125?

4 THE WITNESS: That is correct.

5 JUDGE FARRAR: So you had nothing to do

6 with preparing that?

7 THE WITNESS: No.

8 JUDGE FARRAR: But I take it you are

9 familiar with it?

10 THE WITNESS: Yes.

11 MR. TURK: Go ahead, Mr. Turk.

12 MR. TURK: You asked one of the

13 questions I was going to ask.

14

15 VOIR DIRE EXAMINATION

16 BY MR. TURK:

17 Q. You had nothing to do with the

18 preparation of 125, the Murphy paper; correct?

19 A. Preparation of the exhibit or the paper?

20 Q. The paper itself?

21 A. Correct.

22 Q. And your only knowledge of this paper is

23 based upon your reading of it; correct?

24 A. That is correct.

25 Q. In your testimony you refer to this on

1 several occasions as commentary by the Staff. Is
2 that correct, on Page 7 of your testimony?
3 A. That's correct.
4 Q. In fact, you recognize that this
5 publication is not a document of the NRC staff? Do
6 you know that?
7 A. I'll have to accept the distinction
8 between the authors being identified in their
9 institutional affiliation with the U.S. Nuclear
10 Regulatory Commission.
11 Q. So the authors are employed by the NRC.
12 Is that your understanding?
13 A. That is correct.
14 Q. You understand this to be a publication
15 by the NRC or by the NRC staff?
16 A. As we just explained, publication by
17 employees of the NRC.
18 Q. But you recognize it is not an official
19 paper of the NRC staff or of the NRC itself?
20 A. I will accept your characterization of
21 it as such.
22 Q. I'm not asking you to accept my
23 characterization. I'm asking your understanding.
24 JUDGE FARRAR: Mr. Turk, is what is
25 important his understanding or our understanding?

1 MR. TURK: Your Honor, he cites this
2 paper in several places in his testimony as being a
3 Staff position. You'll see that in Answer 10, the
4 first paragraph, three lines from the bottom of
5 that first paragraph. He says it is corresponding
6 commentary by the Staff. Again in the second
7 paragraph in Answer 10, the tail end, he quotes
8 from the paper. He calls it again commentary by
9 the Staff in 1997. Again on Page 8 he cites --
10 well, he provides a citation to it as Murphy et al,
11 1997 at 7. He relies upon it, apparently, in his
12 testimony with the view that this is the NRC
13 Staff's position. And I'm asking the witness
14 whether that is a correct statement or not in his
15 understanding.
16 JUDGE FARRAR: Well, rather than ask the
17 witness and spend a lot of time on this, I seem to
18 remember from my ethics day at the Environmental
19 Protection Agency that I understand the disclaimer
20 on Page 7-17. But people like this get invited to
21 make these international presentations because of
22 where they work. And if they travel to the
23 function, that is usually paid by the government.
24 So I don't know how much we can get out of this
25 witness about -- are you trying to establish what

1 he thought this was or are you trying to establish
2 what it is? Because I will concede to you that
3 it's not an official publication of the NRC staff.
4 But these people wouldn't be doing this if it
5 wasn't for where they were working, notwithstanding
6 the disclaimer.
7 MR. SILBERG: Mr. Chairman, could I
8 propose something which might be a shortcut?
9 JUDGE FARRAR: Yes, please.
10 MR. SILBERG: Without discussing with my
11 counsel. Can this be solved by changing
12 "commentary by the Staff" to "commentaries of
13 employees by the NRC"? Or, "individuals employed
14 by the NRC"? Something like that. Then it is
15 clear who they are. It's not a Staff position.
16 MS. CHANCELLOR: I'm not sure that will
17 get us there because the Murphy paper is used to
18 support Reg Guide 1.165. If it is being used by
19 the Staff to support the Reg Guide for which the
20 reference probability discussion is contained in
21 Dr. Arabasz's paper, this isn't some minor
22 presentation at some international conference. It
23 goes to the heart of Reg Guide 1.165. And if it's
24 adequate for the Staff to support the Murphy et al
25 paper for Reg Guide 1.165, then I think generically

1 referring to it as "commentary by the Staff"
2 shouldn't be misleading.
3 MR. SILBERG: Mr. Chairman, that would
4 make any document cited in a Reg Guide as Staff
5 position, which it clearly isn't. It may be a
6 reference in the Staff position, but that doesn't
7 make the document an NRC staff document.
8 JUDGE FARRAR: Mr. Silberg, I appreciate
9 your excellent suggestion for a shortcut. Ms.
10 Chancellor, I appreciate your remarks. This is our
11 last day here. I don't think we want to do this
12 witness. I don't think this is worth spending any
13 more time on. We all know what it is.
14 MR. TURK: I'll come back to it in
15 cross-examination.
16 JUDGE FARRAR: I'm not interested in
17 hearing any more about -- I mean, it is what it is.
18 And on cross, Dr. Arabasz can explain the extent to
19 which he relies on it. But I don't know that
20 putting a name on this really affects the substance
21 of the proceeding. But if you want to argue that,
22 we can.
23 MR. TURK: I'd like to come back to the
24 issue of Voir Dire. But briefly, Ms. Chancellor
25 indicated in her view that this paper is cited in

1 Reg Guide 1.165, is a basis for 1.165. I'd like
2 her to point to where that occurs.
3 MS. CHANCELLOR: I'd need a copy of --
4 Dr. Arabasz, do you have a copy of Reg Guide --
5 JUDGE FARRAR: No, no.
6 MR. TURK: And the reason I --
7 JUDGE FARRAR: Let's get going.
8 MR. TURK: Your Honor, for the record,
9 Reg Guide 1.167 is dated 1997. This paper is dated
10 August of 1997 and if Ms. Chancellor is aware of
11 something in Reg Guide 1.165 that refers to this
12 paper, I would appreciate that reference.
13 With respect to Voir Dire, your Honor,
14 the witness indicated he had nothing to do with the
15 preparation of this document. He is not familiar
16 with this except that he read it. He is not a
17 proper sponsoring witness for the document. At the
18 tail end of the document there's a disclaimer that
19 states this is not the position of the NRC staff.
20 JUDGE FARRAR: Experts are allowed to
21 form their own opinions based on things they have
22 read. Why does that not fall under that category?
23 MR. TURK: He can form an opinion, your
24 Honor. But with respect to the document itself, if
25 he is not a proper sponsoring witness, then there's

1 no basis for his sponsoring of the document. He is
2 not expert in its preparation or what it means or
3 whether the authors themselves later decided that
4 they had misstated something. He is just not
5 familiar with the paper or how far he can go with
6 it.
7 MS. CHANCELLOR: Your Honor, I think we
8 are getting bogged down. This is what it is. And
9 this is Dr. Arabasz's representation and he has
10 agreed --
11 JUDGE FARRAR: That's enough. Mr.
12 Gaukler, any objection?
13 MR. GAUKLER: No objection.
14 JUDGE FARRAR: The document is in.
15 Objection overruled.
16 (EXHIBIT-125 WAS ADMITTED.)
17 Q. 126. Any objection?
18 MS. CHANCELLOR: No.
19 JUDGE FARRAR: You can't object. It's
20 your document. Mr. Turk?
21 MR. TURK: I have no objection.
22 JUDGE FARRAR: Mr. Gaukler?
23 MR. GAUKLER: No objection.
24 (EXHIBIT-126 WAS ADMITTED.)
25 JUDGE FARRAR: Ms. Chancellor? You want

1 to object, or stop while you're ahead?

2 MS. CHANCELLOR: I want to say this is

3 from the draft DOE 2001. There's now a 2002. I

4 just wanted to note that on the record.

5 JUDGE FARRAR: All right. Are we going

6 to see that?

7 MS. CHANCELLOR: Yes, we probably will.

8 JUDGE FARRAR: All right. 127? Mr.

9 Turk?

10 MR. TURK: Your Honor, 127 again appears

11 to be duplicative, but I don't object to it.

12 JUDGE FARRAR: Same ruling, Mr. Gaukler?

13 MR. GAUKLER: No objection.

14 JUDGE FARRAR: Same ruling. Just to

15 keep the record straight, 127 is in.

16 (EXHIBIT-127 WAS ADMITTED.)

17 Q. And 128, that's the one we already

18 covered and let that in, not withstanding that it

19 is contained in a previous exhibit. Ms.

20 Chancellor, anything else before you turn the

21 witness over?

22 MS. CHANCELLOR: No. Dr. Arabasz is now

23 available for cross-examination.

24 JUDGE FARRAR: All right. Thank you.

25 We will begin with the Applicant. Is that you, Mr.

1 Gaukler?

2 MR. GAUKLER: Yes, it is.

3 JUDGE FARRAR: Go ahead.

4

5 CROSS EXAMINATION

6 BY MR. GAUKLER:

7 Q. Good morning, Dr. Arabasz.

8 A. Good morning, Mr. Gaukler.

9 Q. We have talked several times before in

10 this matter, haven't we?

11 A. Yes, we have.

12 Q. I would like to start by understanding

13 your role and concerns with respect to what is now

14 categorized as Section E of the Unified Contention

15 Utah L/QQ. And that concerns the seismic

16 exemptions; correct?

17 A. Correct.

18 Q. As a preliminary matter, what input did

19 you have in drafting Part B of Utah L which is now

20 Section E of the Unified Contention?

21 A. I missed one word of your question.

22 What kind of a matter?

23 Q. As a preliminary matter, will you please

24 describe your role in drafting or providing

25 information input for that part of the contention.

1 A. Yes, we discussed this in my deposition
2 last October. And I explained that my involvement
3 with the State began in 1998 and in an attempt to
4 provide assistance to the Department of
5 Environmental Quality in the attorney general's
6 office. A contract was created between the
7 University of Utah and the Department of
8 Environmental Quality. And originally my intent
9 was to provide objective scientific review for the
10 State and in early documents I indicated that it
11 was my intent to do so, but not to become a party
12 to the State's position on the PFSF.
13 And then in continuing to be given the
14 responsibility to review documents to later assist
15 in Discovery and so on when rationales were put
16 forward for the bases for selecting the 2000 year
17 design basis earthquake, then I assisted in
18 providing my judgment about where I believed those
19 bases were flawed or ad hoc, and sequentially
20 assisting in providing a response to these bases as
21 they sequentially appeared in the SER, the revised
22 SER and so on.
23 Q. And with respect to the matters that
24 appear in Section E of the Unified Contention,
25 there are six bases identified in Section E of the

1 Unified Contention, if I recall correctly.
2 A. Yes. I have that approximate
3 recollection.
4 Q. Okay. And it's my understanding that
5 you and Dr. Resnikoff were the two people that
6 supplied the technical inputs as bases for those
7 contentions?
8 A. Independently.
9 Q. And he provided the input for, say,
10 basis number two, which went to the radiation dose
11 consequences; correct?
12 A. Correct.
13 Q. And you were the provider of the input
14 for the other bases of the contention?
15 A. Predominantly, that's correct.
16 Q. Now, your understanding of the
17 exemptions request is that PFSF requested to use a
18 probability seismic hazard analysis with a 2000
19 year mean return period earthquake as a design
20 basis earthquake for the PFSF. Is that your
21 understanding of the exemptions?
22 A. In its current revised form, yes.
23 Beyond the original 1000 year request.
24 Q. Right. Initially a request for 1000
25 year PSHA and then they modified it to a request

1 for a 2000 year PSHA; correct?

2 A. Correct. I think in our jargon we would

3 refer to it as a PSHA.

4 Q. Okay. I stand corrected. Now, you do

5 not agree in principal with the use of the PSHA.

6 Is that correct?

7 A. The first part of your question, please?

8 Q. You do not disagree in principal with

9 the use of a PSHA. Is that correct?

10 A. That's correct.

11 Q. And, in fact, a PSHA is a commonly

12 accepted method for characterizing earthquake

13 hazards; correct?

14 A. Correct.

15 Q. And you have used it many times

16 yourself; correct?

17 A. Yes. And let me explain "used". I

18 explained it in the deposition previously, that

19 "using" a PSHA is a very long and involved process.

20 And so yes, I have participated in and used results

21 and so on.

22 Q. You provide part of the input that goes

23 into a PSHA; correct?

24 A. Correct.

25 Q. I just want to remind you that the

1 deposition is not in evidence here, so I'm going
2 over some of the same questions. So if it sounds
3 repetitive, in some respects, that's the reason for
4 it.
5 A. Thank you for that clarification.
6 Q. One of the benefits of a PSHA
7 methodology is that it allows one to incorporate
8 risk and uncertainty into the seismic analysis. Is
9 that correct?
10 A. Uncertainty. The risk is a separate
11 part of an analysis of the problem that is a
12 follow-up to the PSHA.
13 Q. So if I understand correctly, you are
14 able to incorporate uncertainty in your prediction
15 of, say, the seismic hazard curve; correct?
16 A. That is correct.
17 Q. And then you think, by virtue of the
18 seismic hazard curve which shows, to my
19 understanding, it shows the design basis ground
20 motion at various return periods, you can kind of
21 pick the level of risk associated with a potential
22 earthquake; the risk for which you design a
23 building?
24 A. Yes. It provides a starting point, a
25 depiction of the hazard, the annual frequency of

1 exceedance or annual probability, more
2 conventionally at least by hazard analysts. The
3 probability of exceedance of a ground motion of a
4 particular level which then provides, again, the
5 starting point for entering that hazard depiction
6 for choosing a mean return period of interest and a
7 design basis earthquake and so on.
8 Q. And it would be fair to say,
9 Dr. Arabasz, that you support the use of a
10 probability seismic hazard analysis as a sound
11 approach or a sound practice for characterizing
12 seismic hazards for the purpose of seismic design?
13 A. Correct.
14 Q. And would you generally favor the use of
15 a PSHA as opposed to a deterministic method? Is
16 that correct?
17 A. It depends on the context. One begins
18 with regulations and depending on the context of
19 what is applicable, one or the other may apply.
20 But in general, following up on my preceding
21 agreements with you, yes, it is fair to say that I
22 would favor the use of a probabilistic methodology
23 for approaching the problem of seismic hazards.
24 Q. And that's totally consistent with
25 discussions at length in a couple other

1 depositions, your depositions; correct?
2 A. Correct.
3 Q. And therefore, if I understand
4 correctly, you're not suggesting that PFS's request
5 for an exemption here should be rejected because it
6 is using a PSHA methodology as opposed to a
7 deterministic methodology; is that correct?
8 A. Correct.
9 Q. And, likewise, as I understand your
10 testimony, you're not taking exception to PFS's use
11 of the PSHA. In other words, you are not
12 challenging, in Section E of this contention, the
13 adequacy of PFS's PSHA to depict the potential
14 hazard at the PFS site? Is that correct?
15 A. Let me hone in on a key term,
16 "adequacy", if that's the key term that I'm
17 agreeing to. I think it's fair to say that the
18 PSHA, as undertaken and carried out by Geomatrix,
19 has been reviewed by the State, it has been
20 independently reviewed by the Staff. And I think
21 for the information of the judges, it is fair to
22 characterize that, yes, there's general agreement
23 of adequacy. If there were belief that the PSHA
24 results underrepresented a hazard, I think the
25 judges would have heard from other parties.

1 Q. I'm just saying you don't take issue
2 with the adequacy of the PSHA? I'm not saying
3 anything about potential conservatisms, or lack
4 thereof.
5 A. So the answer is "correct".
6 Q. If I understand your testimony, you also
7 don't take issue with the use of a 2000 year return
8 period earthquake per se. You look at the issue of
9 whether the 2000 year earthquake is an appropriate
10 design basis earthquake as an answer that must be
11 considered in the context of both the design basis
12 return period of the earthquake and the inherence
13 or conservatisms that may be or may not be in that
14 design; correct?
15 A. I'll pause before giving a simple answer
16 because that part of the question that relates to
17 the 2000 years is very complicated dimension into a
18 host of arguments that are raised in my testimony.
19 But per se, if one selected an appropriate value
20 within an overall context of addressing the
21 question of sufficient protection or adequate
22 conservatism, yes, one can pick a number and that
23 number may or may not be 2000 years.
24 Q. But if I understand your testimony, the
25 adequacy of that number depends both upon the

1 design level itself as well as the conservatism
2 that may or may not be embedded in that number.
3 A. Emphatically yes. And I believe for the
4 Board's benefit, this is where Dr. Cornell and I
5 are on the same page in emphasizing that in looking
6 at the issue, one must fundamentally couple the
7 mean return period of the design basis earthquake
8 with the design elements, notably the design
9 conservatisms and acceptance criteria. That is
10 plainly in my testimony.
11 Q. And you state that clearly in Question
12 and Answer Number 8 in your testimony; correct?
13 A. I'll accept what number the answer is;
14 but yes, I remember that position.
15 Q. And you were here and you have read
16 Dr. Cornell's trial testimony?
17 A. Yes, I have.
18 Q. And you were here when he testified to
19 the Board I believe last Saturday?
20 A. Correct.
21 Q. And as you just mentioned, this concept
22 that the adequacy of an earthquake design, you have
23 to take into consideration both the return period
24 and the conservatisms of the acceptance criteria,
25 was one of the major principles that Dr. Cornell

1 referred to in his testimony, as you just noted?
2 A. Correct.
3 Q. And a second major concept that
4 Dr. Cornell noted in his testimony was the
5 principle of using a risk-related approach. In
6 other words, the level of earthquake design, the
7 level of earthquake safety that it's appropriate to
8 look at the potential hazard of the facility in
9 determining the appropriate level of earthquake
10 design safety for that facility.
11 A. Correct.
12 Q. And I take it that you, yourself, agree
13 with the use of such a risk-related approach.
14 A. Yes. In the interest of seeing sound
15 policy developed for dealing with earthquake
16 hazards. This is fully embodied in NRC policy
17 making, explicit or by intent. And I agree that
18 that is a very rational and needed approach.
19 Q. And, in fact, you would concur that the
20 radiological hazard proposed by a dry cask storage
21 facility such as the Private Fuel Storage facility
22 is inherently lower than the potential hazard from
23 operating a nuclear power plant, as a general
24 matter?
25 A. As a general matter, correct.

1 Q. And therefore it would be appropriate
2 for a facility such as the Private Fuel Storage
3 facility to have a higher level of design basis
4 earthquake or performance objective implemented
5 with respect to it as opposed to that for a nuclear
6 power plant?
7 A. Yes. Relative to the standard that
8 would be applied to a nuclear power plant at the
9 same site.
10 MR. TURK: Could I have the question?
11 (The record was read as follows: "And
12 therefore it would be appropriate for a
13 facility such as the Private Fuel Storage
14 facility to have a higher level of design basis
15 earthquake or performance objective implemented
16 with respect to it as opposed to that for a
17 nuclear power plant.")
18 JUDGE FARRAR: The question said
19 "higher". And rather than rephrase the question,
20 Dr. Arabasz, tell us which one you think should
21 have, at the same site, should have the higher
22 standard.
23 THE WITNESS: Okay. I will try to be
24 more careful. We will continually potentially be
25 confused by the inverses, the mean return period,

1 and the hazard exceedance probability in this case.
2 If you are speaking in terms of an
3 annual exceedance probability, higher, a mean
4 return period, lower for the ISFSI compared to the
5 nuclear power plant.
6 Q. (By Mr. Gaukler) So for example, just a
7 hypothetical, if the nuclear power plant had an
8 earthquake design that the appropriate design for
9 an earthquake would be 10,000, an earthquake with a
10 10,000 mean return period, then it would be
11 appropriate for the ISFSI to have a design period
12 that would be lower, say 2000, 5000, something. In
13 any event, lower than 10,000.
14 A. Accepting your characterization of
15 10,000 as hypothetical, yes, I would agree.
16 Q. And the reverse of it: Suppose that the
17 mean annual for a 10,000 earthquake, the mean
18 annual probability of exceedance is one times ten
19 to the minus four. And again just hypothetically
20 assume that was for a nuclear power plant, then it
21 would be appropriate to have a higher mean of
22 probability for exceedance for ISFSIs such as PFS
23 is proposing, five times ten to the minus four.
24 A. Correct.
25 Q. And the same would be -- and in this

1 sense we are talking both about -- the same would
2 be true for a performance objective. Looking
3 beyond just the earthquake itself and the
4 performance objective of the facility in terms of
5 after you take into account the earthquake design
6 such as the probability of exceedance for a nuclear
7 power plant of one times ten to the minus four, and
8 you would have some conservatism inherent in that
9 design, you would agree, which would make the
10 actual potential failure lower than one times ten
11 to the minus four; correct?
12 A. Let me see if I can follow your
13 question. You used the phrase or the term
14 "performance objective". And here I do understand
15 that you are referring, for example, within the DOE
16 context, to a failure probability or a target
17 seismic performance --
18 Q. Yes.
19 A. -- in terms of a failure probability?
20 Q. Yes, I was.
21 A. And you specifically used one times ten
22 to the minus four, which would be for PC-3 SSC for
23 a performance goal?
24 Q. I guess that was a little unclear. Let
25 me rephrase it. Suppose you have performance goal

1 for a PC-3 of one times ten to the minus four and
2 PC-3 in the nuclear or DOE 1020 parlance is
3 analogous to a facility such as the PFSF; correct?
4 An ISFSI?
5 A. Correct.
6 Q. And that facility has the target
7 performance for PC-3 categories under DOE 1020 as
8 one times ten to the minus four. Correct?
9 A. With a footnote.
10 Q. And the footnote is -- well, why don't
11 you tell me what the footnote is.
12 A. May I refer to one of my exhibits?
13 Q. Certainly.
14 MS. CHANCELLOR: I believe it is 126.
15 A. Thank you, Ms. Chancellor.
16 I was incorrect. The footnote does not
17 apply to the seismic performance goal.
18 Q. Okay. And for DOE 1020, the seismic
19 performance goal for nuclear power plants is one
20 times ten to the minus five. Correct?
21 A. That is correct.
22 Q. And so that reflects the graded approach
23 that we were just talking about; correct?
24 A. Yes.
25 Q. And as you have stated, you believe that

1 an ISFSI would be categorized, first of all --
2 strike that.
3 You would agree with Dr. Cornell that
4 DOE 1020 is a good analogy of the application or
5 good example of the application of a risk-graded
6 approach?
7 A. Correct. And with emphasis on
8 "approach", because I think this goes to the heart
9 of the matter of what will be my testimony and the
10 issue before the Board, naming the selection of a
11 number as opposed to a consideration of a total
12 approach.
13 Q. I don't quite understand. Consideration
14 of a number in what sense?
15 A. The number that I was referring to was
16 the mean return period design basis earthquake
17 number.
18 Q. And so the approach you're suggesting is
19 that you have to look at the number for the mean
20 return period earthquake in line with some idea of
21 the margins or target that you are shooting for in
22 terms of performance?
23 A. Yes. Within some paradigm of risk
24 assessment or judgment of acceptable risk.
25 Q. And under DOE 1020-94 which was the one

1 we talked about in your deposition, the performance
2 objective for PC-3s was one times ten to the minus
3 four; correct?
4 A. Yes. What DOE refers to as a target
5 seismic performance goal, P sub F. Correct.
6 Q. And the mean annual return period
7 earthquake for which they had for PC-3 categories
8 and DOE standard 1020-94 was the 2000 year mean
9 return period earthquake?
10 A. That's correct.
11 Q. And in general, you think that would be
12 an appropriate approach in general; to have an
13 earthquake design of five times ten to the minus
14 four for the earthquake with some performance
15 objective target in the range of ten to the minus
16 four?
17 A. In the context of the DOE philosophy and
18 approach, the 2000 is one element, coupled with
19 other elements. A design performance goal and
20 companion conservatisms in design.
21 Q. And you have reviewed Dr. Cornell's
22 testimony in terms of where he talks about the
23 application by analogy of this idea of looking at
24 the mean annual return period of exceedance and the
25 conservatism inherent in the design to nuclear

1 codes and standards.

2 A. Yes.

3 Q. And he has inputs from -- you look --

4 Dr. Cornell relies on technical inputs from other

5 people in certain analyses with respect to the

6 PFSF. And assuming hypothetically, this is a

7 hypothetical now, assuming that the information

8 upon which Dr. Cornell bases his opinions regarding

9 the conservatism in the design of the PFSF were

10 correct, do you have any problem with his

11 methodology by which he reaches his conclusion that

12 there is roughly a risk reduction factor of five or

13 the facility would meet a seismic target

14 performance on the order of ten to the minus four?

15 MS. CHANCELLOR: I'll object to that

16 hypothetical. Mr. Gaukler is asking Dr. Arabasz to

17 assume that everything in PFS's arguments with

18 respect to the seismic exemptions are correct. If

19 all those arguments are correct, does he agree with

20 Dr. Cornell. I think that's a gigantic leap that

21 Mr. Gaukler is asking Dr. Arabasz to make.

22 MR. GAUKLER: That's not what I'm asking

23 him to make. I'm asking him to assume that the

24 technical inputs that Dr. Cornell relied upon from

25 other PFS experts were correct. Dr. Arabasz relies

1 on the State's experts for analysis. And I'm
2 asking him hypothetically, assuming that
3 Dr. Cornell's inputs were correct, does he have any
4 problem with the methodology and the approach by
5 which Dr. Cornell reached his conclusion that the
6 facility would have a seismic target performance on
7 the order of ten to the minus four. Assuming that
8 he had the same inputs that Dr. Cornell had, would
9 he reach the same conclusion or does he have a
10 problem with how Dr. Cornell reached the
11 conclusion, given the inputs that he had?
12 MS. CHANCELLOR: The difference, your
13 Honor, is that Dr. Arabasz stops at the mean annual
14 return period and with respect to conservatism he
15 doesn't take a position. He hands off to the State
16 expert. So he doesn't rely on input from the State
17 experts. He says, "Go look at that other testimony
18 because that's not my area of expertise." So I
19 think Mr. Gaukler is asking Dr. Arabasz to go too
20 far.
21 JUDGE FARRAR: Does the Staff have a
22 position on this?
23 MR. TURK: No, your Honor. Perhaps one
24 suggestion might be that the question seemed rather
25 long. If it could be restated in the elements,

1 maybe we could get past it.

2 JUDGE FARRAR: I think that's why I was

3 hesitating to have it reread.

4 (The Board confers off the record.)

5 JUDGE FARRAR: We are going to overrule

6 the objection and so the witness can answer. But

7 feel free not to just answer. With the question

8 that was this long, feel free not to just answer

9 the question but to tell us about your thinking and

10 if, in fact, as your counsel suggests, the question

11 asks you to take a leap into an area that you are

12 not comfortable dealing with, you are free to say

13 that, also. We have instructed all the witnesses,

14 you know, don't speculate, don't guess. Just

15 because someone asks you a question, if that's not

16 your area of expertise, you are free to say no, and

17 no one will be offended. So with that

18 understanding, do you feel you can answer the

19 hypothetical question?

20 THE WITNESS: Thank you, hour Honor. As

21 I listened to hearings earlier, I think I got your

22 message; get on to the record as efficiently as we

23 can without my damaging my representation for the

24 State.

25 Mr. Gaukler, as I listened to your

1 question and as you led me to Dr. Cornell's
2 proposition, I would recognize the dependence of
3 the logic - not fully, but in part - Dr. Cornell's
4 reliance on PFS engineers. I recognize the
5 similarity arguments that Dr. Cornell put forward,
6 that I'm hesitant to apply to unanchored casks; the
7 similarity of conservatisms and SRP, Standard
8 Review Plans, and bringing forward by similarity
9 those conclusions of conservatisms of five to
10 twenty or greater.
11 On my part with my logic on the State's
12 side, Ms. Chancellor is correct and at the end of
13 my testimony I say to the Board, "This is the heart
14 of the matter." That ultimately the judgment that
15 I have to rely on for whether there's adequate
16 conservatism on the design side to couple to the
17 mean return period ground motion, I have to pass
18 off to the State's engineering experts and rely on
19 their judgment for that part of the logic train.
20 But at bottom, yes, I follow this logic wherever it
21 takes us. And once I take my part of the logic up
22 to the question "if-then", if the conservatisms,
23 the risk reduction ratios are such and such, then I
24 have to accept the "then" because I have
25 constructed the logic.

1 Q. So if I understood your answer, if
2 Dr. Cornell is correct in terms of his inputs being
3 correct, that there's a risk reduction factor on
4 the order of five and that, therefore, we would
5 meet a seismic target performance in order of
6 magnitude of one times ten to the minus four, you
7 would find that acceptable? Hypothetically you
8 would find that acceptable?
9 A. I would tell the Board that's where the
10 rub is. And that's their arena of business, of
11 deciding what the risk reduction ratio really is.
12 And once a determination is made, if that
13 determination either, in fact or in regulatory
14 judgment, is asserted to be such and such, then
15 that's where the train goes.
16 Q. Okay. And so therefore, if it is found
17 that the inputs that Dr. Cornell relied upon were
18 correct, then the logic follows that a 2000 year
19 design basis earthquake would be adequate for the
20 PFSF. Is that correct?
21 MS. CHANCELLOR: Objection, your Honor.
22 Asked and answered.
23 JUDGE FARRAR: That could be the third
24 time. It is phrased somewhat differently but I
25 think it is saying pretty much the same question,

1 again, Mr. Gaukler. But I will hear you if you
2 think it's --
3 MR. GAUKLER: I think he hasn't quite
4 answered my question. He has answered it pretty
5 closely, but I was trying to get a definite answer.
6 JUDGE FARRAR: Objection overruled. You
7 may answer if you remember the question.
8 THE WITNESS: May I ask that the
9 question be repeated?
10 (Record was read as follows: "And so
11 therefore, if it is found that the inputs that
12 Dr. Cornell relied upon were correct, then the
13 logic follows that a 2000 year design basis
14 earthquake would be adequate for the PFSF. Is
15 that correct?")
16 THE WITNESS: If it were established
17 that the risk reduction ratio indeed were five or
18 greater within the DOE paradigm, then the 2000 year
19 return period earthquake becomes justifiable,
20 coupled to a target performance goal of one times
21 ten to the minus four.
22 MS. CHANCELLOR: Point of clarification,
23 Doctor. Are you referring to the 1020-94 standard
24 or 2002?
25 THE WITNESS: Consistently I will

1 attempt to refer to the latest standard, 2002. DOE
2 standard 1020-2002.
3 MS. CHANCELLOR: And that would be a
4 2000 year return period earthquake.
5 Q. (By Mr. Gaukler) Dr. Arabasz, assuming
6 we --
7 JUDGE FARRAR: We didn't hear an answer.
8 She asked a question and there was not an audible
9 answer.
10 THE WITNESS: The exceedance
11 probability, the MAPE for PC-3 in the latest DOE
12 standard 1020-2002 indeed has been changed to a
13 2500 year mean return period.
14 Q. (By Mr. Gaukler) And they have also
15 changed the risk reduction factor, correct, to a
16 factor of 4 in DOE 1020-2002; correct?
17 A. Correct.
18 Q. And therefore, you end up with the same
19 seismic target performance area, applying either
20 DOE 1020-94 or 1020-2002; correct?
21 A. Correct.
22 Q. And the ultimate in terms of determining
23 acceptability is the performance objective;
24 correct?
25 A. Within the DOE paradigm, that is

1 correct.

2 Q. And therefore, your answer would still

3 stand that assuming it were established within the

4 DOE paradigm, that you had a risk reduction factor

5 of five, a 2000 year return period earthquake would

6 be appropriate for the PFSF; correct?

7 A. Within the paradigm; correct.

8 Q. Dr. Arabasz, I'd like you to take a look

9 at some sections of DOE 1020-94 and they were part

10 of our exhibits that we filed with the Board. I

11 have given you a book of exhibits and I believe you

12 need to look under the tab of DDD. You are

13 generally familiar with DOE 1020; correct?

14 A. Generally familiar, correct.

15 Q. And you reviewed both DOE 1020-94 and

16 DOE 1020-2002; correct?

17 A. Not line by line. But going to the

18 important standards, yes.

19 Q. Now, if you look, in PFS Exhibit DDD, if

20 you look at Page C-5, I believe.

21 A. I'm there.

22 Q. You're ahead of me. And this table

23 shows the performance categories for the different

24 DOE structure -- strike that.

25 It shows the performance categories for

1 the different DOE SSCs; correct?

2 A. Categorized by performance category.

3 Q. And earthquake.

4 A. Yes.

5 Q. And it also shows the DOE risk reduction

6 factor?

7 A. Correct.

8 Q. And the category PC-4 is nuclear power

9 plants; correct?

10 A. Correct.

11 Q. And it shows here a risk reduction

12 factor for nuclear power plants of 10. Correct?

13 A. Within --

14 Q. Ten to twenty, depending on the location

15 in the country; correct?

16 A. With an extremely important footnote.

17 Q. But it's 10 to 20 based on location in

18 the country; is that correct?

19 A. Correct.

20 Q. And the footnote refers to a particular

21 location in the country where the 20 applies;

22 correct?

23 A. It refers to a very particular part of

24 the Western United States.

25 MS. CHANCELLOR: Could Dr. Arabasz

1 explain his answer?

2 JUDGE FARRAR: Yes. And what part is

3 that?

4 MS. CHANCELLOR: And what is the

5 significance?

6 MR. GAUKLER: I wasn't going to follow

7 up on that. It is not relevant to my line of

8 inquiry, but that's fine.

9 JUDGE FARRAR: When we hear about a

10 footnote to someone's thinking, it's always good to

11 make sure we know what that thinking is.

12 A. In this hearing there's been abundant

13 reference to Western United States versus the

14 Eastern United States. This, in my mind, is a

15 critical reference to a very special part of the

16 Western United States, described in the footnote as

17 near tectonic plate boundaries. And knowing that

18 DOE has abundant sites in the generic Western

19 United States, west of 105 degrees, west of Denver,

20 it singles out LLNL, Lawrence Livermore National

21 Laboratory; SNL, Sandia National Labs, Livermore,

22 in Livermore, California; SLAC, the Stanford Linear

23 Accelerated Center, close to the San Andreas fault;

24 LBL, the Lawrence Berkeley Lab on the east side of

25 San Francisco Bay; and ETEC, the Energy Technology

1 and Engineering Center located north of Los
2 Angeles, west of the San Fernando Basin.
3 And the reason that these are singled
4 out as opposed to other DOE sites in the Western
5 United States such as Sandia in New Mexico, INEEL
6 in Idaho, perhaps Rocky Flats in Denver, just along
7 the 105 degree boundary, is that these sites near
8 the tectonic plate boundary are characterized by
9 something very special; steep seismic hazard
10 curves. And I'll just leave that point there. But
11 this is very germane to the Board's consideration
12 of the Western United States. And in the context
13 of this table, the reference probability for PC-4
14 or, by analogy, a commercial nuclear reactor in the
15 Western United States.
16 MR. TURK: For the record, your Honor --
17 JUDGE FARRAR: I was just going to ask
18 that for the record. You described facilities
19 which would be covered by the footnote and
20 facilities which would not. And the answer to the
21 next question is probably obvious but where would
22 you put the PFS facility in terms of those two
23 different categories?
24 THE WITNESS: Definitely not covered by
25 the footnote.

1 MR. TURK: Just for clarification, your
2 Honor, I don't know if the footnote is apparent to
3 everyone. It is directly below the table on the
4 same page as the table, Page C-5.
5 Q. (By Mr. Gaukler) I wanted to focus, in
6 any event, on the risk reduction factor of ten;
7 okay?
8 A. Yes, sir.
9 JUDGE FARRAR: Mr. Turk, is it page --
10 MR. TURK: Page C-5 of Applicant's
11 Exhibit DDD.
12 JUDGE FARRAR: Why do I have it as Page
13 224?
14 MR. TURK: I'm not sure which document
15 you are looking at. May we go off the record?
16 JUDGE FARRAR: Yes.
17 (Discussion off the record.)
18 JUDGE FARRAR: Back on the record. We
19 have clarified the reference there to similar foot-
20 notes. But we are talking about the one on C-5
21 with Table C-3 as opposed to the other table
22 elsewhere in the document with a similar footnote.
23 Go ahead, Mr. Gaukler.
24 Mr. Turk, was that the end of your
25 clarification?

1 MR. TURK: Yes.

2 JUDGE FARRAR: Go ahead, Mr. Gaukler.

3 Q. (By Mr. Gaukler) Focusing again on PC
4 category 4, just a slight clarification. With the
5 risk reduction factors 10 or 20, the target
6 performance remains the same for nuclear power
7 plants at ten to the minus five; correct?

8 A. Can we -- I think we may need to
9 establish, as a matter of logic, that the PC-4, at
10 least in 1020-94, DOE emphasizes this PC category
11 should be reserved for those facilities that have
12 an accident dose potential similar to commercial
13 nuclear power reactors. So they eliminated that,
14 for whatever reason, in the 1020-2002. I could not
15 find that same statement. But I think we need to
16 establish that analogy.

17 Q. Okay. So the PC-4 category target
18 performance remains the same regardless of the risk
19 reduction factor of 10 or 20; correct?

20 A. That is correct.

21 Q. And so this is a good example of how you
22 look at the combination of the risk reduction
23 factor and the seismic hazard exceedance
24 probability to come up with a target or desired
25 target performance; correct?

1 A. I think it is a very excellent and
2 instructive example.
3 Q. I just want to focus, going back to the
4 risk reduction factor of 10; okay?
5 A. For PC-4?
6 Q. For PC-4, yes. Now, assuming you had a
7 risk reduction factor of 10 and a design basis
8 earthquake of 2000 years, five times ten to the
9 minus four, that would mean that you would
10 essentially have the mean probability of failure of
11 SSCs would be one in 20,000 years; correct?
12 Roughly?
13 A. I need to have the question reread.
14 Q. Okay. Let me try to rephrase the
15 question before you do that. Assuming that you had
16 a risk reduction factor of 10 and instead of a
17 seismic hazard exceedance probability of one times
18 ten to the minus four, you had the seismic
19 exceedance probability of five times ten to the
20 minus four.
21 A. And the rest of the question?
22 Q. And then the mean probability of SSC
23 failures would be one in 20,000 years, five times
24 ten to the minus five.
25 A. Correct.

1 Q. And --

2 A. I hope I don't get nailed with a

3 take-home exam.

4 JUDGE FARRAR: Don't worry. Several

5 people in the room have flunked those.

6 Q. We have given them to witnesses before.

7 Saying, "Look something up at lunch for us." But I

8 don't foresee that.

9 A. But repeat where you are with your final

10 number now so I can follow to the next step.

11 Q. Okay. So you have the mean return

12 period of SSC failures of five times ten to the

13 minus five. Correct? The return period of 20,000

14 years of the failure.

15 A. Okay.

16 Q. And that would be better than a

17 performance goal of one times ten to the minus

18 four, correct, that you have for PC-3s?

19 MR. TURK: I'm sorry. I'm a little

20 lost. I don't know if the witness is. Paul, could

21 you start with the first premise that kind of fell

22 off on the previous question?

23 JUDGE FARRAR: Or would it be easier to

24 eliminate the powers and just use the years we are

25 talking about? Particularly in a long question,

1 would that be easier?

2 MR. GAUKLER: Maybe we can take a short

3 break and I'll talk to Dr. Cornell --

4 JUDGE FARRAR: Okay.

5 MR. GAUKLER: -- to be perfectly frank.

6 JUDGE FARRAR: Why don't we take our

7 mid-morning break. It is 10:20. Why don't we come

8 back at 10:30.

9 (A break was taken.)

10 JUDGE FARRAR: We are back from the

11 break and ready to resume the cross-examination.

12 Q. Before I go back to the question, I

13 think we got confused on terms and using figures

14 that can be represented by different terms.

15 JUDGE FARRAR: Right.

16 Q. And why don't I start talking about the

17 mean return period of failure of 20,000 would be

18 the same thing as an annual probability of

19 exceedance of five times ten to the minus five;

20 correct?

21 A. Yes.

22 Q. So you could use either term to describe

23 that concept; correct?

24 A. Yes. And did you mean to say

25 probability of failure, meaning going to the

1 performance goal?

2 Q. My last question is actually just an

3 example talking about making the point that the

4 mean annual probability of exceedance and the mean

5 return period of failure are really just the

6 inverse of each other.

7 A. There's a subtlety here. Failure --

8 failure as opposed to one being the inverse of the

9 other, when you use the term "failure" that gets us

10 over into the performance goal concept. And

11 there's a potential for confusion.

12 Q. In terms of a target annual --

13 MR. TURK: For clarification, is the

14 witness saying we should be using the term "mean

15 probability of exceedance" rather than "mean

16 probability of failure"?

17 A. There are some simple terms and maybe if

18 we can just pause --

19 Q. That's what I was trying to do here, to

20 make sure we can all understand or agree upon the

21 terms we should use and understand those terms.

22 A. A mean return period, MRP, would be the

23 average time between successive events of the same

24 or greater severity. So we can speak of the MRP,

25 the mean return period.

1 Q. Mean return period of an earthquake?
2 A. The MRP of the DBE, the mean return
3 period of the design basis earthquake ground
4 motions, and that's what the 2000 year number is.
5 Q. Right.
6 A. If we simply take the inverse of that,
7 then we can speak of, in Dr. Cornell's acronym, the
8 MAPE, the mean annual probability of exceedance.
9 So that's simply the inverse of the mean return
10 period. And that's the occurrence of the seismic
11 loading event.
12 Now, when we talk about failure, see --
13 Q. I was trying to apply the same concept
14 to the target seismic performance for a nuclear
15 power plant -- the seismic target performance of a
16 nuclear power plant, for example, or PC-3 category.
17 Can you use the same thing there?
18 A. You said nuclear power plant or PC-3.
19 Q. Let's focus on PC-3.
20 A. Yes.
21 Q. The target performance for PC-3 under
22 DOE is a mean annual probability of exceedance of
23 failure of one times ten to the minus four?
24 A. Or a 10,000 year mean return period to
25 that failure.

1 Q. Right. So again, you can speak either
2 the mean annual probability of exceedance or mean
3 return period.
4 A. Yes.
5 Q. Okay. Let's just -- I'm going to try to
6 speak in terms of mean return period. Can we try
7 to agree to use that, to be consistent?
8 A. Okay.
9 Q. So the target performance -- let me go
10 back to where I was before. Assume that you had an
11 earthquake with a 2000 year mean return period,
12 such as that proposed for the PFSF, and assume that
13 you had a risk reduction factor of 10. What would
14 be the seismic target performance that one would
15 have achieved in that example?
16 A. Let's see, if I'm doing my arithmetic
17 correctly, 20,000 years.
18 Q. So that would be the mean return period
19 to failure?
20 A. To failure, yes. Thankfully,
21 Dr. Cornell is shaking his head in agreement.
22 MR. GAUKLER: Sorry for that detour,
23 your Honor. Given the confusion, I thought it
24 would be worthwhile to try to get a common
25 understanding of the terms.

1 Q. (By Mr. Gaukler) Now, we are talking
2 about the risk reduction of 10 being the risk
3 reduction factor for PC-4 categories on your DOE
4 Standard 1020; correct?
5 A. Correct.
6 Q. And that that is what? The risk
7 reduction they achieve or seek to achieve through
8 their design of the facility; correct?
9 A. Given a seismic hazard exceedance
10 probability; correct.
11 Q. And these PC-4 categories are nuclear
12 type facilities that are analogous with respect to
13 having potential leases similar to commercial
14 nuclear power plants.
15 A. That's my understanding, correct.
16 Q. And isn't it true that DOE Standard 1020
17 recognizes that the level of conservatism in the
18 seismic evaluation performance for PC-4 SSCs
19 approaches or should approach that used for nuclear
20 power plants, commercial nuclear power plants?
21 A. That would be my assumption, yes.
22 Q. So that the actual target performance
23 achieved or the level of conservatism -- strike
24 that.
25 Therefore, the level of conservatism in

1 the DOE 1020 Standards for PC-4 components would
2 approach, would generally approach that for
3 structure systems in components designed for
4 commercial nuclear power plants; is that correct?
5 A. I'm sorry. I got lost in that question.
6 Q. Let me rephrase it. Therefore, the
7 conservatisms embodied in the design criteria and
8 procedures for PC-4 category components under DOE
9 Standard 1020 would approach that inherent in the
10 design codes and standards for commercial nuclear
11 power plants?
12 A. I believe that's generally correct.
13 Again, we are making a similarity between PC-4 and
14 commercial nuclear power plants. And the
15 Standards, the desired performance goals,
16 presumably are the same whether we are in a DOE
17 paradigm or within the NRC SRP paradigm.
18 Q. And in the NRC SRP paradigm, the
19 conservatism inherent in the NRC Standard Review
20 Plan design procedures and criteria are along the
21 same order of magnitude as those for the DOE
22 standards and criterias in PC-4 category
23 components; correct?
24 A. To answer correct, I'd have to rely on
25 agreement with Dr. Cornell's testimony. And I am

1 not or I have not gone through engineering
2 calculations and SRPs, but I will accept that, yes.
3 Q. And that's your understanding; correct?
4 A. Yes.
5 Q. I would like to just clarify a few
6 things. One, I want to go back to Question and
7 Answer 6 in your testimony. There you refer to --
8 the question is, "Do you have any comments about
9 the Deterministic Seismic Hazard Analysis for the
10 PFS site?" And you give some observations with
11 respect to a deterministic seismic hazard
12 evaluation. First of all, I want it to be
13 clarified. You are not suggesting that a
14 deterministic seismic hazard evaluation should be
15 the type of evaluation used for the PFSF site;
16 correct?
17 A. It depends on the governing regulation.
18 And absent an exemption, absent NRC policy making
19 to the contrary, if the requirements of Part 72
20 apply, then one follows the deterministic procedure
21 as a prescription, if there is NRC allowance for
22 adopting the PSHA, then you go in a different
23 direction.
24 Q. And assuming that the NRC would equally
25 allow a PSHA or DSHA, you would not suggest in

1 those circumstances that you use the DSHA; correct?
2 A. Following up on my earlier agreements,
3 correct.
4 Q. Now, you refer to the potential, the
5 last paragraph refers to a DSHA providing a
6 benchmark? Do you see that?
7 A. Yes.
8 Q. Are you aware whether it is common
9 practice in the building industry where PSHA is
10 commonly used to also develop a deterministic
11 earthquake for purposes of benchmarking?
12 A. In the context of the building industry,
13 no. From my involvement in PSHA, it's been my
14 experience that whenever a PSHA has been produced,
15 almost inevitably the companion question arises,
16 "Was a deterministic analysis done just for
17 comparison?" Just as a reality check.
18 Q. And again, that is just for a reality
19 check; not saying you would use the DSHA result;
20 correct?
21 A. Correct.
22 JUDGE FARRAR: Mr. Gaukler, let me
23 pursue that while we are on the subject.
24 MR. GAUKLER: Sure.
25 JUDGE FARRAR: So you would say that

1 even if the rule said all that's needed is a
2 probabilistic analysis, you might say, "Well,
3 apparently the rule doesn't require a deterministic
4 one, but let's do one anyhow because we might learn
5 something from that that would cause us to take a
6 second look at our probabilistic analysis." Is
7 that kind of what you are saying?
8 THE WITNESS: Yes. And in that, the
9 process here with a PSHA result being given to the
10 Staff, if I'm not mistaken the Staff then asked for
11 an updated DSHA from the Applicant. Again, my
12 belief that this is information that you want to
13 have for guidance.
14 JUDGE FARRAR: And what is your opinion
15 today on the value or completeness or qualities
16 like that of the deterministic analysis that has
17 been done in this case?
18 THE WITNESS: I have concerns, as I
19 stated in Answer 6, that the approach that
20 Geomatrix took in entering some probabilistic
21 elements into the way they determined the maximum
22 vibratory ground motion, that it seemed to me that
23 they did not fully meet the requirements of
24 Appendix A. So in Discovery, we asked the question
25 did these meet the requirements of Appendix A? And

1 the Staff reported, as indicated in the last
2 paragraph of A 6, that the DSHA did not meet the
3 deterministic requirements in 10 CFR 100, Appendix
4 A.
5 JUDGE FARRAR: Go ahead, Mr. Gaukler.
6 Q. (By Mr. Gaukler) Going forward to the
7 bases of --
8 JUDGE FARRAR: Wait a minute. You
9 referred -- I'm sorry. The witness referred to the
10 last paragraph of Answer 6 as saying the Staff
11 still didn't or said that the deterministic
12 approach didn't meet the requirements. But I don't
13 see that in the answer. But that's neither here
14 nor there. Your opinion or your information is
15 that the Staff has thought that the deterministic
16 analysis fell short and your opinion is you would
17 like to see that done just as a check on the
18 problemistic analysis? Is that a fair statement?
19 If it's not, tell me.
20 THE WITNESS: I don't think it is
21 absolutely required unless one were to make an
22 argument that a PSHA result were conservative in
23 such and such a way compared to the DSHA result we
24 have in hand. And I believe the State and the
25 Applicant arrived at some stipulation in this

1 regard as to whether the DSHA issue could be set
2 aside. Yes, it could, unless it were re-introduced
3 as an argument for somehow bolstering the
4 correctness of the PSHA result.
5 JUDGE FARRAR: Okay. If anyone else
6 wants to explore this later --
7 MR. TURK: I will, your Honor.
8 Q. (By Mr. Gaukler) And so if I understand
9 correctly, you are not saying we should redo the
10 DSHA at that point in time; correct?
11 A. I don't believe it is essential.
12 Unless...
13 Q. I know the State has reserved the right
14 and that's the agreement we have with the State.
15 JUDGE FARRAR: Dr. Arabasz, someone
16 other than us will read this transcript some day
17 and will wish you had --
18 THE WITNESS: Completed the sentence?
19 JUDGE FARRAR: Wish there weren't just
20 three dots after the "unless". So if you will
21 complete the sentence.
22 THE WITNESS: Unless the Applicant or
23 Staff were to re-introduce the DSHA value as a
24 premise for validating some level of conservatism
25 of the PSHA result.

1 JUDGE FARRAR: Thank you.

2 Q. (By Mr. Gaukler) And I think to date so
3 far we have been discussing what you might classify
4 as the issues under Basis 1, whether or not the use
5 of a 2000 year mean return period earthquake
6 sufficiently protects public health and safety;
7 correct?

8 A. Correct.

9 Q. I'd like to go on to some of the other
10 bases of the contention in Section E. Basis 2
11 concerns radiation dose consequences, and you are
12 not involved with that; correct?

13 A. Correct.

14 Q. I want to ask you one other thing before
15 we get on to the bases. I note that the DOE
16 standard uses a mean return period as opposed to a
17 median return period to characterize the hazard.
18 Correct? I mean uses a mean annual probability of
19 exceedance for the hazard.

20 A. I need to have the question restated,
21 please.

22 Q. It is correct that the DOE standard
23 1020-94 or 2002 that we have been discussing uses a
24 mean annual probability of exceedance as the basis
25 for expressing the potential earthquake hazards;

correct?

A. Correct.

Q. And you generally would agree that it's appropriate to express potential earthquake hazards as a mean annual probability of exceedance; correct?

A. No.

Q. Well, isn't it true that the mean as opposed to the median would capture more uncertainty in the analysis?

A. That's true. If I could elaborate, maybe I could speed up the process.

Q. Fine.

A. Here we have in the exemptions "contest", the issue of median versus mean. And the median, as we have heard in Dr. Cornell's testimony and Dr. McCann's testimony, is embedded in Reg Guide 1.165 as a reference probability, or in this context or the context of Reg Guide 1.165, how one would select the reference probability for a new nuclear power plant. And so then we have the train of reasoning as described in the paper by Murphy and others, and I think probably most lucidly explained in the Yucca Mountain Topical Report 2, that the issue of the median versus the

1 mean and looking for a reference probability for
2 nuclear power plants. Murphy, the paper by Murphy
3 et al established that for a sample of nuclear
4 power plants in the Central and Eastern United
5 States specifically, that the median of the medians
6 for the annual exceedance probability of ten to the
7 minus fifth happened to be the same as the median
8 of the mean. In other words, if one went back to
9 those 29 nuclear power plants and recalculated
10 their annual exceedance probability compared to the
11 SSC that it originally had been determined by a
12 DSHA, the reference probability could be equally
13 stated as 1.10 to the minus five median or 1.10 to
14 the minus four mean.
15 Q. Now, just wholly apart from the context
16 of this case, isn't it true that expressing the
17 hazard as a mean annual probability of exceedance
18 as opposed to a median annual probability of
19 exceedance would capture, better capture the
20 uncertainty in the analysis; correct?
21 A. Would better capture the uncertainty?
22 Correct.
23 Q. And that's because the mean takes into
24 account the values that you may have for some
25 several large events and includes that in the

1 average, in essence; correct?
2 A. It better accounts for the outlyers,
3 yes.
4 Q. And generally, you would agree, apart
5 from the issues raised by Reg Guide 1.165 that the
6 use of a mean annual probability of exceedance
7 would be preferable to the use of a median annual
8 probability of exceedance. Is that correct?
9 A. With the qualification you stated,
10 that's correct.
11 Q. Now, I'd like to go on to the bases for
12 Section E, Bases 3, 4, and 5. Basis 3 concerns the
13 issuance with respect to Reg Guide 1.165. Basis 4
14 concerns questions you raised with respect to the
15 Staff's reliance on DOE Standard 1020-94. And
16 Basis 5 reflects issues you raised with respect to
17 Staff's reliance on the INEEL exemptions; correct?
18 A. Correct.
19 Q. And my understanding of the contention
20 itself and of your testimony in your declaration is
21 that these bases go to issues you have with the
22 logic that the Staff used in granting the
23 exemptions; correct?
24 A. Yes. If I could help by putting this in
25 context. In my testimony I used the phrase "moving

1 target", so that up to the motion for summary
2 disposition at the end of last year, I think it's
3 fair to say that the arguments for the exemptions
4 were chiefly based on Staff's reasoning. And with
5 the motion for summary disposition last fall,
6 following the deposition notably of Dr. Cornell, I
7 would say this is where PFS for the first time
8 introduced its rationale and framework for
9 justifying the exemption request for the 2000 year
10 return period.
11 So that now what has happened
12 historically, some of these bases have been carried
13 forward in the legal process from early stages. So
14 some of the criticisms arose with the Staff
15 justifications that were introduced in the
16 preliminary SER, in something like December, 1999;
17 then some of the Staff's rationale changed in the
18 next stage in the final SER, September a year
19 later; and then some of them changed again going
20 into the consolidated SER.
21 Two of the strands that stayed constant
22 were the reference reliance on DOE Standard 1020
23 and the PC-3 and the TMI, INEEL ISFSI exemptions.
24 That appeared sort of consistently through the SER.
25 But if I were to show you a road map and

1 the State, in fact, has an exhibit that could do
2 this, to say, "Okay. This is where the Staff has
3 gone with its reasoning to justify the 2000 year
4 bases starting here in September or December of
5 1999," and then the next step, and we put these
6 side by side and looked at them, then we could
7 quickly sort out where or at least I and the State
8 are taking an issue with what we think is the
9 Staff's flawed logic.
10 And elsewhere, where the Staff has, in
11 Dr. McCann's testimony, I think has taken or
12 there's clearly been evolution in this process of
13 policy thinking. And Dr. McCann referred to the
14 DOE arena as more mature in terms of establishing
15 standards that you can point to and say, "Okay,
16 let's make a decision based on this."
17 In this process, because the standards
18 or the reasons that the Staff is offering for
19 justifying the 2000 years, there are ad hoc
20 reasoning, there's inconsistency in places and
21 particularly as it relates to the DOE arena. The
22 fixation on a number, the 2000 years, without also
23 embracing the paradigm that requires a target
24 performance goal that is quantified, and the
25 reliance or this fundamental coupling, again, of

1 that number with the design side, the conservatisms
2 and acceptance criteria.
3 Q. So if I understand your answer, Bases 3
4 and 5 go to issues you have with the particular
5 justification of the logic the Staff may have
6 advanced with respect to the exemptions, not to the
7 technical adequacy of the 2000 year mean return
8 period earthquake itself in terms of whether that
9 earthquake is sufficiently protective of the public
10 health and interest.
11 A. First, let me refresh myself. I'm not
12 familiar with the Bases 3 and 5 by number. But
13 then the last part of your question -- I'm sorry.
14 I got distracted by refreshing myself with 3 and 5.
15 Something important in the last part of your
16 question, I know I had to be careful about agreeing
17 to.
18 Q. First of all, have you finished
19 refreshing yourself with respect to Bases 3, 4, and
20 5? Take your time doing that. Look at your
21 testimony where you briefly discuss them. I kind
22 of lumped those three together as kind of one
23 category.
24 MS. CHANCELLOR: Maybe it would help if
25 you referred to 3 as the Reg Guide. I think

1 Dr. Arabasz knows the concepts but he can't put
2 whether the INEEL is 5 or 6 or 4.
3 Q. Basis 3 is the Reg Guide issue.
4 A. The median versus the mean.
5 Q. Yes.
6 A. Got it.
7 Q. Basis 4 is DOE Standard 1020-94 and the
8 Staff's reference.
9 A. Got it.
10 Q. Basis 5 is the Staff's reference to the
11 INEEL exception. With that background, would you
12 please reread my previous question for Dr. Arabasz.
13 (Record was read as follows: "So if I
14 understand your answer, Bases 3 and 5 go to
15 issues you have with the particular
16 justification of the logic the Staff may have
17 advanced with respect to the exemptions, not to
18 the technical adequacy of the 2000 year mean
19 return period earthquake itself in terms of
20 whether that earthquake is sufficiently
21 protective of the public health and interest.")
22 A. My problem is, both with the logic, and
23 if I don't agree with the logic then I have
24 problems with the number. Because the number then,
25 as I have described, at least, and whether one

1 adopts the DOE paradigm or doesn't, then takes you
2 into this arena of decision-making or agreement
3 with the 2000 year number that's coupled with the
4 risk reduction ratio and the conservatism. So I
5 can't agree a priori with the 2000 number.
6 Q. With respect to the DOE paradigm, you
7 don't necessarily see -- first of all, with respect
8 to the DOE paradigm, you haven't done any analysis
9 yourself of the risk reduction factors that are a
10 part of the PFS facility?
11 A. On the design side, no. And again,
12 reaffirming this is where I have to pass off to the
13 engineers and rely on their judgment to continue
14 the train of logic.
15 Q. I understand. And I guess my question
16 was that the issues raised by Bases 3, 4, and 5,
17 don't go to the technical merit of whether we have
18 a certain level of conservatism in the design of
19 the PFSF such that it meets the target performance
20 goal or does not; isn't that correct? That's what
21 I was trying to drive at.
22 A. Correct. With you leading me by shaking
23 your head.
24 Q. I won't shake my head. Do you agree
25 with my last question?

1 Can you reread the question? I will
2 keep my head still.
3 (The record was read as follows: "And I
4 guess my question was that the issues raised by
5 Bases 3, 4, and 5, don't go to the technical
6 merit of whether we have a certain level of
7 conservatism in the design of the PFSF such
8 that it meets the target performance goal or
9 does not; isn't that correct? That's what I
10 was trying to drive at.")
11 A. Correct. My concern with the 2000 years
12 again would be is there sufficient conservatism on
13 the design side? And I'm not qualified on answer
14 that part of it.
15 Q. And Bases 3, 4, and 5 don't really
16 pertain to that part of it as you see the issue?
17 A. No. What they pertain to is a rational
18 approach to justifying, as a matter of sound
19 earthquake policy making, a number, namely a
20 standard of a 2000 year mean return period design
21 basis earthquake, both in the context, it seems to
22 me, of this facility and another facility as it
23 relates to the logic in the modified rulemaking
24 plan.
25 Q. Now, with respect to just the question

1 of what is the mean annual probability of
2 exceedance for the design basis of nuclear power
3 plants, you would agree that the mean annual
4 probability of exceedance for the seismic design
5 basis for nuclear power plants is approximately one
6 times ten to the minus four; correct?
7 A. In the Central and Eastern United
8 States, that's correct.
9 Q. And the mean annual probability of
10 exceedance for nuclear power plants in the western
11 part of the United States have been analyzed;
12 correct?
13 A. I'd have to ask you to define Western
14 United States here because we come back to a very
15 important distinction whether the -- the
16 implication is Western United States in the generic
17 sense described in Reg Guide 1.165, west of 105
18 degrees, or Western United States along the plate
19 boundary? And here again, the critical importance
20 of that footnote in Table C-3.
21 Q. Now, the Yucca Mountain topical report,
22 which is Exhibit DDD, if you take a look at that,
23 please.
24 A. Excuse me. Triple what?
25 Q. D.

1 A. I still can't hear you.

2 Q. DDD.

3 MS. NAKAHARA: I think it is FFF.

4 Q. Excuse me. FFF. If you look at page --

5 JUDGE FARRAR: Mr. Gaukler, let me

6 interrupt. While we are on this, we asked one of

7 the previous witnesses about the difference between

8 this area in the Rockies versus the tectonic plate.

9 And while we all understand what's going on at the

10 tectonic plate boundary, I think the way one of the

11 witnesses described it is there's an awful lot

12 going on inside or we wouldn't have the Rockies.

13 How does that relate to your previous answer?

14 Because you have been very careful to distinguish

15 the two. And intellectually we know why, but as a

16 practical matter, why do you do so?

17 THE WITNESS: I have reread the

18 transcripts from Saturday and Monday and you have

19 lots of information before you that relates to the

20 importance of steep hazard curves along the plate

21 boundary versus shallower hazard curves elsewhere.

22 So now we have the story of the five dollar

23 calculator and the calculation of those MRPs that

24 went along with those five power plants. And two

25 things are very, very important in my mind, and it

1 relates to seeking a reference probability for a
2 new nuclear power plant.
3 There's some logic, if one looks at the
4 PFS site, where one might have to consider what the
5 reference probability of a new nuclear power plant
6 at that site may be. We saw in this document,
7 Yucca Mountain Topical Report 2, that the DOE had a
8 job in front of it, namely it had to establish an
9 MAPE for Frequency Category 2 events that had been
10 introduced in the rulemaking for Part 60, saying,
11 "Okay, you have to consider these unlikely events."
12 And it seems to me what DOE did was say, "Okay, we
13 are going to select one times ten to the minus four
14 and we are going to justify in connection with a
15 reference probability for new nuclear power
16 plants." And they went through a train of logic
17 that led them to one times ten to the minus four.
18 They did not make that calculation of
19 the five nuclear power plants and say, "This gives
20 us enough justification for setting the reference
21 probability at a 5000 year earthquake at Yucca
22 Mountain as a benchmark." And the reason they did
23 not, I believe, is because there's something very
24 special about where those nuclear power plants
25 happen to lie, the steep hazard curves at those

1 sites as opposed to coming into the interior of the
2 Western United States, into the Intermountain area.
3 If you looked at that famous Exhibit R
4 or S, the steep hazard curves, ultimately
5 introduced as JJ, you would see for INEEL, for
6 Yucca Mountain, for Salt Lake City, for PFS,
7 shallow hazard curves that Dr. Cornell took great
8 time to instruct you on, comparing California,
9 those at Salt Lake City, and the important
10 implications that steep hazard curves in California
11 have vis-a-vis shallower ones in the Intermountain
12 area or the Central and Eastern United States in
13 terms of implications for risk reduction ratios.
14 Those five power plants are consistent
15 with DOE's Table C-3 where, for the DOE facilities
16 near the plate boundary again, Lawrence Livermore,
17 and so on, they could justify risk reduction ratios
18 of the order of 20 that allowed for PC-4 a MAPE of
19 5000 years instead of 10,000 years. And that key
20 piece of information tells me this is why, if you
21 go into the regulatory arena and attempt to set the
22 reference probability for a new nuclear power plant
23 in the Western United States, you would not end up
24 for the whole Western United States at 5000 years.
25 And I believe that if the Staff, indeed, as

1 Dr. McCann testified, associated 5000 years with
2 the design basis earthquake for a nuclear power
3 plant in the Western United States, I think they
4 are on shaky ground.
5 JUDGE LAM: So Professor Arabasz, are
6 you saying these averagings have no meaning; one
7 should not do the averages here?
8 THE WITNESS: One can do those meanings
9 but you have to observe that coincidentally where
10 those five nuclear power plants are, except for
11 Palo Verde west of Phoenix, which is the outlyer,
12 that they are along the plate boundary, they have
13 steep hazard curves, and they are consistent with
14 the DOE logic that says, you know, if you go to our
15 DOE sites, and I believe if you go to those four
16 nuclear power plants, you are going to find equally
17 steep hazard curves and you are going to be led to
18 or you can justify a different reference
19 probability than elsewhere in the country.
20 Q. (By Mr. Gaukler) Now, Dr. Arabasz --
21 any further questions from the Board?
22 Dr. Arabasz, I was going to focus you on
23 whether or not it's reasonable to say that,
24 approximately, the mean for nuclear power plants
25 nationally on a design basis -- strike that.

1 The mean annual probability of
2 exceedance for a nuclear power plant nationally is
3 approximately one times ten to the minus four. Not
4 making a distinction necessarily between the East
5 and the West.
6 A. Nationally, I don't have enough
7 information. The information I have is the
8 analysis from the Central and Eastern United States
9 plants. We have the information from the five
10 nuclear power plants that appear in the Yucca
11 Mountain Topical Report. And elsewhere, we don't
12 have any guidance.
13 Q. Doesn't the Yucca Mountain Topical
14 Report basically use as one times ten to the minus
15 four as an approximate average for the mean annual
16 probability of exceedance for nuclear power plants
17 generally?
18 A. At bottom, I think that's probably where
19 you would end up. Except for the plate boundary.
20 Q. And that would be a reasonable number to
21 expect generally as an approximate matter, for the
22 mean annual probability of exceedance for nuclear
23 power plants nationally?
24 MS. CHANCELLOR: Objection. Asked and
25 answered. Dr. Arabasz has explained the

1 distinction between the national one times ten to
2 the minus four and those on the western plate
3 boundaries.
4 JUDGE FARRAR: Have we covered this
5 sufficiently, Mr. Gaukler or is there something
6 more to extract here?
7 MR. GAUKLER: I think he has answered
8 the question. Let me ask one more time in
9 accordance with a similar answer in a deposition.
10 Q. (By Mr. Gaukler) Do you recall that
11 when I asked in your deposition whether using a
12 mean of one times either the minus four or
13 approximately represents all the nuclear power
14 plants in the United States, that your answer was,
15 "That's a reasonable judgment." And I can show you
16 the question and answer.
17 A. You don't need to. Sure. Let me agree
18 to what I said in my deposition.
19 Q. That that would be a reasonable
20 judgment?
21 A. Yes.
22 Q. Okay.
23 MS. CHANCELLOR: Dr. Arabasz shouldn't
24 agree just to move this along. I think he has
25 testified that there is a distinction, and he can

1 change his opinion from his deposition based on
2 further analysis and review. And I don't want him
3 to feel like he is forced to agree.
4 MR. GAUKLER: Let me mark this as an
5 exhibit.
6 JUDGE FARRAR: Dr. Arabasz, let me make
7 sure you understand the old Dale Carnegie thing
8 about winning friends and influencing people. You
9 are here to influence people, not necessarily to
10 win any friends. And we have been here for five or
11 six weeks and we want to get everything on the
12 record that you have on your mind. And so the fact
13 that you said something at your deposition, you may
14 agree that you said it but there's always an
15 opportunity to explain why your answer then was
16 incomplete or your answer may be reconsidered. In
17 other words, we don't like witnesses saying one
18 thing at one time and another at another time,
19 unless there is an explanation. And most times, in
20 scientific matters, there is. So the fact that you
21 said something once before doesn't mean that you
22 are locked into it if you have a different thought
23 process today. Everyone is anxious to hear that.
24 THE WITNESS: Thank you for that
25 guidance. I think I do have a different opinion

1 today than I did at the deposition. In fact, even
2 than I did last Saturday. It was a real epiphany
3 for me to make the connection between that footnote
4 in Table C-3 about the tectonic plate boundary and
5 the reference probability for a nuclear power
6 plant. And I sat probability, I'm ashamed to say,
7 inattentive to that one key piece of information
8 through the State's cross-examination on Monday,
9 and so on. And I think that this really is very,
10 very fundamental. We can look at that table of
11 five nuclear power plants and then we have to be
12 very careful before we make the leap that this
13 somehow is guiding the reference probability for
14 new nuclear power plants in the Western United
15 States.
16 JUDGE FARRAR: Okay.
17 JUDGE FARRAR: Mr. Gaukler, while we
18 were doing that, you handed out an exhibit you
19 wanted or document you wanted marked for
20 identification?
21 MR. GAUKLER: Yes.
22 JUDGE FARRAR: And this will be --
23 MR. GAUKLER: That's what I'm trying to
24 figure out. Off the record for a minute?
25 JUDGE FARRAR: I think it is 103.

1 MR. GAUKLER: Let's go off the record
2 for a second, your Honor.
3 JUDGE FARRAR: Okay.
4 (Discussion off the record and
5 EXHIBIT-102A WAS MARKED.)
6 JUDGE FARRAR: We are going to change
7 the marking system here in light of some exhibits
8 on another issue having been pre-marked by the
9 Applicant, even if not by the reporter. So we will
10 now, for future PFS exhibits today, adopt a suffix.
11 So this will be 102A. This is the excerpts from
12 the deposition of Dr. Arabasz and the court
13 reporter has already marked it as PFS 102A in
14 accordance with our off-the-record discussion.
15 Q. (By Mr. Gaukler) Dr. Arabasz, have you
16 had a chance to look at what's been marked as
17 Exhibit 102A?
18 A. I haven't been. I haven't read it
19 carefully. I'm just waiting for direction to look
20 at a particular comment.
21 Q. I was going to refer you to just the
22 question and answer on Page 71. And the other
23 stuff is all background leading up to it, where I
24 asked you, "So therefore, using a mean of 1E to the
25 minus four approximately represents all the nuclear

1 power plants in the Western, Eastern United
2 States?"
3 And you say, "That's a reasonable
4 judgment."
5 A. Could you point me again to a page and
6 line number?
7 Q. Page 71, lines 7 through 10.
8 A. Yes.
9 JUDGE FARRAR: If you need a minute to
10 read the earlier pages, why don't you do take.
11 A. I think following up on the line of
12 question that you put to me, in retrospect at that
13 time I did believe that that was a reasonable
14 judgment. And as I described to you with my
15 epiphany this past weekend, I just have changed my
16 opinion.
17 JUDGE FARRAR: Do you need to read the
18 earlier pages in anticipation of the next question?
19 Why don't you take a minute and refresh yourself.
20 A. I'm ready.
21 Q. Just a follow-up. If I understand the
22 issue --
23 JUDGE FARRAR: Hold on.
24 (Board confers off the record.)
25 JUDGE FARRAR: Go ahead, Mr. Gaukler.

1 Q. Just going back, if I understand
2 correctly, you read thought this in terms of the
3 western nuclear power plants which have a five
4 times ten to the minus four mean value for the mean
5 annual probability of exceedance; correct?
6 A. Correct.
7 Q. And that's with respect to because they
8 have relatively steep hazard curves; correct?
9 A. Yes.
10 MS. CHANCELLOR: Point of clarification.
11 When you say Western U.S. are you talking about the
12 plate boundaries or generically Western United
13 States?
14 MR. GAUKLER: I'm referring to the five
15 plants that were the basis of the average.
16 Q. (By Mr. Gaukler) So if you didn't have
17 the steep hazard curves, then it would be
18 reasonable to represent the nuclear power plants by
19 a mean of one times ten to the minus four, do you
20 believe?
21 A. I'm going to say yes, and let me explain
22 the basis of my saying yes. We have information
23 from the Central and Eastern United States. We
24 have information from the five plants along the
25 plate boundary. And I don't have information in

1 between. Based on the information, the education
2 that Dr. Cornell gave in this hearing regarding the
3 relative slopes of hazard curves in the Western
4 United States, outside of plate boundary and in the
5 Central and Eastern United States, at bottom I
6 believe that we would come to that one times ten to
7 the minus four number for the Western United States
8 outside of the plate boundary.
9 Q. Okay. And, therefore, for areas like
10 the PFSF you think that's what you would come to as
11 a bottom line for a reasonable representation for a
12 mean; correct?
13 A. Scientists always have to be careful
14 about what the answer is going to be, but I think
15 that is where we would end up.
16 Q. Okay. You mentioned that Palo Verde was
17 one of the five plants that was part of the
18 discussion last Saturday that was part of this
19 average of five times ten to the minus four?
20 A. Yes.
21 Q. And that's not on a plate boundary;
22 correct?
23 A. Correct.
24 Q. So that would be an exception to -- in
25 other words, your concern about being on a plate

1 boundary would not apply to that plan; correct?
2 A. That's an outlyer in the statistics.
3 And it doesn't greatly affect the outcome in that
4 table in an analysis. But it is indicative with
5 its, I believe, what is it, a 26,000 year mean
6 return period? It is indicative of moving away from
7 the plate boundary or in that case clearly outside
8 of what anyone in the Intermountain area would
9 consider a seismic reactive area.
10 Q. Now, if you were going to do a risk-
11 graded approach, and you wanted to compare the -- a
12 risk-graded approach for ISFSI versus nuclear power
13 plants, and you wanted to compare what would be an
14 appropriate mean return period earthquake for a
15 place like the PFSF, it would be appropriate to
16 compare the mean return period earthquake for the
17 PFSF to an analogous return period earthquake for a
18 nuclear power plant.
19 A. I think I'm following your question,
20 yes.
21 Q. And I think, therefore, assuming like we
22 discussed that one times ten to the minus four was
23 the mean annual probability of exceedance for the
24 design basis of nuclear power plants, it would be
25 appropriate in applying the risk-graded approach in

1 determining the appropriate design basis for the
2 PFSF, to compare its mean return period design
3 basis earthquake to the equivalent to a mean annual
4 probability of exceedance of one times ten to the
5 minus four?
6 A. Correct.
7 Q. Now I'd like to turn to Basis 4 of the
8 contention which is the Staff's reference to DOE
9 Standard 1020-94. And if I understand your
10 testimony with respect to Basis 4 and what we have
11 discussed today, you don't disagree with the
12 1020-94 concept; correct?
13 A. I do not disagree with it. Correct.
14 Q. And your concern is that the Staff did
15 not fully implement what you believe to be the
16 1020-94 concept, or adopt it. Is that what you are
17 saying?
18 A. Correct. I believe the Staff
19 selectively chose a number out of this paradigm
20 without, again, embracing the total approach
21 involved.
22 Q. And if I understand the DOE paradigm as
23 we have been talking about is you have a design
24 basis earthquake and you have some margin in your
25 design such that you achieve a probability of

1 failure that is less than the design period
2 earthquake?
3 A. Correct.
4 Q. And the paradigm in terms of if you
5 establish that you have this conservatism, then
6 you -- strike that.
7 When you talk about the DOE paradigm,
8 you are talking about establishing the conservatism
9 by which you establish that you meet a particular
10 target performance level; correct?
11 A. Correct. First you agree that there is
12 a target seismic performance goal.
13 Q. And assuming that -- do you have any
14 opinion in terms of the procedures or process by
15 which you go about establishing whether you have
16 any particular risk reduction factor or not?
17 A. Do I have an opinion?
18 Q. Yes.
19 A. I have been educated on two occasions
20 now by Dr. Cornell about how that is done on the
21 design side by engineers. I don't live on that
22 side, and so I don't have this practical
23 experience. But I have now a more full
24 appreciation of it.
25 Q. And you would -- so you would agree, as

1 we talked about before, if the margin that
2 Dr. Cornell talks about in his testimony is shown
3 to exist, then he would have established a target
4 performance level equivalent to a PC-3 category
5 document of one times ten to the minus four?
6 A. We are back to that big hypothetical,
7 with a capital H.
8 Q. So the answer is yes, with the same
9 caveat you gave before?
10 A. Yes.
11 Q. Okay. Now, with respect to Basis 5,
12 which concerns the INEEL exemptions --
13 A. Yes.
14 Q. Again, in accordance with what we just
15 discussed before, your issue just goes to the
16 precedental value of that exemption as you see it.
17 Is that correct?
18 A. Yes. That is the key point. Whether it
19 was a clear and compelling precedent.
20 Q. And doesn't affect the substance of the
21 issue we were just talking about in terms of
22 whether or not -- the key question we talked about,
23 whether or not we have this or have shown this
24 conservatism; correct?
25 A. Correct.

1 Q. I'd like to turn to Basis 6. It is a
2 little bit different. Basis 6, you were basically
3 provided -- strike that.
4 Basis 6, I believe, is discussed in
5 Question and Answer 14, bottom of Page 12, where
6 you quote Basis 6.
7 A. Yes, I see that.
8 Q. I'll refer everybody to that. And that
9 relates to a different issue. Basically Basis 6
10 says two things. The first thing is that it
11 questions the adequacy of a 2000 mean return period
12 design basis earthquake for the PFSF because the
13 design levels for new Utah building construction
14 highway bridges are more stringent.
15 Now, you were initially the author of
16 this basis. In other words, you provided the
17 technical input for that basis; correct?
18 A. Correct.
19 Q. And after going through the deposition
20 process and the hearing process, you now would
21 agree that just because the design basis earthquake
22 for the PFSF might be lower, might have a value of
23 2000, say, compared to 2500 for a highway bridge,
24 doesn't mean that the PFSF would be less safe than
25 the highway bridge; correct?

1 A. Could I explain what's in Basis 6 here?
2 Q. Certainly.
3 A. There's some historical perspective that
4 is important in terms of, again, a moving target
5 with the Staff's justification. And also, it
6 introduces another paradigm for decision-making
7 about acceptable risk; on the one hand an annual
8 probability, on the other hand the issue of a total
9 exceedance probability.
10 If you track me, you have to track the
11 Staff because they were the initiators of the
12 rationale put forward. So as you track me, you
13 track my response to their moving rationale. In
14 the preliminary SER, they introduced the comparison
15 to building codes. And unfortunately at the time,
16 they referred to an obsolete document, the 1994 UBC
17 which had been superseded by the UBC 2000. And
18 they also, in their argument, used the notion of a
19 total probability of exceedance, which required a
20 premise on the lifetime of the facility. And so
21 this is a thread that will carry through that comes
22 again back in the modified rulemaking plan, but the
23 Staff's reasoning of using a total probability of
24 exceedance for justifying the 2000 year.
25 In terms of the 2000 year now as it

1 relates to the IBC 2000, I think it has an
2 implication for sound policy making for justifying
3 a mean return period basis for ISFSIs in the larger
4 arena, given the move to the 2500 year return
5 period in the IBC 2000, which the broad engineering
6 community will be aware of, aware of the change in
7 the DOE Standard 1020 version 2002, which a broad
8 community will be certainly aware of.
9 And then the fixation on the 2000 year
10 number in NRC policy making sort of sticks out as a
11 sore thumb. It invites close inspection and
12 examination. It survives if, again, NRC policy
13 making embraces the rest of the DOE paradigm. On
14 its own as a 2000 year number, again, it invites
15 inspection and criticism.
16 Q. So basically you are saying that, like
17 you say in the Question and Answer 14, you can't
18 compare just the mean return period earthquake for
19 two facilities; correct?
20 A. In my testimony, when I address this,
21 let me look at --
22 Q. Page 13?
23 A. Yes. And going down to the second full
24 paragraph, left justified. "Granting that 'the
25 safety achieved depends on both the DBE MRP and the

1 design procedures and criteria utilized,'" then I
2 agree and have to defer to the engineering side,
3 mainly the State's engineering experts, to complete
4 the analogy with the PFS facility in terms of
5 adequate or sufficient protection. Adequate
6 conservatism.
7 Q. So again, this issue would not go to the
8 basic hypothetical we just asked you in terms of
9 assuming that Dr. Cornell is correct on the
10 conservatisms that he has enunciated in his
11 testimony, then we would have shown the seismic or
12 the achievement of a seismic performance level on
13 the order of that provided for by DOE 1020;
14 correct?
15 A. Correct.
16 MS. CHANCELLOR: I'm going to object.
17 Dr. Arabasz has stated that as far as conservatism
18 goes, he hands off to the State's expert. He said
19 this is a hypothetical with a capital H. Mr.
20 Gaukler keeps coming back to this and the record
21 shouldn't reflect that Dr. Arabasz agrees with
22 PFS's fundamental underlying argument that its
23 facility is conservative because his testimony
24 states he hands off to the other State's experts.
25 JUDGE FARRAR: Mr. Gaukler, it has

1 seemed that we have heard this same question and
2 same answer several times.
3 MR. GAUKLER: My apology. I just want
4 to --
5 JUDGE FARRAR: Don't apologize.
6 MR. GAUKLER: Let me say the reason I
7 was saying it. I just wanted to make clear on the
8 record that the issue in Basis 6 doesn't relate to
9 that basic issue that we described in the
10 hypothetical. It doesn't play into it.
11 MS. CHANCELLOR: You could ask the
12 question does it play into the way in which you
13 would implement DOE Standard 1020, and you would
14 get to the same place without having to go through
15 the hypothetical.
16 MR. TURK: There's no question pending,
17 your Honor. I don't know why we need to do this.
18 JUDGE FARRAR: Because we enjoy it.
19 MR. TURK: The objection is late.
20 JUDGE FARRAR: Mr. Turk is correct. So
21 let's move on. But let's maybe --
22 MR. GAUKLER: I'll keep the objection in
23 mind in the future questions. Okay?
24 JUDGE FARRAR: Okay.
25 MR. GAUKLER: I just wanted to pass out

1 a courtesy copy of parts of Dr. Bartlett's and
2 Dr. Ostadan's testimony on lack of design
3 conservatism.
4 Q. (By Mr. Gaukler) I'd like to have you
5 focus on the Question and Answer number 9. This is
6 testimony from Dr. Bartlett and Ostadan dated April
7 1, 2002 that was prefiled with respect to this
8 section of the contention. And you will note that
9 in Question and Answer number 9, Dr. Bartlett and
10 Dr. Ostadan addressed, in essence, this part of
11 Basis 6. And they refer to the 2500 year design
12 basis earthquakes for highway bridges and other
13 facilities. And in particular I'd like to have you
14 focus on the last paragraph where it says, "In our
15 opinion, PFS's reliance on 2000-year DBE is not
16 consistent with safety and engineering standards
17 established for DOE nuclear facilities or even the
18 general standard for buildings and highways."
19 A. Yes.
20 Q. You would agree with me, would you not,
21 after our discussion today, that one cannot make
22 the statement that our use of a 2000-year design
23 period earthquake is not consistent with the use of
24 a 2500- year design basis earthquake under some
25 other standard without evaluating the conservatisms

1 embodied in the relative earthquake designs of
2 both; correct?
3 A. I will agree. And that will be
4 consistent with my earlier agreements.
5 Q. Right. In other words, they are only --
6 JUDGE FARRAR: Wait. The witness has
7 some more to answer.
8 Q. You have more? I didn't realize you had
9 more.
10 A. First, I will make the point that my
11 testimony was shaped independent of Dr. Bartlett's
12 or Dr. Ostadan's, and so I am here offering my own
13 personal opinion. And as I reply, I always have to
14 qualify because we look at a number and we can look
15 at that number within the context of the DOE
16 paradigm or look at that number within the context
17 of NRC decision-making or precedents again which
18 don't share, by any agreement yet, that same
19 paradigm. But from what you have asked me, if I
20 understood -- well, heck. I guess I better have
21 you or have the question reread before I give you
22 my affirmative yes.
23 Q. Fair enough.
24 Please reread the question.
25 (The record was read as follows: "You

1 would agree with me, would you not, after our
2 discussion today, that one cannot make the
3 statement that our use of a 2000-year design
4 period earthquake is not consistent with the
5 use of a 2500-year design basis earthquake
6 under some other standard without evaluating
7 the conservatisms embodied in the relative
8 earthquake designs of both; correct?")
9 A. In my opinion, correct.
10 Q. And so this question and answer -- in
11 this question and answer of Dr. Ostadan and
12 Dr. Bartlett, you are only considering one of the
13 two factors that go into making that judgment;
14 correct?
15 A. Correct.
16 Q. I now would like to go on to the second
17 part of Basis 6, which is the question of the life
18 for the facility of the return period and to the
19 extent to which the life of the facility plays into
20 evaluating the appropriate design basis earthquake.
21 JUDGE FARRAR: Mr. Gaukler, let me
22 interrupt for planning purposes, and lunch
23 purposes. How much more total cross do you have?
24 MR. GAUKLER: I think I should be done
25 by 12:30.

1 JUDGE FARRAR: Okay. Good. Let's go
2 ahead, then.
3 Q. You were saying that historically this
4 basis in the contention arose from the Staff
5 reference to the life of the facility as part of
6 its logic for granting the exemptions or proving
7 the exemptions; correct?
8 A. Correct.
9 Q. And you heard Dr. McCann and Stamatakos
10 and Dr. Chen's testimony, I believe, Saturday and
11 Monday where this is no longer a part of the
12 Staff's premise for the granting of the exemptions;
13 correct?
14 A. In the train of documents that put
15 forward the Staff's reasons why the 2000 year MRP
16 is justified, it appeared in the preliminary SER
17 and subsequently apparently set aside; but for
18 whatever reason, re-appearing in the modified
19 rulemaking plan as a justifiable reason for a 2000
20 year MRP.
21 Q. So do you still consider this to be part
22 of the issues in this case or not, as far as you
23 are concerned?
24 A. It remains a part until someone sets the
25 guidance for decision-making about acceptable risk.

1 We have the DOE paradigm before us, and we have
2 I'll say floating another paradigm that says that
3 the total probability of exceedance during the
4 lifetime of a facility may provide a basis for
5 judgment on acceptable risk. In the Staff's
6 reasoning most recently, if I recall correctly in
7 the modified rulemaking plan, the comparison of the
8 total probability of exceedance at an ISFSI with a
9 2000-year MAPE compared to Yucca Mountain with a
10 one-hundred year lifetime versus a twenty-year
11 lifetime for the ISFSI, and with a higher MAPE,
12 both of them giving a total probability of
13 exceedance of, if I recall correctly, .02 over the
14 lifetimes of the facilities.
15 Q. Would you agree, wholly apart from the
16 issue of what the Staff has or has not relied upon
17 in terms of the exemptions here, would you agree
18 with Dr. Cornell, as you heard his testimony on
19 Saturday, that the appropriate way in which to set
20 forth and evaluate earthquake risk is on an annual
21 basis? In other words, you should look at the
22 annual probability of exceedance and define the
23 risk in the mean return period earthquake in that
24 sense.
25 A. You asked me this question in deposition

1 in October and I remember vividly deferring to
2 Dr. Cornell. And in my testimony here, I revisit
3 that agreement, saying that I beg to differ
4 particularly with at least the offering of a
5 citation to the Pate-Cornell paper as establishing
6 that this was a norm for public safety. And I
7 spend more than half of Page 16 parsing the
8 Pate-Cornell paper, and stating that I guess at
9 bottom I am not a risk analyst and don't have a
10 firm basis for agreeing that, indeed, annual
11 probabilities should be the risk-metric.
12 Insofar as Dr. Cornell's side of the
13 Pate-Cornell paper, as a seeming basis for his
14 statement that this was the norm in virtually all
15 areas of public safety, then after reading the
16 Pate-Cornell paper, I disagreed, respectfully.
17 Q. You disagreed that the Pate-Cornell
18 paper provided a basis for using the annual
19 frequency, is what I understood you to say.
20 A. I begin my statement relating to that
21 issue near the top of Page 16, the second
22 paragraph, saying, "The cited paper by Pate-Cornell
23 does not convincingly establish as a norm for
24 public safety that," in Dr. Cornell's words,
25 "'hazards are measured as annual probabilities (or

1 frequencies) of occurrence, regardless of the
2 length of activity in question, the exposure time,
3 the estimated facility life, or the licensing
4 duration.'".
5 Q. And I guess I was just trying to
6 understand what you were agreeing with or
7 disagreeing with. Are you saying that now you
8 believe that you should not use an annual risk
9 basis or are you saying that the reference to the
10 Pate-Cornell paper does not provide sufficient
11 justification in your view to use an annual risk
12 basis? I'm just trying to clarify which you are
13 saying.
14 A. Okay. At the end of the day, I will
15 admit, as I did a few moments ago, that I'm not a
16 risk analyst. As stated in my testimony, I may
17 agree with Dr. Cornell ultimately but he is going
18 to have to show me better reason than the
19 Pate-Cornell paper.
20 Q. Just wanted to understand what you are
21 saying.
22 You make reference in your testimony
23 to -- I believe I'm looking for the reference here.
24 I believe it's the NEHRP reference.
25 A. In Answer 15. Is this what you are

1 referring to? On Page 14, the bottom?

2 Q. Yes. That's what I'm referring to.

3 Answer 14. Answer 15 going over to Page 15. You

4 refer to, "The hazard maps depict probabilistic

5 ground motion and spectral response with ten

6 percent, five percent, and two percent probability

7 of exceedance in fifty years." Correct?

8 A. Correct.

9 Q. And you refer that kind of as an example

10 where you looked at something that may not be an

11 annual frequency? Is that what I understand the

12 purpose of that?

13 A. Correct.

14 Q. Now, isn't it true that the 2 percent

15 likelihood of exceedance in 50 years could just as

16 easily be expressed as an annual probability of

17 exceedance of .04 percent?

18 A. Yes. My point is that from my

19 understanding of how people in the engineering or

20 building community, or at least in the earthquake

21 hazard community, how they have approached

22 decision-making with the question before them on

23 how to arrive at a level of acceptable risk; that

24 they have taken into account exposure periods, life

25 times of facilities. At least in my understanding.

1 Q. Well, in terms of this 2 percent of
2 likelihood of exceedance in fifty years, do you
3 change that if you have a building that is designed
4 for a hundred years? Will you use a different
5 probability? Do you know?
6 A. I'll say I don't know.
7 Q. And by the same token, you wouldn't know
8 whether you would change the capability if it was
9 to be designed for twenty-five years; correct?
10 A. I am not a practicing engineer and
11 conversant with the practical decisions and the
12 politics that go into standards in the building
13 arena. Not as conversant, certainly, as
14 Dr. Cornell.
15 I'll add one thing. I have had enough
16 experience in my years of involvement in the
17 earthquake hazard arena to recognize that there are
18 not first principles that apply in code decisions,
19 but clearly lots of judgment and frankly lots of
20 compromising and politics.
21 Q. As a matter of fact, just going back to
22 this question of whether or not you can express the
23 probability of exceedance in 50 years equally well
24 as an annual probability of exceedance. Will you
25 look at your answer on Page 15. Doesn't one of the

1 quotes there actually take a 10 percent probability
2 of exceedance in 50 years and reference the
3 corresponding annual exceedance of probability of
4 about two times ten to the minus three. And they
5 make that direct correlation in that quote you have
6 there?
7 A. Yes. These quotes tell me that these
8 exposure periods somehow were considerations in the
9 process of decision-making or the thought processes
10 of these decisionmakers.
11 Q. As opposed to just another way of
12 expressing annual exceedance?
13 A. It provides human guidance. For
14 example, within the NEHRP national hazard maps, the
15 2 percent probability of exceedance in 50 years
16 corresponding to the 2500 year ground motion, that
17 is telling building officials and engineers, in my
18 opinion, something about what they are considering
19 that is a little bit different than an annual
20 probability which, in the experience of this
21 hearing, people find hard to track. But they can
22 intuitively relate to the 500-year earthquake and
23 the 2500-year earthquake.
24 Q. But don't they, doesn't that quote show
25 on Page 15 that they equate them; just a different

1 way of expressing them?

2 A. Point me, please, to the --

3 Q. I'm looking at the quote from the

4 National Research Panel on Seismic Hazard Analysis.

5 And specifically in there it says that the --

6 reading the first part of the quote, it refers to

7 the Applied Technology Council.

8 A. Yes.

9 Q. "Has suggested the design seismic hazard

10 levels should have a 10 percent probability of

11 exceedance in 50 years, which corresponds to an

12 annual exceedance probability of about two times

13 ten to the minus three."

14 A. The quote does indeed equate that.

15 Q. And down further again it says, "Such

16 facilities should remain essentially elastic for

17 seismic hazard with a 50 percent probability of

18 exceedance in fifty years or about one times ten to

19 the minus two annual exceedance probability." So

20 they equate it there, as well?

21 A. Correct.

22 Q. And so when you apply these maps, these

23 NEHRP maps, they are employed to all different

24 types of structures with different life times, et

25 cetera. Correct?

1 A. Correct.

2 Q. Let me confer for a second.

3 No further questions, your Honor.

4 JUDGE FARRAR: Judge Lam has some

5 questions.

6 JUDGE LAM: Professor Arabasz, if I may

7 follow up on Mr. Gaukler's questions on highways

8 and bridges. Consider if a builder comes forward

9 with an extra robust bridge or highway, and since

10 the code requirement is for 2500 years earthquake,

11 if he asks for an exemptions for 2000 year

12 earthquake, would you grant it?

13 THE WITNESS: If the regulatory guidance

14 has a framework for explaining, justifying, and

15 understanding the exemptions, it appears to be a

16 reasonable consideration. Would I grant it if the

17 regulatory framework were not in place for solidly

18 justifying it? I would be hesitant.

19 JUDGE LAM: May I ask you what is the

20 purpose of setting a requirement in building

21 highway bridges? If 2500 years can be waived, what

22 is the purpose of setting that requirement?

23 THE WITNESS: The purpose, I would

24 judge, would be to insure adequate seismic loading

25 to test the design or to insure that the design

1 could with- stand that seismic loading.

2 JUDGE LAM: So your views of seismic

3 safety really are global in the sense that you

4 consider both the seismic requirement and standard

5 and the design margin of the facility being built.

6 THE WITNESS: Correct.

7 JUDGE LAM: And Dr. Arabasz, in your

8 Exhibit 124 and 120A, they talk about the latest

9 proposal making plans, soliciting comments on the

10 mean annual exceedance probability between the

11 range of five times ten to the minus four, and one

12 times ten to the minus four, which means in the

13 range of 2000 years to 10,000 year return period

14 earthquake. If you have not already done so, what

15 comments would you provide to the Commission?

16 THE WITNESS: In some of my testimony

17 earlier this morning I would raise the concern for

18 sound policy making that in one instance would

19 relate to clear visibility before the engineering

20 and design community and awareness that other

21 standards have advanced to a 2500 year number. And

22 my concern also that the regulatory framework

23 contain standards, guidance, against which this

24 2000 year number, if adopted, can be rationalized

25 rather than simply the selection of a number

1 without the accompanying framework for standards in
2 guidance, in this case notably the understanding
3 and agreement on a desired performance goal and
4 standards that one could go to, to insure the
5 appropriate conservatism accompanying that number
6 in design.
7 JUDGE LAM: Professor Arabasz, reading
8 your resume, I understand you are intimately
9 familiar with the seismic activity within the State
10 of Utah. Is that correct?
11 THE WITNESS: Correct. Well, I will be
12 modest. But I have lived in Utah since 1974 and it
13 has been a main stay of my job to be monitoring the
14 earthquake activity.
15 JUDGE LAM: With that background,
16 Professor Arabasz, may I ask you for a moment just
17 disregard whatever degree of conservatism built
18 into the design of this particular facility that we
19 are considering. Just disregard what the degree of
20 conservatisms, assuming you don't know that. And
21 with your intimate knowledge of the State of Utah
22 seismic activity, what would you consider an
23 appropriate level of requirement for the return
24 earthquake period?
25 THE WITNESS: I would base my answer on

1 an experience and understanding of the rate of
2 earthquake activity in the Intermountain area
3 compared to the plate boundary as a point of
4 reference; and also an understanding of the
5 difference in return period of large earthquakes on
6 the major active faults here in the Intermountain
7 area compared to those in California. And simply
8 put, the large active faults have relatively longer
9 return periods compared to faults in California.
10 So you want to insure a mean return period design
11 basis motion that will fit or give some assurance
12 that whatever you put on the landscape can survive
13 that expected motion from a larger-sized earthquake
14 rather than just accepting a number based on a
15 probability argument. Let's say 2000 years.
16 Q. So do you have a number for us, just an
17 expert guess? Now, of course you know the longer
18 the return period, the safer the standard is. One
19 has to balance without being excessively cautious
20 what you just said. Like for example, the State
21 has maintained that 2000 year is not adequate. And
22 furthermore, in one of the State's briefs, the
23 State says if the Board ruled against 10,000 year
24 requirement perhaps the Board would select and
25 decide a number somewhere between. That is why I'm

1 asking you this question. Do you have an opinion
2 if not 2000 year, what should it be?
3 THE WITNESS: I have been asked this
4 question before and I have been fairly guarded and
5 careful in my answer because I want to respect a
6 regulatory framework that can be rationalized. And
7 I cannot, having said that, pick a number separate
8 from the conservatisms on the right-hand side of
9 the equation so that if we are considering
10 unanchored casks at a PFSF and if we reach a
11 conclusion that given a design basis earthquake
12 there is a low risk reduction ratio or a
13 conditional probability that doesn't get me to a
14 performance goal adequately, then I am forced to
15 come up on the MAPE side higher than 2000 years.
16 Going back to your original question,
17 you are asking me for some kind of intuition about
18 geological behavior and trying to guess or give an
19 opinion regarding a mean return period relating to
20 the earthquake activity rate or the return period
21 of large earthquakes on the major active faults.
22 Here in the Salt Lake valley, the move to the 2500
23 year maximum considered earthquake in the building
24 code was very, very important, as Dr. Cornell
25 explained; because, were it along the plate

1 boundary, one on a time scale of hundreds of years,
2 one would experience the kind of seismic loading
3 you want to have some defense against.
4 Here in the Intermountain area, or
5 specifically in the Salt Lake valley, the average
6 return period of a large surface rupturing
7 earthquake on the part of the Wasatch fault here in
8 the Salt Lake valley is approximately 1400 years.
9 Or on average one to 2000 years. So then we have
10 an average rate and then you would use a Poisson
11 model to estimate what the likelihood of an event
12 of that size is within some period of
13 consideration.
14 When we move to Skull Valley, the return
15 periods become longer. The mean return period for
16 the Stansbury fault, we don't have great
17 information on -- we have a knowledge of a most
18 recent event perhaps on the order of 8000 years and
19 a prior event of 15,000 years or longer. We don't
20 have information to really understand that beast.
21 We know from the slip rate of the order of .4
22 millimeters per year plus or minus a millimeter a
23 year, excuse me, a tenth of a millimeter a year,
24 that that fault has been storing energy for at
25 least 8000 years and it's capable of delivering a

1 large earthquake.

2 We have to stand back if we are, in

3 Dr. McCann's words, risk articulate, or if we deal

4 with probabilities and understand the position that

5 we really don't know whether the next event is

6 tomorrow or thousands of years away. So we rest

7 our decision-making, given that uncertainty, on the

8 outcome of a probabilistic seismic hazard analysis

9 from which an annual probability of exceedance is

10 calculated. And we then, in our consistent logic,

11 proceed forward with some kind of decision-making.

12 JUDGE LAM: Okay. Professor Arabasz, a

13 final question for you. I just want to clarify if

14 I'm reading your testimony correctly on Pages 12 to

15 16, your answers to Question 14 and 15. In your

16 debate with Dr. Cornell, on the annual versus

17 lifetime risk, am I reading your testimony

18 correctly, Professor Arabasz, that if your theory

19 of lifetime risk prevailed and this facility is

20 built for 40 years, the perhaps the appropriate

21 level of return into it would be about 4000 year?

22 THE WITNESS: First let me qualify that

23 it is not my theory. What I am doing is picking up

24 on the Staff's logic and saying, "Okay, if that's

25 where you want to go, these are the implications."

1 And the implication, if we follow their logic, it
2 is yes, a to 4000 year MAPE would be appropriate
3 for the metric that they have posed.
4 JUDGE LAM: To be exact, it is 3980
5 years; isn't it?
6 THE WITNESS: Yes.
7 JUDGE LAM: Okay. Thank you, Professor.
8 JUDGE FARRAR: Dr. Arabasz, listening to
9 the previous answer where Dr. Lam asked for a
10 return period earthquake, maybe we have to urge you
11 not to be so diffident and modest. We have two
12 kinds of witnesses: There are some who are aware
13 of what they don't know and are very cautious of
14 what they say, and you strike me as one of those
15 people. We have other witnesses - and talking
16 generally here, not anybody or referring to any
17 particular testimony - but sometimes people aren't
18 aware of their limitations and they barge ahead and
19 give you an answer. So then the Board is left with
20 an answer from someone who is not aware of their
21 own limitations, and no answer from the cautious
22 people. So I would urge you to put the caution
23 aside. You have studied the testimony. You are
24 aware of the regulatory system. And let me repeat
25 Judge Lam's question about what your recommendation

1 would be to us, about the return period earthquake.
2 And you have given us, in the previous answer, a
3 very extensive look at your thought processes. But
4 now could you add to that answer, "And therefore
5 the answer is . . ."
6 THE WITNESS: Judge Lam trapped me by
7 requiring that I had to completely set aside the
8 conservatism part of the equation.
9 JUDGE FARRAR: And for purposes of this
10 question, put that aside. One, you are not an
11 expert, in that; and two, we have plenty of
12 evidence on that subject so we can take whatever
13 answer you give and amend it if appropriate to take
14 account of the conservatism. But before we can do
15 that, we have to have or we would like to have an
16 answer from you putting aside the conservatisms.
17 THE WITNESS: In my interactions with
18 Mr. Gaukler, I am keenly aware of logic and my
19 following the logic so that if the DOE paradigm is
20 adopted, you have what Judge Kline was seeking in
21 the form of an algorithm to go from some judgment
22 about what the conservatism, what the risk
23 reduction really is; or put another way, given the
24 design basis earthquake, what is the probability of
25 failure, given the event.

1 We have as points of reference --

2 JUDGE FARRAR: I'll tell you what. Give

3 me the answer first and then you can explain it.

4 THE WITNESS: Okay. You allowed

5 Dr. McCann to bounce between two bounds.

6 JUDGE FARRAR: Okay.

7 THE WITNESS: Dr. McCann set 5000 years

8 as the mean return period design basis earthquake

9 for a nuclear power plant. I don't agree with

10 that. I think that is not supportable for the PFS

11 site. Mr. Gaukler --

12 JUDGE FARRAR: You think it should be a

13 higher number?

14 THE WITNESS: Mr. Gaukler brought me at

15 least up to 10,000 years.

16 JUDGE FARRAR: All right.

17 THE WITNESS: On the lower end, the

18 regulatory process has a real perception problem

19 with that 2500 year benchmark that has been

20 introduced in many standards. We heard testimony

21 that it may not make a big difference to go from

22 2000 to 2500 years. In terms of a promulgated

23 standard, I'd say, "Yep, we've got a problem." You

24 have a problem if you leave it at 2000 years.

25 JUDGE LAM: Of perception? Is that what

1 you are referring to?

2 THE WITNESS: Yes.

3 JUDGE LAM: Somebody is permitting a

4 requirement for nuclear facility which is lower

5 than for highway and bridges. Is that what you are

6 referring to?

7 THE WITNESS: Right. Absent the codery

8 of the cognoscente, who can explain it, yes. So

9 now we are between 2500 years and 10,000 years.

10 JUDGE FARRAR: But the 10,000 was for

11 nuclear power plants.

12 THE WITNESS: That's correct. Yes.

13 JUDGE FARRAR: So we are going to come

14 down from that.

15 THE WITNESS: That's correct.

16 JUDGE FARRAR: How far are we coming

17 down on the high side and does the 2500 stay at the

18 low side?

19 THE WITNESS: Absent the considerations

20 of conservatism that you are not allowing me to

21 consider, I would look at the argument that the

22 Staff introduced relating to some judgment about

23 acceptable risk in terms of the lifetime of the

24 facility, realistically a 40-year lifetime. And

25 the exceedance probability, I can't remember the

1 metric, but the metric that brought me for a
2 40-year lifetime to about a 4000-year mean return
3 period, I think that was becoming a comfortable
4 number for me. And again, with the qualification
5 that you have not allowed me to consider the design
6 conservatisms.
7 JUDGE FARRAR: I think that answers our
8 questions. Before we take a lunch break, just for
9 planning, Mr. Turk how long do you think your cross
10 will take this afternoon?
11 MR. TURK: Approximately three hours.
12 JUDGE FARRAR: And then will the State
13 have much in the way of redirect?
14 MS. CHANCELLOR: Based on Mr. Gaukler's
15 cross, not a whole lot. It depends on what comes
16 out on Mr. Turk's.
17 MR. TURK: Most of the testimony seems
18 directed at the Staff rationales and I think that's
19 where I need to spend a little time.
20 JUDGE FARRAR: Then it's 25 of; if we
21 came back at quarter to two, we will have our
22 decision on Utah SS.
23 MR. SILBERG: Is it possible to do that
24 before lunch?
25 MS. CHANCELLOR: I told Mr. Stewart we

1 would be doing it after lunch, and I told him about
2 1:30.
3 JUDGE FARRAR: I forgot, Mr. Silberg,
4 what time do you need to leave the building?
5 MR. SILBERG: I'd like to get a two
6 o'clock shuttle from here to the airport.
7 JUDGE FARRAR: Let's shorten the lunch.
8 What time did you tell --
9 MS. CHANCELLOR: I told him we usually
10 come back at 1:30.
11 JUDGE FARRAR: If that suits him, that
12 would suit you?
13 MR. SILBERG: Yes, it would. Thank you.
14 JUDGE FARRAR: Let's be back at 1:30
15 and that will build in a little extra time for the
16 Staff's cross.
17 (The lunch break was held.)
18 JUDGE FARRAR: We're back for the
19 afternoon session, and we promised the parties when
20 we heard the three hours of oral argument seven
21 days ago that we would try to announce today our
22 decision on contention Utah SS.
23 Earlier this year, after the Staff, NRC
24 Staff filed a Final Environmental Impact Statement
25 required by the National Environmental Policy Act,

1 the State requested that we admit into the
2 proceeding a new contention, Utah SS, challenging
3 the revised economic analysis contained in the
4 FEIS. That request was opposed by the Applicant on
5 two grounds: its alleged untimeliness, and on the
6 second ground that even if it were validly filed,
7 there was nothing in the contention that would
8 entitle the State to any relief and therefore the
9 contention should not be admitted.
10 Ordinarily if we were back home we would
11 deal with an issue like this in a written opinion.
12 We have limited capability and resources to do that
13 out here, and so we said we would announce an oral
14 decision today because the parties are entitled to
15 an early decision, given that our ruling could
16 result in additional proceedings that they'd have
17 to gear up for. So we're announcing an oral
18 decision today and will provide written reasons at
19 a later time. All you get today is a roughed-out
20 outline of our thinking.
21 I'll give you the bottom line. We
22 decide the issue against the State on the second
23 ground only, not on the ground of untimeliness.
24 Let me tell you how we get there.
25 The untimeliness, under Section 2.714(a)

1 of our regulations the State has to show good cause
2 for its late filing. We heard extensive argument
3 about that. It's a somewhat murky area, and we
4 feel a need to reconcile any ruling we eventually
5 make on that with the ruling we made earlier this
6 week and other rulings we've made in the case which
7 gave other parties the opportunity to do something
8 that perhaps they should have done earlier. So we
9 want any decision on the contentions rule on
10 timeliness to be consistent with the evidentiary
11 rulings we've made during the course of the case,
12 and we're not prepared to do that.
13 When we do deal with that good cause
14 factor, there are other, if the State -- well,
15 depending how the good cause comes out, there are
16 other factors that have to be considered. One is
17 whether initially the contention would delay the
18 proceeding, and we did come up with a schedule
19 where you could get -- under an expedited schedule
20 get the proceeding done at the same time, or the
21 extra proceeding done at the same time this would
22 be finished.
23 Another factor is whether the State
24 would contribute to development of a sound record
25 on the proffered contention. Although the

1 Applicant and the Staff thought that was not the
2 case, I have consulted with my colleagues who
3 participated in the previous financial
4 qualifications trial, and their opinion is that the
5 State can certainly be counted on -- or could have
6 been counted on to contribute to the development of
7 a sound record. And I'd have to say, based on my
8 experience with the three issues we've heard the
9 State on out here, I would certainly endorse that.
10 Another reason you look into under late
11 filing is whether there are other ways that the
12 State's interests could be protected, and I'll deal
13 with that in the second part of the decision. So
14 we don't deal with the untimeliness factor but
15 we've expressed ourselves on some of the features
16 there, but we do not get to the question whether
17 there was good cause for the late filing.
18 On the second ground where the Applicant
19 but not the Staff asserted that no relief could be
20 granted on this contention, we agree with that
21 argument. NEPA is an environmental statute. The
22 cases cited are all cases -- or the cases cited are
23 the usual cases where there's some extensive
24 environmental injury from a project and you have to
25 do an economic analysis of the benefits. Here,

1 because the Skull Valley Band has offered its
2 reservation in partnership with the Applicant,
3 we're not dealing with the taking of public lands
4 available to the public at large. There's no
5 assertion of gross environmental damage, and what
6 you have is an economic analysis which may or may
7 not be necessary.
8 If you hold a hearing on that analysis,
9 given the fact that the real benefit that's put
10 forward for this project is the sort of insurance
11 policy against late creation of a permanent
12 facility, then we don't see that the economic
13 analysis is central. The State did, however,
14 correctly point out that if you do an economic
15 analysis it's supposed to inform the public and has
16 to be accurate enough to inform the public. We
17 think that the entire record of the case will let
18 the public draw its own conclusions about the
19 20-year receipt, 40-year storage argument.
20 The State made two other arguments, and
21 here's -- and I think our decision is reinforced by
22 the fact that on those arguments the State's relief
23 is not under this contention but there are other
24 avenues available for relief.
25 The first was, as Mr. Stewart referred

1 to it, this is, in the State's view this is an
2 outlaw project. That's an argument which is
3 presently pending in front of the five
4 commissioners of the Nuclear Regulatory Commission
5 who would eventually review any decision of ours,
6 and that's an argument the State also presented to
7 the Federal District Court. So whatever the merits
8 of that view that it's an outlaw project, that's
9 not a matter that we need to look at.
10 The other argument the State made that
11 was an environmental argument was the fear that
12 these would be, if we don't examine under NEPA the
13 Applicant's financial situation, these could end up
14 being orphaned casks left out there with a, as
15 Mr. Stewart called it, a bankruptcy judge
16 administering them.
17 Here the State, as we indicated, has
18 already participated vigorously a year ago in a
19 safety-oriented financial qualifications hearing.
20 That remains -- that was fully tried, fully
21 developed, and remains pending for decision in
22 front of the other board on which my two technical
23 colleagues sit with Chief Judge Bollwerk. So
24 borrowing from the good cause factors, not that
25 it -- borrowing as an analogy, are there other --

1 notion of are there other areas where the State's
2 interests can be protected. Our decision that this
3 is a contention for which no relief can be granted
4 is reinforced by the fact that the two major
5 arguments the state made are in fact being
6 considered elsewhere, and they have -- I don't know
7 whether they'll prevail on those. We're not -- my
8 colleagues are involved in one of the issues, the
9 Commission is involved in the other, and that will
10 be resolved.
11 So short answer, we're rejecting this
12 contention, so there need not be any further
13 proceedings. I would anticipate we would -- based
14 on discussions we had with the parties yesterday
15 about future scheduling, our decision, and given
16 the fact that we'll be -- we'll have further
17 hearings here from June 3rd to 7th or June 3rd to
18 8th, depending on space, we will wrap up in D.C.
19 the last two weeks of June. Depending on the
20 briefing schedule we work out with the parties, our
21 decision would be due either in -- between mid and
22 late November. And I'm sure my colleagues on the
23 financial qualifications will have that decision
24 out by then, and our written reasons elaborating on
25 these oral -- this oral outline will be in that

1 decision, if not provided earlier.

2 So that's our ruling. As I said that

3 day, the three hours of oral argument seven days

4 ago were very well presented, laid out the case for

5 us. And I wish we had had time and the capability

6 of providing a written decision, but those of you

7 who have been watching know we've been here.

8 So thank you, and we'll go on with

9 Dr. Arabasz.

10 MR. SILBERG: Thank you, Mr. Chairman.

11 And if you will allow me to catch an airplane.

12 JUDGE FARRAR: Thank you. I hope that

13 someday the rest of us will follow you, but we

14 haven't had any luck so far.

15 If I recall correctly, we were about to

16 start the Staff's cross-examination of Dr. Arabasz.

17 MR. TURK: That's correct, your Honor.

18

19 CROSS-EXAMINATION

20 BY MR. TURK:

21 Q. Good afternoon, Dr. Arabasz.

22 A. Good afternoon, Mr. Turk.

23 Q. I'd like to start with where we left

24 off. You were responding to questions by the Board

25 as to where you would set the appropriate return

1 period ground motion for the PFS facility. And I
2 believe you were reluctant to pick a number, but
3 you indicated you would be comfortable with a
4 4,000-year return period. Do you recall that?
5 A. Correct.
6 Q. Was that pretty much just a guess of
7 where it would be proper to assign the ground
8 motion return period?
9 A. It was first based on a premise, if I
10 understood correctly, from the questioning judges
11 that I was not to consider anything on the design
12 side, that there was no consideration of
13 conservatism, whether that conservatism be zero or
14 greater than five to twenty in terms of risk
15 reduction ratios. That was the premise on which my
16 answer was based.
17 Q. With that exception, do you feel that
18 you gave an appropriate answer?
19 A. Yes. My opinion, yes.
20 Q. And in forming your opinion, did you
21 consider the radiological risk presented by an
22 ISFSI?
23 A. No, I did not.
24 Q. Did you consider the radiological risk
25 presented by a nuclear power plant?

1 A. Return to my previous answer and revise
2 that. Part of the framing of the number was
3 between two reference probabilities, and the 10,000
4 year was a reference probability for a nuclear
5 power plant, so I misspoke. I in fact did consider
6 it in terms of the relative risk of an ISFSI versus
7 a nuclear power plant.
8 Q. As I understand your answer, then, what
9 you're saying is you'd been made aware that the
10 nuclear power plant with its risks has earned a
11 10,000-year return period ground motion as a design
12 basis, correct?
13 MS. CHANCELLOR: Objection to the word
14 "the," your Honor.
15 Q. I'll change it. As I understand your
16 answer, you understand that nuclear power plants
17 have been assigned an appropriate return period of
18 10,000 years, correct?
19 A. A mean annual return period?
20 Q. Exactly.
21 A. In the central and eastern United
22 States, correct.
23 Q. That's actually a mean annual --
24 A. Mean annual probability of exceedance.
25 Q. Probability of exceedance?

1 A. Yes.

2 Q. Of 10,000 years. And where did you say

3 that was for?

4 A. For the central and eastern United

5 States.

6 Q. Is it a larger return period, in other

7 words, 15,000 or 20,000 years for the western

8 United States?

9 A. This was a subject of extended

10 questioning and testimony this morning, and the

11 line of my testimony indicated that we have a -- we

12 have information and a number in terms of an MAPE

13 for the central and eastern United States; we have

14 information and a number from Yucca Mountain

15 Topical Report No. 2 for a sample of five nuclear

16 power plants, four of which are along the western

17 North American plate boundary; and we also have

18 information in Yucca Mountain Topical Report No. 2

19 in terms of the reference probability that was

20 linked to frequency class 2 at Yucca Mountain.

21 Q. I haven't heard an answer to my

22 question. You were careful to indicate that the

23 10,000-year return period was for the central and

24 eastern United States. I then asked you, is there

25 a different return period for the western United

1 States. I have not heard an answer to that.
2 A. I think it's fair to characterize my
3 testimony this morning as saying that I don't know
4 what the number is for the western United States
5 outside of the plate boundary margin, but I agreed
6 with Mr. Gaukler, I believe, that it was reasonable
7 that the number likely would settle around 1x10-4
8 or 10,000 years MAPE.
9 Q. So your understanding is that with the
10 exception of nuclear power plants located on the
11 tectonic plate boundary of the west coast, the
12 10,000-year return period would be appropriate for
13 nuclear power plants in the western United States?
14 A. When we say "would be appropriate," this
15 is a tough question for me because I can only
16 imagine that such a determination would be made
17 based on an extensive process; and with the
18 information available to me and as presented in
19 this hearing, I am reaching the judgment that yes,
20 it probably would be, for the western United States
21 outside of the plate boundary, 1x10-4.
22 Q. And what plate are we talking about
23 here?
24 A. We're talking about the boundary between
25 the North American plate and the Pacific plate

1 passing through California and the Juan de Fuca
2 plate beneath the Pacific Northwest.
3 Q. How does the Juan de Fuca plate
4 correlate with the other two plates you mentioned?
5 A. There is a different type of plate
6 boundary along western North America. Through most
7 of the plate boundary course through California the
8 plates simply -- the plate on the left, on the
9 Pacific side, is moving in a horizontal direction
10 with respect to the North American plate. The
11 North American plate moving to the -- in a
12 southerly direction compared to the Pacific plate
13 moving in a northerly direction.
14 Beneath the Pacific Northwest --
15 Q. I'm sorry. Just for clarification,
16 you're saying the continental plate, the North
17 American plate is moving northward and the Pacific
18 plate is moving southward?
19 A. The other direction. If you looked
20 across the plate boundary there would be a
21 right-handed sense of displacement. The plate on
22 the other side would be moving to the right. So if
23 we were in California looking toward the Pacific,
24 the plate, the Pacific plate would be moving to the
25 right.

1 Q. Well, then you're saying the Pacific
2 plate is moving northerly.
3 A. I thought that was what I had said. If
4 I misspoke --
5 Q. No, just so I understand what you're
6 saying.
7 A. Yes.
8 Q. The Pacific plate is moving northerly,
9 and the North American plate, is that moving also,
10 or is it relatively standing and the Pacific plate
11 is moving?
12 A. We're into where one fixes the point of
13 reference in terms of relative motion on the globe.
14 Q. Well, let's pick San Onofre, for
15 instance. San Onofre is located somewhere at the
16 confluence of the North American plate and the
17 Pacific plate?
18 A. Correct.
19 Q. And what's happening there with respect
20 to plate movements?
21 A. My geography fails me in terms of which
22 side of the San Andreas fault the -- I'm assuming
23 that the San Onofre plate is on the west side of
24 the San Andreas fault, and it would be moving to
25 the right with respect to the North American plate.

1 Q. Assuming San Onofre is located on the
2 Pacific plate, then is it your opinion that San
3 Onofre is moving northward relative to the northern
4 American continent?
5 A. Correct.
6 Q. Okay. Let's take Diablo Canyon, then.
7 Is Diablo Canyon located at the confluence of these
8 two plates?
9 A. When we say confluence, it's somewhere
10 in the vicinity of the plate boundary. And to the
11 best of my understanding, Diablo Canyon also would
12 be on the Pacific side; but there is a complex
13 boundary. For example, the San Andreas Fault is
14 not the only part of the boundary, that we have the
15 Hosgri fault offshore that is part of the zone, the
16 wider zone of deformation.
17 Q. Well, come back to my question. Is the
18 confluence, in other words, the meeting up of the
19 Pacific plate and the North American plate, is that
20 happening in the vicinity of the Diablo Canyon
21 plant?
22 MS. CHANCELLOR: Your Honor, I'm not
23 sure where this line of questioning is going, being
24 able to pinpoint where two tectonic plates meet. I
25 haven't objected up till now, but it's just not

1 obvious that this is -- I don't want to say it
2 isn't relevant, but --
3 JUDGE FARRAR: It's certainly
4 interesting, but --
5 MR. TURK: It's most relevant, your
6 Honor, and I will make that clear.
7 JUDGE FARRAR: Then on that
8 representation, we'll overrule the objection.
9 THE WITNESS: Mr. Turk, could you define
10 confluence for me?
11 Q. (By Mr. Turk) Well, I'll let you
12 describe it any way you want. You indicated that
13 you believe the five nuclear power plants, I guess
14 with the exception of Palo Verde?
15 A. Correct.
16 Q. Listed in the topical report for Yucca
17 Mountain, you thought all those were located near
18 or were influenced by plate tectonics, correct?
19 A. That they had the common feature of a
20 steep hazard curve which was associated with their
21 location near a plate boundary.
22 Q. Okay. Now I'm asking, with respect to
23 Diablo Canyon, where is that in relation to a plate
24 boundary?
25 A. It is close to the plate boundary.

1 Q. How close?

2 A. I would say within tens of miles.

3 Q. Tens of miles being less than fifty?

4 Less than thirty? How many tens are we talking

5 about?

6 A. I don't know the precise location of

7 Diablo with respect to the San Andreas Fault.

8 Q. And by the way, Palo Verde you mentioned

9 is not near a plate boundary, correct?

10 A. Correct.

11 Q. Approximately how far away is Palo Verde

12 from a plate boundary?

13 A. I would guess something in the order of

14 one to two hundred miles.

15 MS. CHANCELLOR: I'd instruct the

16 witness not to guess.

17 JUDGE FARRAR: Where is it? Arizona

18 somewhere, isn't it?

19 THE WITNESS: It's west of Phoenix, and

20 I believe it's 36 miles west of Phoenix. Something

21 of that that order.

22 Q. (By Mr. Turk) And the fact that it's

23 located that distance and far away from a plate

24 boundary was the reason why you think that's not

25 one of the plate tectonic affected sites listed in

1 the table, correct?

2 A. Correct, that its seismic hazard curve

3 is not influenced by proximity to large faults with

4 high maximum magnitudes and to a rate of seismic

5 activity that would result in a hazard curve being

6 steep as in most of California, and particularly

7 those California sites close to the plate boundary.

8 Q. You mentioned the San Juan de Fuca

9 plate.

10 A. The Juan de Fuca.

11 Q. Juan de Fuca?

12 A. J-u-a-n, d-e, F-u-c-a.

13 Q. Now, how does that interface with the

14 other two plates we've been talking about?

15 A. There is a geological feature called a

16 triple point located in offshore northern

17 California with the intersection with the Gorda

18 Ridge. And this triple point allows relative

19 motion between three plates to be accommodated in a

20 fashion where horizontal motion, as along the

21 famous San Andreas Fault where the displacement is

22 in a horizontal direction, crossing farther

23 northward across the triple point boundary the

24 motion is transformed such that the motion of the

25 Pacific side plate, or in this case the Juan de

1 Fuca plate as it interact with the North American
2 plate is a convergent motion where the Juan de Fuca
3 plate slipped out so it pushes its way underneath
4 the North American continent, giving rise to the
5 Cascade Range and volcanic activity in the Pacific
6 Northwest.
7 Q. And is that located somewhere near
8 Seattle?
9 A. In the case of a convergent plate
10 boundary the zone of interaction between the two
11 plates is broader, whereas in California the locus
12 of displacement between the two plates is, in a
13 simple-minded way, along the line, namely the San
14 Andreas Fault, and the Pacific Northwest the zone
15 of interaction between the two plates is broader
16 because of this inclined geometry.
17 Q. And by inclined geometry you mean the
18 fact that the Juan de Fuca plate is pushing
19 underneath the North American continent plate?
20 A. Correct. And so there is an interface
21 between the two plates that is broader because of
22 this inclined geometry than the interface along the
23 San Andreas Fault.
24 Q. And do you have an estimate for how
25 large that zone of interaction is? Are we talking

1 again in terms of maybe tens of miles?

2 A. Several tens of miles to more than a

3 hundred.

4 Q. And when you say more than a hundred,

5 you mean much more than a hundred, or is that

6 pretty much the upper limit?

7 A. No, I would not choose 100 as an upper

8 limit. The issue technically would relate to the

9 geometry of the plate interface along which there

10 is seismogenic, or in essence frictional contact

11 between the two plates as opposed to the

12 deformation that is induced in the overriding North

13 American plate. For example, the Cascade Range

14 clearly is a product of that deformation.

15 Q. Where does the North American plate end?

16 If we're looking at the Pacific Northwest, what's

17 the furthest reach of the North American plate

18 relative to some place on the ground? Is it under

19 the ocean? Is it under land?

20 A. Alaska would be part of the North

21 American plate.

22 JUDGE FARRAR: Mr. Turk, I hate to

23 interrupt, but a lot of this --

24 MR. TURK: It's coming.

25 JUDGE FARRAR: -- we can almost take

1 judicial notice of.

2 MR. TURK: Well, if you'll allow me a

3 bit more, your Honor.

4 JUDGE FARRAR: Go ahead.

5 Q. (By Mr. Turk) In the state of

6 Washington where does the North American plate edge

7 or boundary exist?

8 A. At the surface offshore with basically

9 an oceanic trench. The point at which the Juan de

10 Fuca plate begins its dive under the North American

11 continent is west of the Washington coast offshore.

12 Q. And approximately how far west of the

13 Washington coast?

14 A. I could only guess.

15 MS. CHANCELLOR: Instruct the witness

16 not to guess.

17 Q. (By Mr. Turk) I don't want your guess,

18 either. Have you ever seen a map of where that

19 plate boundary is?

20 A. Yes, I've seen maps many times. I have

21 not paid particular attention in terms of scaling.

22 Q. Well, it's not right next to the coast,

23 correct?

24 A. No.

25 Q. Would you agree that it's more than ten

1 miles off coast?

2 A. Yes.

3 Q. Can you give any better bounds to that?

4 For instance, is it more than a hundred miles off

5 course?

6 MS. CHANCELLOR: Objection, your Honor.

7 Dr. Arabasz has testified that --

8 MR. TURK: It's quite relevant, your

9 Honor.

10 JUDGE FARRAR: I understand, but the

11 problem is -- my colleagues know a lot more about

12 this than I do, but I even know about this. If

13 you're trying to get him to say the PFS site is not

14 influenced by being near tectonic plate boundaries,

15 we know that.

16 MR. TURK: I'm not going there.

17 JUDGE FARRAR: Then I am very intrigued,

18 so keep going. Off the record.

19 (Discussion off the record.)

20 JUDGE FARRAR: Say that again.

21 MR. TURK: I'm sorry?

22 JUDGE FARRAR: Say that again. That you

23 don't do this all the time. And Ms. Chancellor,

24 Mr. Turk has not shown a proclivity to waste the

25 Board's time in the future, so when he says --

1 sorry, in the past. So when he makes a
2 representation that it's going somewhere, we give
3 him some leeway to demonstrate that.
4 MR. TURK: Thank you.
5 THE WITNESS: Is there a question
6 pending?
7 Q. (By Mr. Turk) Yes. The question was,
8 you had indicated you've seen maps of the tectonic
9 plates, you indicated you know that the Juan de
10 Fuca begins its dive under the North American plate
11 more than ten miles away from the coast of
12 Washington, and I was asking you, is it on the
13 order of a hundred miles away? Can you tell me
14 that? What's your best estimate based on your
15 having looked at maps and your experience as a
16 seismologist?
17 MS. CHANCELLOR: Does Mr. Turk have a
18 map he can show Dr. Arabasz?
19 MR. TURK: Unfortunately, I tried to get
20 one and I was not able to over the lunch hour.
21 JUDGE FARRAR: And I take it, Mr. Turk,
22 that this is an order of magnitude miles we're
23 talking about?
24 MR. TURK: Yes.
25 JUDGE FARRAR: So --

1 THE WITNESS: I would make an estimate
2 that it's less than a hundred miles.
3 Q. (By Mr. Turk) And you mentioned that
4 there were five plants listed on that table in the
5 Yucca Mountain Topical Report. Do you remember
6 what those plants were?
7 A. San Onofre, Diablo Canyon, Palo Verde,
8 Washington Nuclear Power Plant 2, I believe that
9 was the designation, and Washington Nuclear Power
10 Plant 3. Washington Nuclear Power Plant 2, if I
11 remember correctly, located near Satsop; Washington
12 Nuclear Power Plant 3 located northwest of Richland
13 along the Columbia River; Palo Verde located
14 approximately 30 miles west of Phoenix; San Onofre
15 located east of San Clemente; and Diablo Canyon
16 located west of San Luis Obispo, California.
17 Q. Washington No. 2 you said is located
18 near Satsop, Washington?
19 A. If I have the numbers 2 and 3 correctly
20 memorized, yes. Or it may be vice versa if my
21 memory's failed me.
22 Q. If I suggested to you that No. 3 is
23 located near Satsop rather than No. 2, you wouldn't
24 quarrel with that? It's one or the other, but --
25 A. It's one or the other.

1 Q. And Satsop is located approximately how
2 far away from the Washington coast?
3 A. I would guess within 50 miles of the
4 Washington coast.
5 Q. That's a guess?
6 MS. CHANCELLOR: He said he estimated, I
7 believe. Objection.
8 Q. (By Mr. Turk) Was it a guess or an
9 estimate?
10 A. Estimate.
11 Q. And Richland, Washington. That's where
12 the other Washington nuclear power plant is located
13 that was listed in the Topical Report?
14 A. That's correct.
15 Q. How far is Richland from the coast?
16 A. I would estimate in the range of two to
17 three hundred miles.
18 Q. You recognize, then, that the Richland
19 location is not close to where the San Juan de Fuca
20 plate interacts with the North American continent
21 plate, correct?
22 A. Correct.
23 Q. Nor is it close to where the Pacific
24 plate interacts with the North American plate,
25 correct?

1 A. I'll quibble with "interaction,"
2 because --
3 Q. Well, let's talk about location. Is
4 Richland, Washington located close to where those
5 two plates interface?
6 MS. CHANCELLOR: Objection, your Honor.
7 Mr. Turk is trying to get Dr. Arabasz to talk about
8 location without -- without the underlying seismic
9 activity that's going on, and when he tried to
10 explain it Mr. Turk was forcing him to talk about a
11 geographic distance as opposed to the influence of
12 plate tectonics.
13 JUDGE FARRAR: We'll overrule the
14 objection. But Mr. Turk, we've got to get to this
15 point you're --
16 MR. TURK: We're just about at the end .
17 JUDGE FARRAR: Okay.
18 THE WITNESS: Question again, please?
19 MR. TURK: Could you read back the
20 question, please?
21 And your Honor, I have to inform you I
22 may not be able to finish today. I may have to
23 continue into the next period.
24 JUDGE FARRAR: Then -- I'll withhold
25 comment. Let's get see where we're --

1 MS. CHANCELLOR: So will I.

2 JUDGE FARRAR: Let's see where this

3 goes.

4 (The record was read as follows: "Well,

5 let's talk about location. Is Richland,

6 Washington located close to where those two

7 plates interface?")

8 JUDGE FARRAR: What we need to -- we

9 need to be sure we're talking about where the

10 plates meet as opposed to where there may be

11 action, tectonic action resulting, maybe in some

12 distance resulting from -- okay, so let's use the

13 word where they -- well, I guess interface is okay

14 for that purpose.

15 A. I would estimate something in the order

16 of a hundred miles.

17 Q. I'm sorry. What's a hundred miles?

18 A. The distance from Richland, Washington

19 to the zone of interface between the Juan de Fuca

20 plate and the North American plate.

21 Q. You indicated that Richland is located

22 approximately two hundred to three hundred miles

23 away from the North American plate boundary,

24 correct?

25 A. Correct, with the plate then subducting

1 beneath the Pacific Northwest.

2 Q. Which plate is subducting?

3 A. The Juan de Fuca plate.

4 Q. And is it your belief that the Juan de

5 Fuca plate influence, that that subduction

6 influence extends two hundred to three hundred

7 miles to the east towards -- to where Richland,

8 Washington is located?

9 A. In the general scheme, yes. Richland

10 obviously on the east side of the Cascades. The

11 Cascade Mountain range is there because of the

12 plate interaction between the Juan de Fuca plate

13 and the North American plate.

14 Q. And approximately how far to the east of

15 those mountains is Richland, Washington? Do you

16 know?

17 A. I would estimate within approximately 50

18 miles.

19 Q. That's your best estimate?

20 A. Yes.

21 Q. So is it your opinion that the Richland

22 site's hazard, its seismic hazard is influenced

23 significantly by the Juan de Fuca plate subduction

24 under the North American plate?

25 A. I can't answer that question without

1 looking at the hazard curve and an understanding of
2 what is driving the hazard at the Richland site.
3 Q. There may be other faults or earthquake
4 sources there that could influence the seismic
5 hazard at the Richland site?
6 A. Yes, there could be.
7 Q. But you don't know whether the seismic
8 hazard there is influenced more by those sources or
9 by the subduction of the Juan de Fuca plate?
10 A. I don't. I infer that, given the mean
11 annual probability of exceedance as calculated in
12 that table, that the seismic hazard curve is steep.
13 Q. But you don't know what causes that
14 curve to be steep?
15 A. No, I do not.
16 Q. You don't know whether the seismic
17 hazard curve's steepness is caused because of any
18 location close to plate boundaries, do you?
19 A. I infer that.
20 Q. But it would be possible to infer to the
21 contrary also, right, that there is some other
22 fault located nearby that's responsible for having
23 the greatest influence on that seismic hazard
24 curve's steepness, correct?
25 A. Correct.

1 MS. CHANCELLOR: Objection, your Honor.
2 Dr. Arabasz said that he would need to look at a
3 seismic hazard curve to determine what actually
4 influences the hazards at the Richland site. This
5 is getting pretty abstract.
6 JUDGE FARRAR: Can you answer the
7 question without that sort of documentation to look
8 at?
9 THE WITNESS: May I ask the question be
10 repeated, please?
11 MR. TURK: Could you read the question
12 back, please?
13 (The record was read as follows: "But it
14 would be possible to infer to the contrary
15 also, right, that there is some other fault
16 located nearby that's responsible for having
17 the greatest influence on that seismic hazard
18 curve's steepness, correct?")
19 THE WITNESS: Correct.
20 Q. (By Mr. Turk) In other words, there may
21 well be another dominant pair, if you will, in
22 terms of magnitude and location of earthquake -- of
23 a fault that will be responsible for the steepness
24 of the curve for that facility, the Washington No.
25 2 facility, correct?

1 A. Correct. And what I would end up with
2 is the attaching importance to the steepness of the
3 hazard curve more so than the label affixed in the
4 DOE table that characterizes or that relates to
5 sites near a plate boundary.
6 Q. In fact, you indicated you had an
7 epiphany, I believe that was your word, when you
8 looked at the table in that Yucca Mountain Topical
9 Report and you saw five nuclear power plants listed
10 there, and you suddenly came to the realization
11 that those plants were located near the plate
12 boundary. That's what you had concluded, correct?
13 A. That, and that there was something
14 particular about them, their steep hazard curves
15 other than Palo Verde.
16 Q. Well, isn't it true now that you're not
17 sure whether -- in fact, maybe only three of those
18 power plants can be located close to the plate
19 tectonic boundaries that would be influenced by
20 them, even if there's maybe some other seismic
21 source responsible for the shape of the curve for
22 Hanford No. 2, correct?
23 A. Yes.
24 Q. In which case your conclusion that the
25 5,000-year return period mean, or that the mean,

1 the annual probability of exceedance for those
2 nuclear power plants being 5,000 years may not be
3 due to plate tectonics at all but may be due to
4 plate tectonics and some other factors, correct?
5 A. For two of the -- excuse me. From the
6 sample of five I will allow that Palo Verde is a
7 outlier and does not fall in the category of being
8 influenced by its proximity to the plate boundary.
9 The Satsop site I will allow either conclusion.
10 Q. Satsop or Richland?
11 A. Excuse me, Richland.
12 Q. Would you allow the same conclusion for
13 Satsop?
14 A. No.
15 Q. So it's just two out of five that you
16 would recognize may not be plate tectonic -- may
17 not reflect plate tectonic effects?
18 A. I'm uncertain about Richland, so we have
19 that arithmetic.
20 Q. I'd like to come back to a question that
21 I started with, and that was whether you were
22 familiar with the radiological risks imposed by
23 different nuclear facilities, and you indicated
24 you're not familiar with the -- I'm sorry -- you do
25 not consider the radiological risk of an ISFSI. Do

1 you know what is the radiological risk of a nuclear
2 power plant? Do you know anything about the
3 radioactive contents of a nuclear power plant
4 reactor?
5 A. It's one of those things that I just
6 don't want to know, but to answer your question
7 directly, no.
8 Q. Do you know anything about the pressures
9 under which a nuclear power plant operates?
10 A. I can't quantify it, no.
11 Q. Well, do you know anything about it at
12 all?
13 A. Yes, I know something, and I say that
14 because I've been interrogated by probability
15 experts before and they will always insist that I
16 have -- I know something. And I know that there
17 are driving pressures and temperatures that are
18 described to be a cause of a diffusion of
19 radioactivity, and correspondingly, reportedly the
20 lack of such driving forces for pressure and
21 temperature for an ISFSI.
22 Q. You say reportedly that those driving
23 pressures and temperatures don't exist for an
24 ISFSI. Do you know one way or the other?
25 A. I say reportedly because my information

1 is based on reading.

2 Q. Do you have any independent knowledge as

3 to what the pressures or temperatures are inside a

4 dry cask storage system such as the HI-STORM 100

5 cask?

6 A. No, I do not.

7 Q. And again, do you have any quantitative

8 assessment of what are the pressures or

9 temperatures inside an operating nuclear power

10 plant?

11 MS. CHANCELLOR: Objection, your Honor.

12 Dr. Arabasz is not being put forward as an expert

13 by the State on radiological consequences of a

14 conservatism in the design of the ISFSI or a

15 nuclear power plant. I believe the questioning is

16 outside the purpose for which we have put

17 Dr. Arabasz forward. And to the extent that he is

18 referring to nuclear power plants, he uses the DOE

19 table. And I'm just concerned that we're getting

20 bogged down again on another line of questioning.

21 JUDGE FARRAR: Mr. Turk, you told us you

22 needed three hours. You've been at this 35

23 minutes, and --

24 MR. TURK: Your Honor --

25 JUDGE FARRAR: -- usually you're more on

1 point, and I'm really getting confused and
2 troubled, particularly when you tell me now or told
3 us a few minutes ago you couldn't -- you might not
4 finish today.
5 MR. TURK: My problem, your Honor, is
6 twofold. Number one, because we are not one of the
7 lead parties in the proceeding, we're neither
8 advocating the application or advocating its
9 denial, we come second. We present our
10 cross-examination after other parties have done
11 that.
12 In this case we have a witness whose
13 main concern is not so much the design, in fact, he
14 has no concern about the design of the facility,
15 his only concern is the way the Staff reached its
16 conclusions. The focus of his testimony and of his
17 extensive amplification of that testimony during
18 cross-examination is the quality of the Staff's
19 judgment. And because of that I wanted more time
20 with this witness. I apologize. I know that today
21 is Friday, we're all aiming to go home. I can't
22 help the fact that my turn comes after the
23 Applicant's.
24 JUDGE FARRAR: That I think,
25 Ms. Chancellor, is an adequate answer, so we'll

1 overrule the objection.

2 MR. TURK: Thank you, your Honor.

3 Q. (By Mr. Turk) Do you need the question

4 read back?

5 A. Yes, please.

6 (The record was read as follows: "And

7 again, do you have any quantitative assessment

8 of what are the pressures or temperatures

9 inside an operating nuclear power plant?")

10 THE WITNESS: I do not.

11 Q. (By Mr. Turk) Is it fair to say, or

12 would you concede that the NRC Staff among its

13 collective wisdom is what aware of what those

14 pressures and temperatures would be both inside

15 nuclear power plants and inside an ISFSI?

16 A. I concede that.

17 Q. And would you concede that the

18 Commission itself would know that?

19 A. I concede that.

20 Q. I'd like to show you a copy of a

21 document.

22 I have only one copy with me, your

23 Honor. It's the Statement of Consideration that

24 accompanied the final rule adopting the 10 CFR Part

25 72 regulations. This is published at 45 Federal

1 Register 74,693.

2 JUDGE FARRAR: What was that again?

3 MR. TURK: 45 Federal Register 74,693,

4 published November 12th, 1980.

5 MS. CHANCELLOR: Mr. Turk, is this the

6 same federal register that's referred to in

7 Dr. Stamatakos's testimony?

8 MR. TURK: I believe it is, but I would

9 have to look at his testimony to confirm that.

10 Your Honor, may I approach the witness?

11 JUDGE FARRAR: Yes.

12 MR. TURK: And unfortunately, because I

13 don't have copies of the document, I'll have to

14 read over his shoulder. Your Honor, I'm reading at

15 page 74,694 of the Federal Register.

16 Q. (By Mr. Turk) At the bottom of the

17 first column there's a comment to which the

18 Commission was responding. The comment is, "Is

19 spent fuel storage a low risk operation?" Do you

20 see that question in the Federal Register?

21 A. Yes, I do.

22 Q. I'd like to begin reading, and I'd ask

23 Dr. Arabasz to tell me if I'm reading correctly the

24 following paragraph. "Radiological risks to the

25 public result from a release of radioactive

1 materials and their dispersal to the environment.
2 Once in place, spent fuel storage is a static
3 operation, and during normal operations the
4 conditions required for the release and dispersal
5 of significant quantities of radioactive materials
6 are not present." Did I read that correctly?
7 A. Yes, you did.
8 Q. It goes on to say as follows, "There are
9 no high temperatures or pressures present during
10 normal operations or under design-basis accident
11 conditions to cause the release and dispersal of
12 radioactive materials." Did I read that correctly?
13 A. Yes, you did.
14 Q. And then it goes on to say, "This is
15 primarily due to the low heat generation rate of
16 spent fuel with more than the one year of decay
17 before storage in an ISFSI required by the rule,
18 and with the low inventory of volatile radioactive
19 materials readily available for release to the
20 environments." Did I read that correctly?
21 A. Yes, you did.
22 Q. And do you recognize that this is a
23 statement issued by the Commission upon adoption of
24 10 CFR part 72? Should I show you that page?
25 A. Yes, please.

1 MS. CHANCELLOR: Do you have a question?

2 MR. TURK: Yes.

3 A. Yes.

4 Q. And would you concede that the Staff was

5 aware of that Commission statement when they made

6 the determination in this case as to what the

7 appropriate return period would be for this ISFSI

8 as compared to a nuclear power plant?

9 MS. CHANCELLOR: Objection, your Honor.

10 Dr. Arabasz can't be expected to know what the

11 Staff is aware of and what they aren't aware of. I

12 mean, the Staff are either aware of it or they

13 aren't.

14 MR. TURK: Your Honor, the witness

15 extensively criticizes the Staff's judgment and

16 setting of the standard for this ISFSI. I'm asking

17 him whether it's fair to say that the Staff is

18 aware from the Commission's own statement and from

19 its own knowledge of radioactive risks posed by

20 nuclear power plants and ISFSIs, that an ISFSI is

21 inherently safer, much safer than a nuclear power

22 plant.

23 JUDGE FARRAR: But is that something he

24 can address, or is that something we can take

25 notice of from --

1 MR. TURK: Well, if he can't address it
2 then I think much of his testimony should be
3 stricken, because he comes out and criticizes the
4 Staff for having a lack of basis for its
5 determinations. If I have to I'll parse through
6 his testimony line by line to show which of these
7 statements are on that basis. And I'm very willing
8 to do that. I think maybe that's the best course.
9 MS. CHANCELLOR: Your Honor, Dr. Arabasz
10 has already conceded to Mr. Turk that he agrees
11 than an ISFSI poses a much lower radiological risk
12 than a nuclear power plant. He's conceded that.
13 Whether the Staff knew it or not is within the
14 Staff's domain. I just don't know what we're
15 getting at.
16 (The board confers off the record.)
17 JUDGE FARRAR: Let me hear the question
18 again, please.
19 (The record was read as follows: "And
20 would you concede that the Staff was aware of
21 that Commission statement when they made the
22 determination in this case as to what the
23 appropriate return period would be for this
24 ISFSI as compared to a nuclear power plant?")
25 JUDGE FARRAR: How about we just change

1 the form of the question to, are you prepared to
2 assume? No?
3 MR. TURK: I can't do that, your Honor.
4 His testimony comes out and criticizes the Staff
5 directly. If he lacks knowledge, he can say he
6 lacks knowledge and I'll accept that answer.
7 MS. CHANCELLOR: Your Honor, you're
8 asking him to say whether the Staff knew about a
9 1980 Federal Register notice when in 19 and 2000
10 they decided that PFS's exemption was okay. I
11 think that this is --
12 JUDGE FARRAR: Okay. You want to know
13 if he knew, not whether I knew, not whether the
14 Board knew the Staff was aware, but did he know?
15 MR. TURK: Maybe if I can ask a
16 preliminary question, the relevance will seem a
17 little more clear.
18 JUDGE FARRAR: Okay.
19 Q. (By Mr. Turk) Dr. Arabasz, you
20 indicated when we first began today that you were
21 one of the principal drafters of Contention Utah
22 L/QQ Part E, the seismic exemption aspect of this
23 contention, correct?
24 A. Yes.
25 Q. You drafted it with Ms. Chancellor?

1 A. Correct.

2 Q. And in the contention is it not true

3 that you directly challenged the Staff's adoption

4 of a 2,000-year return period because in your view

5 it lacked any consideration of risk? Is that not

6 part of your contention?

7 A. The lack of consideration of risk,

8 you'll need to point me to more specific language.

9 Q. I'm looking for your contention right

10 now.

11 MR. TURK: Your Honor, I'm looking for

12 my copy. Mr. Gaukler has indicated he has a copy

13 handy. Actually, I have my copy right here.

14 Q. (By Mr. Turk) Is it correct,

15 Dr. Arabasz, that this portion of contention Utah

16 L/QQ was filed on November 9, 2000 as part of the

17 State of Utah's Request for Admission of Late-Filed

18 Modification to Basis 2 of Contention Utah L/QQ?

19 MS. CHANCELLOR: Which version of Basis

20 L are you talking about?

21 MR. TURK: I'm looking at the November

22 9th paper. Mr. Gaukler indicates he has extra

23 copies if people require it.

24 MS. CHANCELLOR: Are you looking at the

25 contention as rewritten by the Board, or the

1 contention as filed?

2 Your Honor, I'd object to this line of

3 questioning. The Board made a decision and rewrote

4 the contention. Whether it is in the contention of

5 November the 9th needs to be considered in terms of

6 what is being tried here, whether what Mr. Turk is

7 pointing to is in the contention as rewritten by

8 the Board in its decision admitting this

9 contention.

10 JUDGE FARRAR: Except I thought he

11 was -- well, the document we've just been handed is

12 a document the State filed. Whether or not the

13 parties later rewrote it may be irrelevant --

14 rewrote it at our direction or our suggestion may

15 be irrelevant.

16 If Mr. Turk wants to question this

17 witness about this document that he authored. But

18 I'm not sure I understood the answer about him

19 being the author of the contention, whether that

20 meant the author of the contention the State

21 originally filed or the author of the joint

22 contention.

23 MS. CHANCELLOR: I think we need to

24 clarify just one point. The parties worked on a

25 Unified Contention. Section E of the Unified

1 Contention comes directly from Judge Bollwerk's
2 decision admitting Contention L Part B, and in that
3 decision Judge Bollwerk rewrote the contention and
4 laid out six bases based on the remand from the
5 Commission.
6 So what you see in Basis E of the
7 Unified Contention comes directly from Judge
8 Bollwerk's decision. It has not been changed at
9 all.
10 MR. TURK: Does the state mean to
11 suggest that this witness and the State are not
12 asserting that the Staff's assignment of a
13 2,000-year return period for this facility is not
14 based upon risk considerations? If Ms. Chancellor
15 wishes us to believe that only Judge Bollwerk
16 raised that question and the State did not, I am
17 willing to accept that and would move to strike
18 that aspect of the contention. She can't have
19 it -- it seems, your Honor, she's trying to say she
20 didn't write the risk portion of the contention,
21 Judge Bollwerk did, and therefore we can't hold her
22 witness responsible for it.
23 MS. CHANCELLOR: No, your Honor. I was
24 making a distinction between the Unified Contention
25 and the November 9, 2000 version of the contention.

1 Whether risk is in the Unified Contention or not,
2 we would request that Mr. Turk point us exactly to
3 the Unified Contention, which is what is at issue
4 in this proceeding.
5 JUDGE FARRAR: The ruling in principle
6 is we want to talk to this witness about what he
7 had a hand -- or Mr. Turk wants to talk to this
8 witness about what he had a hand in writing. So is
9 there some way among the two contentious parties
10 here we can agree on how we could focus on what
11 this witness did?
12 MR. GAUKLER: Your Honor, may I add
13 something? The document --
14 JUDGE FARRAR: I tried to save you,
15 Mr. Gaukler, mentioned two parties. If you want to
16 jump in, you're welcome to.
17 MR. GAUKLER: The document you've just
18 been handed was the exhibit at the deposition of
19 Dr. Arabasz when he was asked whether he was a
20 principal author of the contention. So he was
21 referring to this document that we've just been
22 handed in his deposition. I believe that he will
23 confirm that is correct.
24 THE WITNESS: I believe that in my
25 deposition I expanded at length about the concept

1 of authorship.

2 MR. GAUKLER: Right, you did. I agree

3 with you.

4 MS. CHANCELLOR: Exactly. That was my

5 next objection. By the way, this document is

6 signed by me.

7 MR. GAUKLER: Anyway, this is the

8 document he was referring to in his deposition that

9 led to the questioning.

10 JUDGE FARRAR: Okay, let's have counsel

11 up here and we'll have an off-the-record conference

12 at the bench.

13 (A bench conference was held off

14 the record.)

15 JUDGE FARRAR: We've just concluded a

16 bench conference with the parties trying to lay out

17 a procedure that may work more efficiently and lead

18 to less need for objections while testing the

19 validity of the witness's opinions in a fair

20 manner.

21 So go ahead, Mr. Turk.

22 Q. (By Mr. Turk) Dr. Arabasz, are you

23 familiar with the document dated November 9, 2000

24 in which State of Utah requested admission of

25 late-filed modification to Basis 2 of Contention

1 Utah L?

2 A. Yes, Mr. Turk.

3 Q. And in fact you attached to that

4 document a three-page declaration, did you not?

5 A. Yes. And I believe that it helps

6 explain or amplifies on my contributions to, quote,

7 authorship.

8 Q. On page 1 of your declaration I've

9 attached to that contention, you state in paragraph

10 2 that you are familiar with the PFS application

11 and Safety Analysis Report. In other information

12 you also say that you are familiar "with NRC

13 regulations, Rulemaking Plan to amend Part 72,

14 guidance documents, and the methodologies for

15 earthquake hazard evaluation and new developments

16 pertaining to the latter." Is that correct?

17 A. In the first part of your question --

18 Q. I'm only asking if that's a statement

19 that appears in your declaration.

20 A. No, you didn't read the complete

21 statement. It said, "familiar with the application

22 and Safety Analysis Report with respect to

23 earthquake hazards."

24 Q. Right. And I'm asking you now about the

25 sentence that follows that where you claim to be

1 familiar with NRC regulations, Rulemaking Plan to
2 amend Part 72, guidance documents, and the
3 methodologies for earthquake hazard evaluation and
4 new developments pertaining to the latter. That
5 statement appears in your declaration, does it not?
6 A. Yes, it does.
7 Q. Did you -- in making that statement were
8 you excluding from that any knowledge of the NRC's
9 radiological risk considerations that may apply to
10 ISFSIs or nuclear power plants, or do you have
11 knowledge of that?
12 A. With respect to earthquake hazards, I
13 was taking a more narrowing interpretation of what
14 would be conventionally described under
15 seismotectonic considerations or seismological and
16 geological factors.
17 Q. In reaching your conclusion that the
18 Staff had inappropriately set or accepted a
19 2,000-year return period for this ISFSI, were you
20 evaluating whether the Staff had an ample or
21 adequate basis with respect to the radiological
22 risks of an ISFSI as compared to nuclear power
23 plants? Did you mean to make a judgment on that
24 issue?
25 A. Relative judgment, the relative risk of

1 an ISFSI versus that of a nuclear power plant. In
2 terms of any radiological descriptions or
3 references in this document, they would not have
4 been part of my, quote, authorship or contribution
5 to authorship. They would have been limited or
6 they would be trackable from the other itemized
7 statements in my testimony, namely, my addressing
8 the justifications put forward by the Staff. And I
9 believe in item 6 it refers to five statements in
10 support of the justification to accept the PSHA
11 methodology with a 2,000-year return value, and
12 those arguments would have been my principal
13 contribution to this document.
14 Q. I'd ask you to turn to page 10 of the
15 contention as filed on November 9, 2000.
16 A. Are we still looking at the same
17 document?
18 Q. The November 9th, 2000 document. I
19 believe that's the one in front of you.
20 A. Yes.
21 Q. And there's a statement in the large
22 paragraph that appears on that page which reads as
23 follows, "If the Staff chooses not to use" -- I'm
24 sorry. Let me start with the previous sentence.
25 "The point is that the Staff's acceptance of a mean

1 annual probability of exceedance of 5x10-4 is
2 completely arbitrary. If the Staff chooses not to
3 use the reference probabilities for an ISFSI
4 specified in the Rulemaking Plan, then it should
5 determine and justify an alternative reference
6 probability to make a quantitative risk analysis
7 using a procedure similar to the one referenced in
8 Appendix B to Reg Guide 1.165. This it has failed
9 to do." And there's a citation that says Arabasz
10 declaration, paragraph 8. Do you see that
11 statement?
12 A. Yes, I do.
13 Q. In making that statement, was it your
14 understanding that you or the State were
15 challenging the adequacy of the Staff's risk
16 analysis for this ISFSI with respect to
17 radiological risks as compared to nuclear power
18 plants?
19 MS. CHANCELLOR: Is this specific to
20 this particular paragraph? Is that correct,
21 Mr. Turk? This large paragraph in the middle of
22 page 10 of the contention, is it specific to that
23 paragraph, your question?
24 MR. TURK: My question is specific to
25 that paragraph.

1 THE WITNESS: May I have the question
2 again, please?
3 (The record was read as follows: "In
4 making that statement, was it your
5 understanding that you or the State were
6 challenging the adequacy of the Staff's risk
7 analysis for this ISFSI with respect to
8 radiological risks as compared to nuclear power
9 plants?")
10 THE WITNESS: Simply, no. What I was
11 addressing was the reference probability or the
12 relative probabilities that would be attached to a
13 nuclear power plant and some factor for going from
14 that reference probability to an ISFSI.
15 Q. (By Mr. Turk) How do you understand
16 that the Staff went from the reference probability
17 for a nuclear power plant to selecting a different
18 reference probability for this ISFSI? You've
19 criticized the Staff's logic on a number of
20 occasions, especially in your cross-examination
21 I've heard today. What do you understand to be the
22 principle bases for the Staff's judgment there?
23 A. The bases in my understanding are set
24 forward in the first instance in three documents:
25 the preliminary SER dated approximately December

1999; subsequently reasons put forward in a revised SER I believe in September 2001; then in the consolidated SER; and also reasons put forward in the modified Rulemaking Plan. Those are the bases on which I interpret the reasons that the Staff puts forward for justifying the 2,000-year return period for the ISFSI.

Q. Do you understand that the Staff has given any consideration to the relative radiological risks of nuclear power plants versus ISFSIs?

A. That argument is put forward in at least the second version of the SER and the -- and I believe the consolidated SER. I'm not sure about the latter.

Q. I'd like to show you a document that's been admitted into evidence as Staff Exhibit No. C. This is the consolidated SER at page 2-50. And I'm going to read them, and if you would please tell me if I'm reading correctly.

In the middle of the page it states, "The Staff has determined that a 2,000-year return value with the PSHA methodology can be acceptable for the following reasons." Do you see that statement?

1 A. Yes, I do.

2 Q. And the very first bullet after that,

3 could you read that into the record, please?

4 A. Yes. "The radiological hazard posed by

5 a dry cask storage facility is inherently lower and

6 the facility is less vulnerable to

7 earthquake-induced accidents and operating nuclear

8 commercial nuclear power plants." The citation

9 "(Hossing et al. 1997)." "In its statement of

10 consideration accompanying the rulemaking for 10

11 CFR Part 72, the NRC recognized a reduced

12 radiological hazard associated with dry cask

13 storage facilities and stated that the seismic

14 design-basis ground motions for these facilities

15 need not be as high as for commercial nuclear power

16 plants," followed by citations.

17 Q. And the first of those citations is 45

18 Federal Register 74,697, correct?

19 A. That's correct.

20 Q. Do you have a basis to disagree with the

21 Staff's conclusion in that paragraph with respect

22 to the relative risks of the ISFSIs versus nuclear

23 power plants?

24 A. No. Following my testimony to

25 Mr. Gaukler this morning, I'm in agreement with

1 that proposition.

2 Q. I'd like to ask you to turn in the

3 November 9th contention to page 12. Under item C,

4 "Use of a PSHA with a 2,000-year return period does

5 not ensure an adequate level of conservatism."

6 A. Excuse me. I don't see where you're

7 reading.

8 Q. Page 12 of the November 9th, 2000

9 document.

10 A. I have it.

11 Q. Do you have the bold lettering C, "Use

12 of a PSHA"?

13 A. Okay.

14 Q. The first -- the sentence under that

15 states, "The State does not agree that a 2,000-year

16 return period ensures an adequate level of

17 conservatism for seismic design of the PFS

18 facility. As argued in Part A here, PFS has not

19 demonstrated that the design of the PFS facility

20 will provide adequate protection against

21 radiological impacts on public health and safety or

22 that equipment essential to safety will be designed

23 to withstand a 2,000-year recurrence earthquake."

24 Do you see that statement?

25 A. Yes, I do.

1 Q. Is that a statement that you're
2 sponsoring in the contention?
3 A. What I'm doing is referencing Part A,
4 arguments made by others in this document, and
5 using that as a connecting introduction to this
6 part. Where it is written as argued in part A
7 here, not argued by me in part A.
8 Q. Are you making a judgment in this
9 paragraph that there will be inadequate protection
10 against radiological impacts to public health and
11 safety in a 2,000-year return period earthquake as
12 utilized as a design-basis ground motion?
13 A. Let me pause for a moment to look at
14 this text to see if I wrote this part.
15 If I wrote this part, then I am simply
16 making an argument by reference to part A
17 propounded by others.
18 MS. CHANCELLOR: Your Honor, I would
19 note that this contention was written prior to PFS
20 filing for summary disposition, and some of these
21 issues have changed, as Dr. Arabasz has testified
22 to.
23 MR. TURK: When you say -- may I
24 proceed, your Honor?
25 Q. (By Mr. Turk) When you refer to part A,

1 are you talking about the discussion in the
2 contention that begins at page 6 which states, "The
3 grant of the exemption request fails to comply with
4 the NRC Rulemaking Plan"?
5 A. Yes.
6 Q. I'm afraid the trail is a little bit
7 hard to follow. When I read your declaration --
8 MS. CHANCELLOR: If you'll look in part
9 A, there's a cite to Dr. Resnikoff's declaration,
10 couple of citations.
11 Q. (By Mr. Turk) On page 2 you indicate
12 that you assisted in the preparation of a January
13 26th, 2000 modification to Basis 2 of the
14 contention, this is paragraph 4, with the exception
15 of the portion of the document that relates to dose
16 limits. Now, maybe there's a little confusion
17 here. Are you sponsoring or did you sponsor all of
18 the November 9, 2000 contention except with respect
19 to dose limits being exceeded?
20 MS. CHANCELLOR: Objection, your Honor.
21 The document speaks for itself.
22 MR. TURK: Your Honor, I don't know why
23 the State has objected. If he sponsored it, he
24 did. If he didn't, he didn't. And I don't think
25 the document speaks for itself. I think it needs a

1 little clarification here.

2 MS. CHANCELLOR: The document has

3 specific citations to either Dr. Resnikoff's

4 declaration or Dr. Arabasz's declaration where

5 appropriate. And in Part A there are two

6 references to Dr. Resnikoff's declaration.

7 MR. TURK: Just to cut it short, your

8 Honor, on page 10 a statement is made drawn upon

9 Dr. Arabasz's declaration that if the Staff does

10 not want to use the Rulemaking Plan reference

11 probabilities which, as you know, were the 1,000

12 and 10,000 back in the original Rulemaking Plan,

13 then it should determine a justified alternative

14 reference probability using a quantitative risk

15 analysis as used in Regulatory Guide 1.165. And

16 the State referenced Dr. Arabasz for that

17 statement. I'm asking the witness if in fact he is

18 the one who's sponsoring that statement.

19 JUDGE FARRAR: That's a fair question.

20 Objection overruled. I mean, it says he's

21 sponsoring it, but you're asking --

22 MR. TURK: I'm asking if that's in fact

23 correct.

24 JUDGE FARRAR: It's cross-examination;

25 you're permitted to do that.

1 THE WITNESS: I'm confused. At this
2 point you're asking me if I sponsored which
3 statement specifically for this?
4 Q. (By Mr. Turk) . That if the Staff does
5 not want to use a 1,000 or a 10,000 reference year
6 probability for this ISFSI, it should utilize, or
7 should, in your words or in the words of the State,
8 determine and justify an alternative reference
9 probability from a quantitative risk analysis using
10 a procedure similar to the one referenced in
11 Appendix B to Reg Guide 1.165. Is it you who's
12 asking for a quantitative risk analysis?
13 A. I'll accept responsibility as in the --
14 with the quantitative risk analysis being a
15 prescription given in Reg Guide 1.165.
16 Q. And I take it you're making the judgment
17 that unless a quantitative risk analysis is
18 performed, there's no basis upon which the
19 Commission could license a facility based upon a
20 qualitative risk analysis. Is that your view?
21 A. My view here was that reading the
22 guidance in 1.165 that the alternative reference
23 probability was to be accompanied by a risk
24 analysis. And that was the simple point that I was
25 making.

1 MR. TURK: Could you read my question
2 back?
3 (The record was read as follows: "And I
4 take it you're making the judgment that unless
5 a quantitative risk analysis is performed,
6 there's no basis upon which the Commission
7 could license a facility based upon a
8 qualitative risk analysis. Is that your
9 view?")
10 THE WITNESS: There's an inference of my
11 judgment, and no basis -- no, I was not making that
12 judgment.
13 Q. (By Mr. Turk) Then I take it you would
14 not object if the Commission was to reach a
15 qualitative -- I'm sorry -- was to reach a judgment
16 on licensing based upon a qualitative consideration
17 of risk factors. Correct?
18 A. Correct.
19 Q. Do you recognize that the Staff in that
20 first bullet we discussed in the consolidated SER
21 was doing in fact just that, making a qualitative
22 judgment based upon consideration of risk?
23 A. Yes, I recognize that.
24 Q. Dr. Arabasz, as I recall from reading
25 your deposition transcript, you have not been

1 involved in NRC licensing proceedings prior to this
2 one?
3 A. Correct.
4 Q. Have you been involved in the review of
5 any NRC license applications prior to your
6 involvement with the PFS license application?
7 A. No, I have not.
8 Q. And I guess this goes without saying,
9 but I take it you've never been involved in looking
10 at the radiological risk posed by any particular
11 type of facility, including this facility?
12 A. Correct.
13 Q. On page 10 of your testimony after you
14 see several indentations there, you're quoting from
15 various other materials including Dr. Cornell's
16 declaration. There's a paragraph that begins, "The
17 discovery and deposition process."
18 A. Correct, I see that.
19 Q. In that paragraph you state that the
20 discovery and deposition process for this
21 contention, Contention Utah L, Part B, has led you
22 to the opinion that determination of the mean
23 annual exceedance probabilities for equivalent
24 return period of a DBE of the proposed PFS facility
25 and whether it ensures sufficient protection cannot

1 be made independent of an evaluation of
2 conservatism or nonconservatism in design
3 procedures." Correct?
4 A. Correct.
5 Q. Are you aware whether the Staff has
6 considered the adequacy of the PFS ISFSI design in
7 the procedures utilized in developing that design?
8 A. I am not aware.
9 Q. So you don't know whether that's
10 considered in the Staff's Safety Evaluation Report
11 or not?
12 A. Could we pause for a moment, please?
13 My recollection is that it is
14 considered, but without the quantification as it
15 appears in the DOE paradigm.
16 Q. And would you agree also that the NRC
17 and the NRC Staff are not obliged to follow the DOE
18 paradigm?
19 A. Yes, I acknowledge that.
20 Q. And the Staff in fact is free to follow
21 its own regulatory guidance documents in
22 determining whether or not a facility's design is
23 adequate, correct?
24 A. That's my understanding.
25 Q. In your testimony, in fact, in the

1 original contention there's reference to the 1998
2 Rulemaking Plan, and I take it you recognize that
3 that Rulemaking Plan was not in fact in the
4 regulation. Correct?
5 A. Correct.
6 Q. It was not even a proposed regulation at
7 that time, correct? Do you understand the
8 difference?
9 A. No, I do not.
10 Q. Would you agree that there was no
11 obligation to the Staff to follow that Rulemaking
12 Plan in its determination whether or not to approve
13 the PFS seismic exemption request?
14 A. I would rely on my answer on the
15 guidance provided by the Commission in its
16 memorandum and order of June 19 -- June of 2001
17 where, in my understanding, the import of the
18 Rulemaking Plan was that the State could not rely
19 on it solely for its argument, it had to
20 demonstrate or argue that the standard the
21 2,000-year mean return period design basis was
22 inadequately conservative, and conversely a burden
23 was on PFS to prove that the design was
24 sufficiently protective.
25 Q. You've raised another question. I want

1 to start with the one that I asked you, which was
2 the 1998 Rulemaking Plan. Not anything subsequent
3 to that, that original Rulemaking Plan. Do you
4 understand that the Staff is not obliged to follow
5 that Rulemaking Plan in deciding whether or not to
6 approve the exemption request from PFS?
7 A. I gained that understanding from this
8 process, yes, and --
9 Q. Were you aware of that when you drafted
10 or participated in the drafting?
11 MS. CHANCELLOR: Dr. Arabasz, did you
12 finish your answer?
13 THE WITNESS: No, I had not.
14 MS. CHANCELLOR: It sounded like you
15 paused there.
16 MR. TURK: I'll strike the question and
17 let the witness complete his prior answer.
18 THE WITNESS: What I would simply add,
19 and I'll try to be careful with my wording, much to
20 my chagrin, what I learned in this process is that
21 the standards or apparent standards are
22 suggestions, guidance, need not be adhered to, and
23 just leads to a fluidity in the process that is
24 hard to find touch points for.
25 Q. (By Mr. Turk) Are you equating the

1 initial Rulemaking Plan with regulatory guidance?
2 Is that what you believe it was?
3 A. It was my understanding it was intended
4 to be eventually rulemaking -- it was intended to
5 be eventual guidance.
6 Q. When you participated in the drafting of
7 the contention which later became Part E of Unified
8 L/QQ, is it correct your understanding was that the
9 original Rulemaking Plan from 1998 was regulatory
10 guidance that should be followed in this instance?
11 A. That was my understanding, simply put,
12 that it had a greater force of weight than has now
13 been explained to me.
14 Q. In fact, that's the basis for this
15 portion of Contention L/QQ, isn't it, that the
16 Rulemaking Plan is not being adhered to in the
17 approval, or the Staff's proposed approval of the
18 seismic exemption for PFS?
19 A. I can't speak fully to that because part
20 of the argument was made by State's counsel, and
21 specifically relating to the Rulemaking Plan.
22 Q. Well, your understanding at that time
23 when the contention was framed and when you
24 submitted your declaration in support of the
25 contention was that the Rulemaking Plan was

1 regulatory guidance that should have been followed
2 with respect to the approval of the PFS seismic
3 exemption request?
4 A. And the context --
5 MS. CHANCELLOR: Your Honor, I would
6 object to the extent that this gets into attorney
7 work product as to how the state frames its
8 contention. If counsel is making certain legal
9 arguments with respect to rulemaking plans versus
10 guidance documents and to the extent that Mr. Turk
11 is impinging on that area, I would instruct the
12 witness to not answer questions relating to
13 attorney work product.
14 JUDGE FARRAR: Mr. Turk?
15 MR. TURK: Your Honor, any instruction
16 should come from you, first of all.
17 Second, the witness has signed a sworn
18 declaration under penalty of perjury. I'm testing
19 his basis for saying that he supports the
20 contention if the contention is a valid one. If
21 he's relying only on counsel, he can state that.
22 JUDGE FARRAR: Let me hear the question
23 again, with these arguments in mind.
24 (The record was read as follows: "Well,
25 your understanding at that time when the

1 contention was framed and when you submitted
2 your declaration in support of the contention
3 was that the Rulemaking Plan was regulatory
4 guidance that should have been followed with
5 respect to the approval of the PFS seismic
6 exemption request?")
7 JUDGE FARRAR: In future questions,
8 Dr. Arabasz, limit yourself to what you knew and
9 not to any discussions you might have had with
10 counsel about strategy and so forth, just what was
11 your understanding, and don't touch on anything
12 that you and counsel may have discussed. So you
13 can go ahead and answer.
14 THE WITNESS: That basically was my
15 understanding, Mr. Turk.
16 Q. (By Mr. Turk) And did you come to that
17 understanding based upon your own reading and
18 interpretation of the Rulemaking Plan and its place
19 in the regulatory process or based upon your
20 communications with counsel?
21 A. Both.
22 Q. All right. Let's touch upon the part
23 that was not related to you by counsel. What basis
24 did you have to reach an understanding of what the
25 Rulemaking Plan -- what force the Rulemaking Plan

1 had?

2 A. I'm pausing because this is distant

3 memory at this point. From my recollection, to the

4 best of my memory, the allowance was set forth for

5 the option of the 1,000-year or the 10,000-year

6 mean return periods, depending on accident

7 consequences.

8 JUDGE FARRAR: Mr. Turk, it may be

9 getting time for a break here, unless you're --

10 MR. TURK: That's fine.

11 JUDGE FARRAR: It's almost 20 after.

12 Let's come back at 3:35.

13 MR. TURK: What time do you want to

14 break this evening, your Honor?

15 JUDGE FARRAR: No later than -- I'd like

16 to do five, but we'll go to 5:30. But if we're not

17 going to finish, then there's no sense going late

18 because we'll just come back on June 3rd.

19 MR. TURK: And I -- well, I need to talk

20 to you about scheduling, but I think we should take

21 a break first. But I think if counsel for the

22 State has redirect, then we won't finish with the

23 witness today.

24 (A recess was taken.)

25 JUDGE FARRAR: All right, we're back on

1 the record to resume the state -- the Staff's
2 cross-examination. But there was some conversation
3 as we left the room about scheduling or something.
4 MR. TURK: Yes. Do you want to talk
5 about that now or afterwards?
6 MS. CHANCELLOR: I think, given where we
7 are today, I think we need to revisit amongst
8 ourselves and schedule.
9 JUDGE FARRAR: All that's happened since
10 we last talked was that we learned this witness
11 won't be finished today, but does that dramatically
12 affect the schedule on the 3rd through the 7th?
13 MR. GAUKLER: I do not think so, your
14 Honor.
15 MS. CHANCELLOR: I think we need to look
16 at the schedule and the lawyers' and the witnesses'
17 availability, because Mr. Turk won't be in until
18 late in the afternoon on Tuesday, and that affects
19 the witnesses that we can have on. We can't have
20 Dr. Arabasz up first if Mr. Turk is not going to be
21 here.
22 JUDGE FARRAR: But he was not going to
23 be up first. In other words, why wouldn't we just
24 defer this witness to some other time?
25 MS. CHANCELLOR: Because we wouldn't be

1 able to do rebuttal on D and E because Dr. Arabasz
2 would not have testified, would not have completed
3 his -- yes, right.
4 MR. TURK: We can make a lot of progress
5 that week, but we won't be able to achieve as much
6 as we had hoped. I see three principal effects.
7 One, that I'll need to complete the examination,
8 which I do not think I'll be able to do tonight.
9 So that means some time during that next week will
10 be necessary for that. The State will have
11 redirect. I don't know if the PFS will have
12 follow-up. We're looking at a good half a day
13 finishing Dr. Arabasz during that second week.
14 Second, because of my graduation of my
15 daughter Monday night --
16 JUDGE FARRAR: Wait. That second week,
17 you mean during the week of June 3rd to 7th?
18 MR. TURK: That's what I'm talking
19 about, the week of June 3rd through 7th. In that
20 same week because of my daughter's graduation I
21 won't be able to arrive here until midafternoon
22 Tuesday.
23 JUDGE FARRAR: Right.
24 MR. TURK: So I would ask that we not
25 start Dr. Bartlett or Dr. Arabasz until I can get

1 here, which may mean that we need -- if we do the
2 Khan testimony on Monday and the Singh/Soler
3 rebuttal to that, that will probably take all of
4 Monday and possibly going into Tuesday. And I
5 would ask that at that point for a dispensation
6 that you allow the hearings to take a brief pause
7 until I can get out here. And then we'd be able to
8 continue with the Bartlett, Ostadan, and other
9 Ostadan testimony. And possibly fit in Dr. Arabasz
10 that week and maybe wait for the rebuttal. There
11 may be some adjustment to the calendar.
12 MS. CHANCELLOR: Your Honor, we had
13 devised a schedule based on a very precise
14 availability of witnesses. It's sort of like the
15 dance that we did throughout the week. And part of
16 that dance entails going forward with -- I hate to
17 bore with you the details, but part of the dance
18 involved getting through Dr. Bartlett's testimony
19 on Tuesday, the 4th.
20 JUDGE FARRAR: And why can't we do that?
21 MS. CHANCELLOR: Mr. Turk has now asked
22 that that be deferred until he arrives. Previously
23 he said Mr. O'Neill could be involved in that
24 testimony and Mr. Turk would pick it up on
25 Wednesday morning.

1 JUDGE FARRAR: Right. I understand why
2 you want to be here to finish Dr. Arabasz, but why
3 can't you -- why can't Mr. O'Neill -- Mr. O'Neill
4 was going to do which testimony?
5 MR. TURK: He's going to be handling the
6 Khan testimony on Monday, and then there's the
7 Bartlett piece of Part E of the contention on
8 Tuesday. Mr. O'Neill's not been involved in part E
9 of the contention at all. I made that offer as a
10 means of trying to expedite the proceeding, but
11 after today's events I see that I would be doing a
12 disservice to my client if I'm not here to
13 represent it. And I say that because --
14 JUDGE FARRAR: To represent it on
15 Bartlett?
16 MR. TURK: On Bartlett on part E.
17 JUDGE FARRAR: Because part E has taken
18 on new dimensions for you.
19 MR. TURK: Well, what seems to happen is
20 witnesses may expand beyond the original testimony,
21 and if I don't hear their cross-examination then
22 I'll be very ineffective as counsel, and I don't
23 want to do that to my client voluntarily.
24 MS. CHANCELLOR: Your Honor, most of our
25 witnesses are available the week of June 24. Maybe

1 we should think about going to the week of June 24
2 and just continuing, trying to get -- allow a
3 little more time. We're trying to squeeze way too
4 much into --
5 MR. GAUKLER: I strongly object to that,
6 your Honor. I've got all my witnesses available
7 for the week of June 3rd. I don't want to have to
8 go back and start rescheduling. We have a very
9 productive week in line for June 3rd with the
10 possibility of part of Tuesday, and I think we
11 ought to go forward and get whatever done we can
12 get done in that week and deal with what we have
13 left at the end of that week.
14 JUDGE FARRAR: Were you suggesting,
15 Ms. Chancellor, that we scrub the week of June 3rd
16 and do everything in D.C.?
17 MS. CHANCELLOR: That certainty wasn't
18 my suggestion. My suggestion was maybe do soils
19 and radiation in D.C. and then come back here the
20 week of June 24th and finish up D and E. You don't
21 like that?
22 JUDGE FARRAR: No.
23 MR. GAUKLER: Let's go forward and do
24 what we can today and go forward to the week of
25 June 3rd, and --

1 JUDGE FARRAR: We'll come back the week
2 of the 3rd, we'll get done what can be done. If
3 we're only 80 percent efficient, that's -- 80
4 percent is less than a hundred but it's a lot more
5 than zero.
6 MR. GAUKLER: I agree 100 percent.
7 MR. TURK: Or 80 percent.
8 JUDGE FARRAR: Well put, Mr. Gaukler.
9 MR. TURK: That sounds like 90 percent
10 times 95 percent.
11 JUDGE FARRAR: In other words, a lot of
12 effort has gone into scheduling that week. Maybe
13 we won't get as much done as we'd hoped, but we'll
14 get something done, and at some point this
15 proceeding has to come to an end. And lease just
16 go with the plan, and the problem being anything we
17 don't get done we'll get done the week of the 24th
18 in D.C.
19 MS. CHANCELLOR: But that was based on
20 the premise before Mr. Turk retracted his offer.
21 JUDGE FARRAR: Well, he -- number one,
22 his dispensation is legitimate. There's almost
23 nothing in life more important than a high school
24 graduation of a child.
25 Number two, given the developments

1 today, not that we're pleased with them, but his
2 point about needing to represent his client because
3 of the way other parties' cross-examination went is
4 valid. If any of you said that, it would be fine.
5 And several days ago we put off the completion of
6 aircraft because it was fair for you all, for the
7 State to say they needed to be able to study this
8 new evidence.
9 So while we don't like developments like
10 this, no one likes them, we have to -- parties are
11 entitled to protect their interests. So I would
12 say let's keep going, see how far we get.
13 MR. TURK: Your Honor, I should note,
14 you're probably aware of this already, I have not
15 been following my cross-examination plan. I've
16 been following lines developed during the earlier
17 cross-examination. I'd like to continue doing that
18 today. And some of the items on my
19 cross-examination plan have been addressed but I'd
20 like to touch -- I'd like to go back to today's
21 testimony, cross-examine on that, and then come
22 back to the plan after I finish that.
23 JUDGE FARRAR: That's fine. Let's do
24 that.
25 Q. (By Mr. Turk) Dr. Arabasz, when did you

1 write your testimony?

2 A. To the best of my memory, it would have

3 been in the week leading up to March 31st deadline,

4 as I recall, for the filing within the previous

5 week, approximately.

6 Q. And did you write it or did counsel

7 write it for you?

8 A. Let's see.

9 MS. CHANCELLOR: I'd caution Dr. Arabasz

10 to be careful how he answers questions that deal

11 with attorney-client or attorney work product.

12 JUDGE FARRAR: Mr. Turk, that's a

13 question I've rarely heard. Actually, I've never

14 heard it because I've only been back for this case.

15 MR. TURK: You will get the gist in just

16 a few moments, your Honor.

17 JUDGE FARRAR: Okay. But be careful,

18 please.

19 MR. TURK: I will not ask for any breach

20 of privilege that may exist between counsel for the

21 state and the state's expert witness, if such a

22 privilege exists.

23 THE WITNESS: In draft form, I believe

24 much of my testimony -- in draft form my testimony

25 was put together by counsel, but using a prior

1 document, the state's response to PFS's motion for
2 a summary disposition, I believe that most of the
3 outline and framing of my testimony follows my
4 contribution to that document. Here I certainly
5 read very carefully this testimony before having
6 it, or allowing it to be submitted.
7 Q. So in fact that the testimony was put
8 together by counsel, not by yourself in its current
9 form?
10 MS. CHANCELLOR: Objection, your Honor.
11 I object to the way that Mr. Turk is --
12 JUDGE FARRAR: Mr. Turk, we're on the
13 edge here of questions that we don't usually ask,
14 and I think he gave an answer, you don't have to
15 recharacterize it. We heard what he said.
16 Q. (By Mr. Turk) You mentioned that it
17 follows your contribution to an earlier document,
18 and that was the State's response to the
19 Applicant's motion for summary disposition, I
20 believe you said.
21 A. Correct.
22 Q. Was that -- do you have that document
23 with you today?
24 A. No, I do not.
25 Q. Is it correct that the document you're

1 referring to was filed by the State on December 7,
2 2001?
3 A. It sounds about the right date.
4 Q. And you had a declaration attached to
5 that response to the motion for summary
6 disposition, correct?
7 A. I believe that was correct, that the
8 documents as submitted typically involved my
9 declaration except for this prefiled testimony.
10 Q. And I don't know if you have it before
11 you. I'm looking for it myself.
12 Your Honor, the boxing of the documents
13 has gotten in my way, unfortunately.
14 But your declaration was dated December
15 6th, 2001, was it not?
16 A. I have no basis for answering.
17 JUDGE FARRAR: May I approach the
18 witness?
19 Q. Dr. Arabasz, I show you a document dated
20 December 7, 2001 entitled State of Utah's Response
21 in Opposition to Applicant's Motion for Summary
22 Disposition of Part B of Utah Contention L.
23 A. Yes.
24 Q. That is the response to summary
25 disposition that you referred to?

1 A. Yes.

2 Q. And do you see attached to that

3 document, I believe it's going to be attachment

4 1 -- may we go off the record just a second?

5 JUDGE FARRAR: Yes.

6 (Discussion off the record.)

7 Q. (By Mr. Turk) I show you a declaration

8 that was attached to that response dated December

9 6, 2001. It's entitled declaration of Dr. Walter

10 J. Arabasz. Do you recognize this document?

11 A. Yes, I do.

12 Q. And this is in fact the document that

13 was attached to the summary disposition motion --

14 I'm sorry -- the response to summary disposition

15 filed by the State?

16 A. It appears to be, yes.

17 Q. And you signed this document on page 17?

18 A. Yes, I did.

19 Q. One thing I could not help but notice,

20 Dr. Arabasz, was that your testimony follows almost

21 word for word your declaration filed on December

22 6th, 2001. Is that a correct understanding, that

23 it's almost a verbatim restatement of your

24 declaration?

25 A. Without comparison, I don't recall. But

1 this situation was after the process of deposition
2 in the fall of 2001, and with the arguments leading
3 up to the response to the motion for summary
4 disposition, basically that's where most of my
5 thinking had been shaped and then was brought
6 forward into this testimony.
7 Q. When you said that you did a careful
8 reading of your testimony before it was filed, did
9 you compare it to your previous declaration to be
10 sure it was consistent with what you had said in
11 your declaration?
12 A. Excuse me. Reading of my testimony
13 was --
14 Q. You indicated that you read your
15 testimony before it was filed, and you stated that
16 you read it carefully. And what I'm asking you now
17 is, in reading your testimony before it was filed,
18 did you verify that in fact it was consistent with
19 your declaration on December 6th?
20 A. I did not make that consistency check,
21 to the best of my memory.
22 Q. Did you have your declaration in front
23 of you as you were reading your testimony to be
24 sure that you were satisfied with the testimony?
25 MS. CHANCELLOR: Objection, your Honor.

1 MR. TURK: Let me make it easier. I'll
2 withdraw the question.
3 MS. CHANCELLOR: Thank you.
4 Q. (By Mr. Turk) . You are aware, are you
5 not, that the testimony does follow paragraph for
6 paragraph, with only very minor modifications, the
7 precise statements that are contained in your
8 declaration of December 6th, correct?
9 A. I'm generally aware of that, yes.
10 Q. And you made your declaration on
11 December 6th. That was before the Staff had issued
12 supplement No. 2 to its SER; is that correct?
13 A. If you can refresh my memory about the
14 date of supplement.
15 MR. TURK: May I approach the witness
16 again, your Honor?
17 JUDGE FARRAR: Yes.
18 Q. (By Mr. Turk) I'd like to show you a
19 letter from Sherwin E. Turk to Denise Chancellor
20 and Jay Silberg dated December 21, 2001. And this
21 letter states, "Enclosed please find an unredacted
22 copy of supplement No. 2 of the NRC Staff's Safety
23 Evaluation Report concerning the Private Fuel
24 Storage facility issued on September 29th, 2000.
25 This SER supplement contains revisions to Chapters

1 2, 4, 5, 6, 7, 11, and 15 related to recent
2 geotechnical information and design changes to the
3 Private Fuel Storage facility." Do you see that
4 document?
5 A. Yes, I do.
6 Q. Does this refresh your recollection as
7 to when the Staff Supplement No. 2 to the SER was
8 issued?
9 A. It jogs my memory about information
10 available in a redacted version. Was information
11 submitted to the State in redacted form prior to
12 the release of the unredacted version? This
13 possibility arises in my mind as you ask me to
14 refresh my memory.
15 Q. If I can refresh your recollection a bit
16 more, and perhaps counsel would verify. On
17 December 21 the Staff sent only to PFS counsel and
18 counsel for the State the unredacted version and
19 later confirmed that it could release that
20 unredacted version to other persons. But December
21 21st is the first issuance of the SER supplement
22 No. 2; is that correct?
23 A. I'd have to accept your explanation.
24 Q. When you made your statement in your
25 declaration in December, on December 6, 2001, you

1 did not have Staff's Supplement No. 2 to the SER in
2 your possession yet, did you?
3 A. As you just explained, that would be
4 correct.
5 Q. Well, that's consistent with your own
6 recollection, too, isn't it? Didn't you receive
7 the supplement to the SER after you filed that
8 declaration?
9 A. I pause because I just sigh thinking
10 about all of the materials I have in my office that
11 have come at me in this process. And I have to
12 accept your chronology as you're establishing it,
13 Mr. Turk.
14 MR. TURK: May I ask if counsel for the
15 State will confirm my representation?
16 MS. CHANCELLOR: I'm sure that's
17 correct. That's fine.
18 Q. (By Mr. Turk) And nowhere in your
19 declaration of December 6th is there any
20 consideration of Staff judgments and assessments
21 contained in Supplement No. 2, correct?
22 MS. CHANCELLOR: Objection.
23 MR. TURK: Your Honor, I'll show the
24 declaration to the witness and he can peruse it and
25 tell me if I'm correct.

1 MS. CHANCELLOR: I think you should
2 look -- the declaration, you said in his testimony.
3 I think you should look at question 4.
4 JUDGE FARRAR: . No, he said in his
5 declaration.
6 MS. CHANCELLOR: Oh, declaration. I beg
7 your pardon.
8 JUDGE FARRAR: Objection is withdrawn.
9 MS. CHANCELLOR: Withdrawn.
10 JUDGE FARRAR: You may answer.
11 Q. (By Mr. Turk) Would you like to see
12 your declaration?
13 A. Yes. The question again, please?
14 (The record was read as follows: "And
15 nowhere in your declaration of December 6th is
16 there any consideration of Staff judgments and
17 assessments contained in Supplement No. 2,
18 correct?")
19 MS. CHANCELLOR: Your Honor, Supplement
20 No. 2 came after Dr. Arabasz's declaration.
21 JUDGE FARRAR: Which means the answer
22 ought to be a foregone conclusion, but --
23 MS. CHANCELLOR: Right.
24 JUDGE FARRAR: But you may answer.
25 THE WITNESS: I'll agree to the foregone

1 conclusion.

2 Q. (By Mr. Turk) To what extent, then, did

3 you consider the Staff's SER Supplement No. 2 in

4 framing your testimony?

5 A. Mr. Turk, to answer in an informative

6 way what I would need to do is to look at the Staff

7 bullets in the December 21st supplement and refresh

8 my memory as to whether there was any change in

9 that rationale with respect to what had appeared in

10 the prior document. In other words, in tracking of

11 the Staff's reasons offered, if there were a

12 difference in the September 29, 2000 ordering of

13 bullets and in the -- or the information contained

14 in the Staff's reasons and compared to those

15 included in the December 21st, 2001 document, if

16 there had been something materially in my judgment

17 to address, it would have altered my testimony.

18 Had it been brought forward from the December 2001

19 version, I would have done so.

20 Q. So you would have looked to see if the

21 bullets were the same and if they were presented in

22 the same order with respect to --

23 A. Not their order, in the general content

24 and as they related to the reasonings or the

25 arguments that I was adducing addressed to the

1 Staff's bases.

2 Q. And you would have focused on the

3 bullets set forth as the rationale for accepting

4 the seismic exemption requests? That would have

5 been a focus of your inquiry?

6 A. Chiefly, yes.

7 Q. And did you do that at the time you

8 filed your testimony? Did you make that comparison

9 of the Staff supplement No. 2 with the final SER of

10 September 2000?

11 A. To the best of my recollection, yes.

12 Q. You recognize that the Supplement No. 2

13 to the SER was issued following the Staff's

14 completion of its review of the revision to the

15 Applicant's ground motion estimate as well as

16 revisions to its facility design with respect to

17 seismic hazard?

18 A. That appears correct, yes.

19 Q. But your focus again would have only

20 been on the bullets listed as the rationale for

21 approving the exemption?

22 A. Correct.

23 Q. You would not have considered design

24 issues?

25 A. In a general way, I would not have paid

1 great attention to those details. And I believe
2 this is consistent with my -- actually, let me
3 frame my response this way. What I intentionally
4 have done is to set aside consideration of the
5 design issues, and in fact in preparing for these
6 hearings I purposely did not read the testimonies
7 of Dr. Bartlett, Drs. Ostadan and Khan, and for the
8 reason that I'm aware of the general issues but I
9 intended to disengage myself from the State's
10 position and tried to focus on that part of the
11 logic that I developed as explained this morning.
12 Q. So you did not consider whether the
13 Staff's rationale defining the design of the
14 facility to be acceptable, you didn't consider
15 whether that was a good rationale or a bad
16 rationale? You didn't pay attention to that?
17 A. From my awareness of the framework of
18 considerations, the nonconsideration of a target
19 performance goal or the coupling of design
20 conservatisms other than with the radiological
21 consequences, that's correct.
22 Q. Just so I understand your answer: you
23 did not consider radiological risk considerations,
24 correct?
25 A. I was aware that in terms of a paradigm

1 of risk consideration that the Staff in looking at
2 DOE standard looked at the 2,000-year number and
3 then added text, as I recall, in the justifications
4 that related to those consequences rather than a
5 quantification of conservatisms and design as in
6 the DOE framework.
7 MR. TURK: Would you back my question,
8 please?
9 (The record was read as follows: "Just
10 so I understand your answer: you did not
11 consider radiological risk considerations,
12 correct?")
13 THE WITNESS: Correct.
14 Q. (By Mr. Turk) And you did not consider
15 the adequacy of the design of the facility?
16 A. Let me pause. I tripped up on this
17 question before when you asked me about
18 radiological consequences. Not in terms of
19 specific dose limits but in terms, only generally
20 again, in relative comparison of ISFSI versus
21 nuclear power plant.
22 Q. Well, I think what you're saying is
23 you're aware that comparison was made by DOE and
24 that the Staff itself made a comparison between
25 nuclear power plants and ISFSIs, but you yourself

1 did not make any such comparison?

2 A. Only in a relative sense. I did not

3 track regulations specifying dose limits. Or, to

4 be more precise, I did not concern myself at length

5 with regulations related to dose limits.

6 Q. Nor did you consider the radiological

7 risk of a nuclear power plant for an ISFSI, because

8 you don't know what that risk is, correct?

9 MS. CHANCELLOR: Objection. This has

10 been asked and answered. Dr. Arabasz had this line

11 of questioning earlier today.

12 JUDGE FARRAR: Mr. Turk, I think I've

13 heard that question before, but if it's part of a

14 series here, we'll let you --

15 MR. TURK: It's an attempt to understand

16 the final basis for the witness's position, your

17 Honor.

18 JUDGE FARRAR: Okay. Short question,

19 short answer. We'll let you -- even if it's

20 repetitive, we'll allow it.

21 THE WITNESS: I'm aware and have

22 considered that ISFSIs are less dangerous than

23 nuclear power plants in terms of their accident

24 dose potential.

25 Q. (By Mr. Turk) But you don't know how

1 much less dangerous they are?

2 A. Correct.

3 Q. And also you do not consider the

4 adequacy of the design or any conservatisms that

5 might be in the design of this ISFSI, correct?

6 A. I considered them in that I was aware

7 with issues raised by the State's experts.

8 Q. But you yourself are not aware of design

9 conservatisms or lack of conservatisms; you're

10 simply relying on other witnesses?

11 A. That's correct. And I believe I made

12 this plain at the end of my testimony.

13 Q. May I ask why you took it upon yourself

14 to rely upon the State's witnesses with respect to

15 what design is conservative instead of looking to

16 see what the Staff's views of that issue were?

17 A. Because I reckoned ultimately that the

18 various parties would put their statements before

19 the Board, and it would be up to the Board to make

20 a judgment among the varying arguments.

21 Q. Then I take it you're not indicating

22 that you believe the State's witnesses have a

23 better view of this issue than the Applicant's

24 witnesses or the Staff's witnesses? You don't know

25 who's correct?

1 A. That ultimately is true. I'm not an
2 engineer. I do not know the answer.
3 Q. Earlier in your testimony today you made
4 a statement that you had reviewed Dr. Cornell's
5 testimony, and you stated that you were hesitant to
6 apply a risk reduction factor of 5 to 20 to
7 unanchored casks. Do you remember that statement
8 in your testimony?
9 A. Yes, I do.
10 Q. What do you know about unanchored casks
11 that would lead you to be hesitant to rely upon a 5
12 to 20 design conservatism margin?
13 A. I notice in the DOE guidance within
14 which framework Dr. Cornell was operating that the
15 performance for PC-3 in terms of continued
16 function, I believe it's Table C-2 in the Appendix
17 D of DOE Standard 1020, refers to that specifically
18 that the SSC's remained anchored.
19 MS. CHANCELLOR: And this is in PFS
20 Exhibit FFF? No, DDD on page C-3?
21 THE WITNESS: That's correct.
22 Q. (By Mr. Turk) And what sentence are you
23 reading there?
24 A. I'm looking at Table C-2. Enter the
25 third row of PC-3 and --

1 Q. I'm sorry. What page are you on?
2 A. Page C-3 of the Exhibit DDD.
3 MS. CHANCELLOR: Would you read the
4 caption of the table, Dr. Arabasz?
5 THE WITNESS: The caption reads Table
6 C-2, Qualitative Seismic Performance Goals.
7 Q. (By Mr. Turk) Go on.
8 A. And entering row 3 under PC-3, the
9 right-hand side, the next to last column under
10 Component Functionality, "component anchored and
11 functional."
12 Q. And what is the structure that you
13 believe is the subject of that row?
14 A. I believe it's a generic SSC, in my
15 understanding.
16 Q. Are you aware of whether this refers to
17 building structures?
18 A. No, I am not. Again, my understanding
19 from the table is that it would -- that it's
20 referring to a generic SSC.
21 Q. So you don't know whether DOE has a
22 position on unanchored casks?
23 A. I do not know that.
24 Q. And is that the basis for your saying
25 that you're hesitant to apply a margin of 5 to 20

1 to unanchored casks, because you don't know how DOE
2 addresses it?
3 A. That's part of the basis. I believe I
4 explained in my testimony this morning that another
5 part was my belief that Dr. Cornell in part relies
6 on testimony of PFS's experts and in part on
7 similarity arguments to arrive at his conclusion.
8 Q. And Dr. Cornell is a licensed engineer?
9 He's a practicing engineer, correct?
10 A. That's correct.
11 Q. And you indicated you are not, correct?
12 A. That is correct.
13 Q. But what I hear in your answer is that
14 you don't believe that Dr. Cornell is a practicing
15 engineer. He's using the correct input to reach
16 his judgment. You're criticizing his use of those
17 inputs to make his judgment?
18 A. I think that's an unfair conclusion from
19 what I said. You began your line of questioning
20 asking about, if I recall correctly, my hesitancy
21 to agree to Dr. Cornell's conclusions.
22 Q. But then you went on to say that you
23 don't consider that he's using the appropriate
24 information in reaching his conclusion. I don't
25 see how you're not challenging him, unless you want

1 to withdraw the statement.

2 A. I have to make a balanced judgment about

3 whether to accept Dr. Cornell's conclusions or not,

4 and in that balance I consider Dr. Cornell's

5 extensive experience, I consider his being a

6 practicing engineer, and on balance also I consider

7 these factors which I prefaced with "in part." And

8 so ultimately I suspend judgment about

9 Dr. Cornell's conclusions.

10 Q. So to the extent that we might have

11 inferred that you're criticizing Dr. Cornell's

12 basis for reaching his conclusion, you're

13 indicating we should not make that determination;

14 that's not what you meant to say?

15 MS. CHANCELLOR: Objection. The witness

16 has described the way in which he has approached

17 Dr. Cornell's testimony, and counsel is trying to

18 characterize what the witness has testified to. He

19 was very careful to parse exactly what he was

20 comparing and in part what he was taking issue

21 with. It's not a simple -- counsel's simple

22 restatement just doesn't get there.

23 JUDGE FARRAR: Mr. Turk, it is

24 cross-examination but I thought you were asked a

25 question that was fairly answered, and then to try

1 to wrap up a very complex answer into a short
2 phrase and get a yes or no seems to be stretching
3 things. But I'll hear --
4 MR. TURK: Your Honor, what I sensed had
5 happened was that the witness made a statement
6 concerning whether Dr. Cornell was exercising
7 proper judgment in drawing upon similarities rather
8 than simply PFS experts similar to other structures
9 or components.
10 JUDGE FARRAR: Then I thought he
11 answered very thoroughly.
12 MR. TURK: And then I heard him say he
13 in effect suspends judgment on Dr. Cornell's
14 conclusions. And now I guess I was looking for the
15 cap, which would be, we should not utilize, we
16 should not use his previous statements to mean that
17 he's challenging Dr. Cornell's conclusions. And I
18 think with a simple yes or no we'd be far along.
19 JUDGE FARRAR: Well, it's not -- it
20 doesn't sound like it's that simple.
21 MR. TURK: Let me withdraw the question.
22 JUDGE FARRAR: Yeah. This witness we
23 almost chided him this morning for being so
24 cautious about, you know, expressing a strong view,
25 and now that caution seems to be evident and he's

1 been very careful in his answers here. And I
2 don't -- it seems -- well, you've withdrawn the
3 last question.
4 MR. TURK: I'll ask it maybe in a better
5 way.
6 JUDGE FARRAR: Okay.
7 Q. (By Mr. Turk) Is it correct,
8 Dr. Arabasz, that you have no knowledge or no way
9 to assess whether Dr. Cornell was correct or not
10 correct in making his statement concerning the
11 margins with respect to unanchored casks? Or you
12 just don't know?
13 A. I have information before me. I have
14 Dr. Cornell's testimony and his analyses, and I
15 have information available to me which suggests a
16 contrary conclusion, namely, information from the
17 State's engineers. And at that point I have two
18 very conflicting potential conclusions, and that's
19 where I suspend judgment.
20 Q. Which means you don't know who was
21 right?
22 A. Correct.
23 Q. Were you present during testimony
24 concerning the revision to DOE Standard 1020-94?
25 Did you hear Dr. Cornell's testimony with respect

1 to that revision?

2 A. Yes, I did.

3 Q. And you are aware, I take it, that in

4 the 2002 revision DOE revised the standard for PC-3

5 facilities from a 5x10-4 to 4x10-4?

6 A. I'm aware of that.

7 Q. What we're talking about now is the

8 seismic hazard exceedance probability, correct?

9 A. Correct.

10 Q. And were you present during

11 Dr. Cornell's testimony in which he discussed a

12 reduction factor that was applied by DOE? I

13 believe the acronym is the SF factor.

14 A. Correct, the seismic scale factor

15 reduced from 1.0 to 0.9.

16 Q. Then you also heard Dr. Cornell's

17 testimony that in effect because the seismic factor

18 reduction is applied now, the .9 instead of a 1.0,

19 that even though the return period may be stated to

20 be 2,500 years, in effect the design of the

21 facility wouldn't change from the 2,000-year return

22 period ground motion design?

23 A. That is correct, within the DOE

24 paradigm.

25 Q. And you agree with that?

1 A. I do.

2 Q. Were you also here during the testimony

3 of Dr. McCann and Dr. Stamatakos as well as

4 Dr. Cornell in which they discussed the use of

5 median, of a median value in Regulatory Guide

6 1.165?

7 A. Yes, I was.

8 Q. And did you understand that the use of a

9 median value was selected in order to resolve the

10 difference between the EPRI and LLNL assessment

11 teams with respect to mean values?

12 A. I addressed this in my testimony, and

13 this is the famous median vs. mean controversy, and

14 I recall Dr. McCann testifying that his memory

15 differed from Dr. Cornell's in terms of how the

16 decision to proceed with the median occurred, as

17 best I can recollect. In other words,

18 understanding the issues relating to mean and

19 median, the Staff nevertheless proceeded to make

20 the median -- the reference probability in Nureg

21 Guide 1.165, and in my familiarity with this matter

22 that this is most lucidly explained in the Yucca

23 Mountain Topical Report 2.

24 Q. Would you agree that it's more

25 appropriate to use a mean annual probability of

1 exceedance rather than a median annual probability
2 of exceedance in establishing the seismic hazard
3 exceedance probability for a nuclear facility?
4 A. A man I respect once told me to file a
5 sentence in my mind and engrave it: "It all
6 depends." And we I think talked about this at
7 length in my testimony this morning with
8 Mr. Gaukler about the statistical preference of the
9 mean. However, if the context is regulatory
10 guidance, then we're back to the median in the Reg
11 Guide 1.165.
12 Q. In the Staff's SER and SER Supplement
13 No. 2 with respect to the PFS facility, the Staff
14 in fact uses a mean value, do they not?
15 A. That's correct.
16 Q. And you don't disagree with the choice
17 of a mean value rather than a median value in
18 establishing a ground motion design basis for the
19 PFS facility?
20 A. I take issue with that. That's one of
21 the bases that the Staff as they put forward their
22 reasons cite for the justification of the
23 equivalency of the 1x10-5 median for a nuclear
24 power plant, its equivalency to a 1x10-4 mean, and
25 they cite the disputed document by Murphy and

1 others, 1997. Unfortunately, they do not
2 explicitly acknowledge as other discussions of this
3 issue do that that equivalency is based on the
4 nuclear power plants in the central and eastern
5 United States.
6 Q. My question to you was, do you take
7 issue with the Staff's using a mean value in the
8 SER as opposed to a median value?
9 A. You said at the PFS site?
10 Q. Yes.
11 A. And yes, I --
12 MS. CHANCELLOR: I thought Dr. Arabasz
13 had just answered that question.
14 MR. TURK: I don't think he did, your
15 Honor.
16 JUDGE FARRAR: I don't think so. Go
17 ahead.
18 THE WITNESS: May I have the question
19 again, please, Mr. Turk?
20 (The record was read as follows: "My
21 question to you was, do you take issue with the
22 Staff's using a mean value in the SER as
23 opposed to a median value?")
24 THE WITNESS: The question, as I
25 understand it, I can interpret differently if we're

1 talking about the ultimate conclusion as opposed to
2 the logic that the Staff proposes for reaching that
3 conclusion.
4 Q. Excuse me. I'm not asking about the
5 logic, I'm asking if you take issue with the bottom
6 line that the Staff uses a mean annual probability
7 of exceedance value in the SER as opposed to using
8 a median value.
9 JUDGE FARRAR: You may answer that yes
10 or no, you can, and then you can go on and explain
11 why your answer.
12 A. Okay. I will agree with the bottom
13 line, because we reached that this morning in my
14 testimony with Mr. Gaukler.
15 Q. I'm sorry. And the bottom line is that
16 it is appropriate to use a mean annual exceedance
17 probability?
18 A. What I arrived at in my discussion with
19 Mr. Gaukler again was that I don't know what the
20 answer is, because there's an analysis yet to be
21 performed, a regulatory process yet to be
22 considered to reach that conclusion. However, I
23 agreed that at the end of that process it's likely
24 that the number would be approximately 1x10-4.
25 Q. I'm sorry. I don't think you're

1 understanding my question, or at least you're not
2 answering directly.
3 MS. CHANCELLOR: He's answered --
4 Q. (By Mr. Turk) I'm asking you -- I'm not
5 asking you about what number should be plugged in.
6 I'm only asking you, is it more appropriate to use
7 a mean value or a median value in assessing the
8 seismic hazard at the PFS facility.
9 JUDGE FARRAR: Well, you asked him if he
10 disagreed with the Staff.
11 MR. TURK: Okay.
12 THE WITNESS: That's how I understood
13 the question, your Honor.
14 JUDGE FARRAR: So the question is, do
15 you disagree with what the Staff did?
16 MR. TURK: Well, it's more specific,
17 your Honor. The question was, does he take issue
18 with the Staff's use of a mean value rather than
19 using a median value. I'm not asking about the
20 number that's input, I'm asking about the
21 description of a seismic hazard -- is it more
22 appropriate to be done using a mean value or a
23 median value.
24 JUDGE FARRAR: At the site.
25 MS. CHANCELLOR: Your Honor, object.

1 Mr. Turk asked the question, and you said that
2 Dr. Arabasz could give a yes answer; if he needed
3 to explain it, then he should do so. And that is
4 exactly what he did. He said the conclusion of a
5 mean may be correct, but he disagreed with the
6 Staff's rationale as to how they got to that mean
7 value. And that was the discussion that he had
8 that Mr. Turk felt like he didn't get just a yes
9 answer.
10 MR. TURK: The witness stated he agrees
11 with the bottom line, and I was merely looking to
12 put on the record what that means. And I think if
13 the witness listens to the question he can provide
14 whatever explanation he wants. But please listen
15 to the question.
16 MS. CHANCELLOR: Please let him answer.
17 JUDGE FARRAR: Let's start with a new
18 question. And on cross-examination counsel is
19 entitled to try to pin you down and you're entitled
20 to explain why -- to give a full explanation. But,
21 and we've said this before during the course of the
22 trial, it does help to give a direct answer and
23 then as full an explanation as you think is
24 warranted.
25 Is there a question pending?

1 MR. TURK: Why don't I ask a new
2 question.
3 JUDGE FARRAR: Right.
4 Q. (By Mr. Turk) Just to be sure that I
5 have an answer on the record, do you take issue
6 with the Staff's using a mean annual probability of
7 exceedance for the PFS facility in the SER in
8 Supplement 2 as opposed to using a median value for
9 the annual probability of exceedance?
10 A. Yes, I do, and I think this has been the
11 continuing thread in this issue of median versus
12 mean that the reference probability under Reg Guide
13 1.165 is specifically given as a median probability
14 of 1x10-5 with guidance about how one proceeds to
15 arrive at an alternative reference probability.
16 And because we are -- you framed your question
17 specifically with the PFS site, then the
18 equivalency with a 1x10-4 mean would not a priori
19 apply because we are not considering a site in the
20 central or eastern United States.
21 Q. Is it correct that nuclear power plants
22 in the central and eastern United States have a
23 mean annual probability of exceedance design basis
24 of approximately 1x10-4 on a mean annual
25 probability of exceedance basis?

1 A. That is correct.

2 Q. Do you believe that nuclear power plants

3 in the western United States have a mean annual

4 probability of exceedance that is different from

5 that?

6 A. I believe that nuclear power plants

7 along the west coast of the United States have a

8 mean annual exceedance probability that appears to

9 be different from the 1x10-4.

10 Q. And how do you understand that to be

11 different? What do you understand the value for

12 plants along the western United States?

13 A. From the hearings, I believe it was on

14 last Saturday during Dr. Cornell's testimony that

15 the Board visited the table in the Yucca Mountain

16 Topical Report that summarized the mean of the mean

17 annual exceedance probabilities for the five plants

18 we discussed earlier.

19 Q. And what is that sum? What numerical

20 figure is given?

21 A. It was either 2.0 or 2.2 times 10-4

22 being the average or the mean of the MAPE's for the

23 five plants.

24 Q. In other words, nuclear power plants

25 along the west coast of the United States would

1 have a design basis return period of approximately
2 5,000 years?
3 A. Under -- could you repeat the question,
4 please?
5 Q. I'm looking to translate the 2x10-4. --
6 A. Yes.
7 Q. -- MAPE into a return period ground
8 motion.
9 A. Yes. That would be the observation
10 comparing the MAPE with the original SSC.
11 Q. For sites located in the western United
12 States that are not located on the west coast where
13 the tectonic plate issue arises, do you believe any
14 MAPE is -- and I don't know whether I should say
15 greater than or less than. I'll let you tell me
16 which is correct. Do you believe that the site
17 that's in the western United States such as the PFS
18 site would have an MAPE that is somewhere in
19 between the 2x10-4 and 1x10-4 value, or do you have
20 a basis for -- or do you have any basis to make a
21 judgment on that? And this is for nuclear power
22 plants.
23 A. Yes. My reckoning is that to establish
24 that reference probability there would be extensive
25 discussion in the scientific and engineering

1 community and in the regulatory forum before that
2 probability were established. The alternative to
3 posing that proposition for general consideration
4 would be to follow Reg Guide 1.165 and go through
5 the procedures for proposing an alternative
6 reference probability to that there stated.
7 Q. Now, I think we've been through this
8 already exhaustively, but you would agree that the
9 seismic hazard on the east coast or in the central
10 United States is less understood than the seismic
11 hazards in the western United States?
12 A. That's correct.
13 Q. And that's one of the reasons, if not
14 the primary reason why the MAPE is different for
15 west coast sites vs. central and eastern United
16 States sites, correct?
17 A. That is why the mean differs from the
18 medians systematically.
19 Q. Would you agree that the seismic hazard
20 at the PFS site is better understood than the
21 seismic hazards for nuclear power plant sites in
22 the central and eastern United States?
23 A. Mr. Gaukler is leading me.
24 Q. What is he doing?
25 A. He's shaking his head and leading me

1 again.

2 Q. Let me know -- every time he says he's

3 shaking his head, I think he's really nodding.

4 MR. GAUKLER: Sleeping.

5 MR. TURK: Would you read back my

6 question, please?

7 THE WITNESS: The answer is yes.

8 MR. TURK: And could I have the question

9 again?

10 (The record was read as follows: "Would

11 you agree that the seismic hazard at the PFS

12 site is better understood than the seismic

13 hazards for nuclear power plant sites in the

14 central and eastern United States?")

15 THE WITNESS: Yes.

16 Q. (By Mr. Turk) And therefore I take it

17 you would agree that it's reasonable that the mean

18 annual probability of exceedance that's assigned to

19 the PFS site should be somewhere in between -- or,

20 I'm sorry. Strike that. I take it that you would

21 agree that the mean annual probability of

22 exceedance for a nuclear power plant if it was to

23 be sited at the PFS site location could be

24 somewhere less than a 10,000-year return period,

25 i.e. -- I hope I'm using the "less" correctly --

1 i.e., it could be 9,000, 8,000, 7,000, some number
2 less than a 10,000-year return period.
3 A. It's conceivable what would be
4 important, from Dr. Cornell's explanation, would be
5 the slope of the hazard curve. I think that would
6 be a very important part of that determination.
7 Q. Have you done a probabilistic seismic
8 hazard analysis for the PFS site?
9 A. I have not.
10 Q. You indicate in your testimony that you
11 believe the Geomatrix work, their PSHA was
12 adequate, correct?
13 A. Correct.
14 Q. In fact, isn't it true that at some
15 point earlier in this proceeding you had very kind
16 words for the Geomatrix PSHA?
17 A. In prior depositions, that's correct.
18 Q. You haven't changed your opinion, have
19 you?
20 A. You have to pin this down as to what
21 part of the Geomatrix work we're talking about,
22 because there was the early work reported in the
23 SAR and then the later work in the 1999 Geomatrix
24 report in terms of the seismic source
25 characterization.

1 Q. Can you refresh my recollection? When
2 in 1999 did Geomatrix issue that report?
3 A. I would estimate March or April. If I
4 could elaborate on my response.
5 Q. Okay.
6 A. There's something fundamental here in
7 the evolution of the site characterization, and
8 that was in the SAR Judge Lam asked the question,
9 and this is relevant, are there likely to be new
10 surprises, are we going to have to revisit this
11 issue with a new discovery. And in my mind,
12 something very, very important happened between the
13 SAR in the 1999 study and the --
14 MR. TURK: I'm sorry. When you say the
15 SAR, you're talking about the 1997 version?
16 A. 1996 and 1997, yes. And that was
17 something that has happened very commonly in the
18 intermountain area, a lack of appreciation for
19 complexity of the alluviated basins. The
20 simple-minded belief is that the major structures
21 are simply at the valley boundaries, and this
22 extensional process that's produced the Basin Range
23 faulting during the last 10 to 20 million years is
24 superimposed on old thrust belt structure relating
25 from horizontal compression chiefly active up to

about 50 million years ago that produced very complicated structure that's been exploited in the intermountain area for oil and gas exploration.

And I and others had enough experience at the time to worry about a source characterization relating to a random earthquake where earthquakes smaller than about magnitude 6 to 6-1/2 can occur in areas where there's no expression of active faulting at the surface.

And in the SAR there was an accounting of a background earthquake which probabilistically was placed at a distance of 17 kilometers from the site, but which, in other hazard analyses that I've been involved in, this random earthquake up to a size of magnitude 6 and 6-1/2 that could occur virtually randomly through the main seismic belt or parts of the areas where there's active faulting might approach the site closer.

And in that history what happened was with the intensive site characterization in the subsurface geophysical studies, the midvalley faults were discovered, and then what before had been a random background earthquake placed at a site of a distance of 17 kilometers from the site was basically dropped to within one to two

1 kilometers beneath the site.

2 Q. And the identification of that fault in

3 close proximity to the PFS facility in effect

4 eliminates a concern about whether or not this

5 distance, 17- kilometer earthquake fault might

6 occur, correct?

7 A. Just so the depiction, the

8 identification and depiction of those sites

9 basically brought bad very close to the site in

10 terms of bad that might be hidden.

11 Q. So that as a result, the Geomatrix PSHA

12 which incorporates that fault in close proximity to

13 the PFS site addresses the concern that might arise

14 about this more distant fault?

15 A. Correct, Mr. Turk.

16 MR. TURK: Off the record.

17 (Discussion off the record.)

18 Q. Dr. Arabasz, my recollection was that

19 the Geomatrix report was dated February 1999.

20 Counsel for PFS has confirmed that's his

21 recollection also. Does that refresh your

22 recollection as to its date?

23 A. I'll accept that date.

24 JUDGE LAM: Let me interrupt, Mr. Turk.

25 Dr. Arabasz, the surprise earthquake with magnitude

1 6 to 6-1/2 plus, how would that correlate with the
2 2,000-year return earthquake in terms of ground
3 motion?
4 THE WITNESS: A deaggregation of the
5 total hazard at the PFS site for the reference
6 probability of 2,000 years leads to controlling
7 earthquakes, if I recall correctly, from the
8 revised Geomatrix analysis. The controlling
9 earthquakes for the spectral band 1 to 2.5 Hz and
10 the controlling earthquake for the 5 to 10 Hz band
11 both turn out to have magnitudes of -- these two
12 controlling earthquakes for the low frequency
13 motions and the higher frequency motions both have
14 magnitudes of about 6.4 to 6.5 at distances of the
15 order of five kilometers from the site.
16 So that my interpretation would be that
17 the earthquake that is controlling the total hazard
18 at the PFS site for a 2,000-year return period is
19 in fact this earthquake in the magnitude 6 range
20 close to the site.
21 JUDGE LAM: Thank you.
22 Q. (By Mr. Turk) In effect, then, because
23 the earthquake isn't brought closer to the site, it
24 has a more dominant effect and therefore bounds the
25 effect of the more distant, uncertain earthquake,

1 correct?

2 A. In general, yes.

3 Q. And when I say bounds, I mean in the

4 sense that the closer earthquake has a greater

5 contribution to the probabilitistic seismic hazard

6 curve because it has greater potential importance

7 to the site than would the more distant site, more

8 distant earthquake fault?

9 A. Yes. There's a trade-off between size

10 and distance. For identical size certainly the

11 closer source is more important. Again, there are

12 trade-offs between size and distance, so this is

13 something that has to be taken into account

14 carefully in the analysis with attenuation and so

15 on.

16 Q. Is it correct that you believe that

17 Geomatrix investigators involved in performing the

18 PSHA are highly competent?

19 A. Correct.

20 Q. And also that the technical quality of

21 their documentation that exists in their report

22 meets very high standards?

23 A. Yes. In prior deposition I said that

24 there were things in the report that I would

25 quibble with, but I'd agree with that

1 characterization, yes.

2 Q. And you also indicated here that between

3 yourself and Dr. Pechmann you had read the

4 Geomatrix report very carefully, that you had

5 reviewed it critically and you could only find

6 minor areas -- I'm sorry -- minor details to

7 quibble with. Correct?

8 A. I stated that, and I still affirm that.

9 Q. And you also stated that as a result of

10 NRC Staff comments and requests for additional

11 information, Geomatrix or PFS, I'm not sure who you

12 were referring to, but people involved in preparing

13 the PSHA performed work that ultimately had the

14 effect of obviating many of the criticisms you had

15 posed earlier?

16 A. That's correct.

17 Q. You also stated, is it not true, that

18 under a probabilistic risk-informed graded approach

19 seismic design levels are linked to risk

20 conditions, so careful scrutiny of PFS's asserted

21 accident conditions is warranted, and such an

22 evaluation is beyond your expertise?

23 A. I'm sorry. Stated where, please?

24 Q. In a document.

25 A. Which document? It's in my testimony?

1 Q. No. This is a statement that I'm asking
2 if you recall having made previously. If you
3 don't, I'll show you the document.
4 A. Yes, please show me the document.
5 Q. I'm looking at a document signed by
6 Dr. Arabasz and Dr. James Pechmann dated April 21,
7 1999 entitled "Issues and perspectives relating to
8 hazard assessment of earthquake ground shaking and
9 surface fault displacement for licensing the
10 Private Fuel Storage facility in Skull Valley,
11 Utah." And this is indicated it's been prepared
12 for the Utah Department of Environmental Quality
13 and the Office of Attorney General, State of Utah.
14 And for the record, I'm looking now at
15 page 2 of the document which bears a Bates stamp
16 number of UT-43097?
17 A. Yes. This is clearly part of a report
18 that I and Dr. Pechmann have signed.
19 Q. Dr. Arabasz, I'd like you to look at
20 page 2 of that document just underneath the
21 sentence that I read. Do you see an area there
22 that's marked "redacted, not relevant"?
23 A. Yes, I do.
24 Q. Do you recall what was located in that
25 area that's been redacted?

1 A. I have no idea.

2 Q. Did you make a determination that it was

3 not relevant?

4 A. No, I did not.

5 MR. TURK: Your Honor, the document I've

6 read from was produced by the State of Utah in

7 discovery. The marking I assume was made by

8 counsel, and it was made sometime in history. I'm

9 not sure why the determination was made if it was

10 not relevant.

11 I would ask that the document be

12 provided to the Board for determination on whether

13 or not that objection to production was properly

14 asserted. Because it seems to me that if we're

15 talking now about -- I should give you a little

16 more background. The top of this discussion has

17 indicated that it addresses "requests for exemption

18 to 10 CFR 72.102 F1, and apparently a paragraph has

19 been deleted as part of that discussion. I don't

20 know what it contained, but I would ask that it be

21 produced to the Board for determination whether or

22 not it's relevant.

23 JUDGE FARRAR: So all that was objected

24 to being produced was the missing paragraph? I

25 mean, you got the document in discovery in the

1 ordinary course?

2 MR. TURK: The document was produced in

3 discovery. There were other areas that are

4 redacted. But that's the only one that's of

5 interest to me right now.

6 JUDGE FARRAR: So you want us -- you

7 want them to give that to us so we can make a

8 determination if that was properly withheld?

9 MR. TURK: Yes. Or I'd ask the State

10 simply to produce it to us if they are willing to

11 withdraw the objection to production.

12 MS. CHANCELLOR: This is a 1999

13 document. It's ancient history. We'd be glad to

14 go back and review the document to see why it was

15 redacted, but quite frankly, it was moved on from

16 then and I'm not sure --

17 JUDGE FARRAR: Well, why don't you do

18 that. You can look at it. If you think you can

19 provide the missing paragraph, go ahead and do so.

20 If you think you shouldn't, then we'll -- why don't

21 you --

22 MS. CHANCELLOR: Could we revisit this

23 again if we can't, and I'll explain the reasons why

24 we can't?

25 JUDGE FARRAR: Why you can't?

1 MS. CHANCELLOR: If we can't.

2 JUDGE FARRAR: Right. I'm just trying

3 to figure out when we would do that. I don't want

4 to lose time on June 3rd arguing about this.

5 MR. TURK: Well, we don't need to argue.

6 I would ask counsel first to go back and look at it

7 and see if they still want to assert the privilege.

8 And for history's sake, I believe this occurred

9 before the seismic exemption was admitted as an

10 issue in the proceeding.

11 If you'll recall, it wasn't until Staff

12 reached a determination on September 2000 to

13 approve the seismic exemption request that a

14 contention was then admitted to challenge the

15 seismic exemption. And it's possible that this was

16 deleted because, as the document indicates, it was

17 relevant to the question of the request for

18 exemption. It was not an issue back in 1999. So

19 it's possible that it now has become relevant, and

20 I would ask counsel to look at it again with that

21 understanding and perhaps produce it to me, or if

22 she is not ready to do that, produce it to the

23 Board for a ruling.

24 JUDGE FARRAR: Okay, why don't we

25 proceed on that basis.

1 THE WITNESS: Mr. Turk, could you
2 refresh my memory on the date of that 1999 document
3 you have in front of you?
4 Q. (By Mr. Turk) Yes. This is April 21.
5 You had issued two documents that are in my
6 possession dated April 21. This one is the one
7 titled Issues and Perspectives. The other one was
8 titled Fault Evaluation Site.
9 JUDGE FARRAR: Mr. Turk, who were these
10 documents addressed to?
11 MR. TURK: These were reports by
12 Dr. Pechmann and Dr. Arabasz provided to the Utah
13 Attorney General and to the Department of
14 Environmental Quality.
15 JUDGE FARRAR: Ms. Chancellor, I take it
16 that what we suggested a minute or two ago be done
17 is not difficult to do?
18 MS. CHANCELLOR: I can go back and
19 review the document, your Honor. And if you want
20 to -- for category, and if you want to take the
21 issue up, we'll discuss it then.
22 JUDGE FARRAR: Well, I don't want to
23 take it up; but if you can't agree, Mr. Turk sounds
24 like he'll take it up, so we'll take it up.
25 MS. CHANCELLOR: There must have been a

1 reason for us to deleting the information. We
2 don't consciously --
3 JUDGE FARRAR: No one is suggesting
4 that. In other words, there's a paragraph and we
5 have a point of inquiry is all.
6 MR. TURK: I think it's the history,
7 your Honor. The markings on these documents
8 indicate that the privilege was partially released
9 in November of '99. Now, at that time there was no
10 contention challenging the seismic exemption, and
11 therefore it would not have been relevant,
12 information would not have been relevant since
13 there was no issue about the exemption. I'm not
14 suggesting any unfair or ulterior motive by the
15 State. I'm asking for a revisiting of the ruling.
16 JUDGE FARRAR: That's all we're doing
17 here. It's a neutral inquiry.
18 MS. CHANCELLOR: Your Honor, the reason
19 for my agitation is that we have got next to no
20 documents from the Staff. The one document that
21 Mr. Turk points to where there is one paragraph
22 deleted for relevance sake, it's just a little
23 ironic, I guess.
24 JUDGE FARRAR: Right, but let's just
25 stick with this issue. That's all we're dealing

1 with.

2 MR. TURK: And your Honor, on the same

3 vein, the second document I mentioned also dated

4 April 21 simply contains an area that's redacted as

5 not relevant. And that occurs on page arc No. 4 of

6 the April 21 document entitled "Document review,

7 fault evaluation study and seismic hazard

8 assessment, Geomatrix, February 1999, and other

9 companion reports. And the redaction occurs at

10 page 4 of that document, which is Bates stamped

11 UT-43105.

12 MS. CHANCELLOR: Are you on 43107 and

13 43105?

14 MR. TURK: Yes, please.

15 Q. (By Mr. Turk) One last question, if I

16 may. You have conducted probabilistic seismic

17 hazard analyses in the past?

18 A. Not a simple question, Mr. Turk, because

19 a probabilistic seismic hazard analysis typically

20 is an enormous undertaking involving the seismic

21 source characterization, the ground motion

22 modeling, and then the final hazard calculations.

23 And I have participated in major PSHA exercises but

24 not done a complete PSHA analysis.

25 Q. You're involved currently in work with

1 Yucca Mountain. Does that involve the development
2 of the PSHA, or were you involved in the
3 development of the PSHA?
4 A. I'm not involved currently, but yes, I
5 was extensively involved in the seismic source
6 characterization for both vibratory and fault
7 displacement hazard.
8 Q. And what time period were you involved
9 in that for Yucca Mountain?
10 A. The dates are indicated in my resume.
11 Chiefly in the 1990's, I believe beginning in
12 the -- beginning as early as 1992, as I recall,
13 were the early site suitability evaluation, and
14 then the mid 1990's, prototype studies for fault
15 displacement analyses. And then I think -- some
16 projects go on a long time. I think maybe in 1995
17 to '98 of that order with the most recent PSHA.
18 MR. TURK: Your Honor, it's slightly
19 after five o'clock. I'm prepared to go forward,
20 but I'm at your disposal whether you want to go
21 forward or not.
22 JUDGE FARRAR: Are you finished with the
23 issues that did not appear on the cross-examination
24 plan?
25 MR. TURK: Unfortunately, not by a long

1 shot.

2 JUDGE FARRAR: A long shot meaning --

3 MR. TURK: In quantitative terms, I'm at

4 page 4 of my notes of the earlier

5 cross-examination, and I would have to go up to

6 page 13 where my own cross-examination began. In a

7 quantitative sense, I would estimate still several

8 hours of cross-examination.

9 JUDGE FARRAR: So you're one-third of

10 the way through --

11 MR. TURK: Through my three-hour

12 estimate, having taken several hours to do it.

13 JUDGE FARRAR: We're now one third of

14 the way through the things not on your

15 cross-examination plan?

16 MR. TURK: Approximately. Some of the

17 matters I've raised were on the cross-examination

18 plan. I've been going back and forth. And I think

19 if you'd like, I can produce a refined

20 cross-examination plan, put them all together so

21 you have that and we can follow that more orderly.

22 JUDGE FARRAR: So how much -- you'd said

23 three hours. It's been three hours. But you have

24 how much left? Is a fourth -- you've done one

25 third, so you've got two thirds left so you've got

1 six hours left?

2 MS. CHANCELLOR: Plus the

3 cross-examination plan.

4 JUDGE FARRAR: No, I take it what he's

5 saying is he's one third through.

6 MS. CHANCELLOR: No, one third through

7 his notes.

8 MR. TURK: Yeah, I'm probably a third

9 through the cross-examination also. I have a hard

10 time estimating this one, and it's because the

11 witness has taken so many opportunities to

12 criticize the Staff's work, and I have to address

13 those criticisms. If the state withdraws its

14 criticisms, I'll sit down.

15 JUDGE FARRAR: What happened to the rule

16 that what's at issue here is the Applicant's --

17 this is an exemption, I'm sorry. That's what

18 happened to it.

19 MR. TURK: We made that argument early

20 on in terms of whether the contention should be

21 admitted, and we argued two things. We said number

22 one --

23 JUDGE FARRAR: No, what happened to it

24 is I momentarily forgot that this is an exemption

25 and they would put it in an opinion. This is the

1 one time the Staff's performance is in issue as
2 opposed to the applicant's proposal. So this is
3 the rare instance where what the Staff did is
4 squarely an issue. And that's under attack, then
5 you're entitled to defend it. Mr. Gaukler, looks
6 like you're ready to help us.
7 MR. GAUKLER: I guess I would say that
8 we put forth the basis in Dr. Cornell's testimony
9 that totally supports the exemption fully apart
10 from the basis of Staff report. And I really see
11 there's two baess that support the exemption.
12 JUDGE FARRAR: But this is not -- I
13 mean, I know applicants in the past have said,
14 don't attack the Staff's performance, doesn't
15 matter if the Staff was asleep. If the Applicant's
16 proposal passes muster, it passes muster. But this
17 is the rare situation where that's not true, and so
18 the Staff's actions been challenged it's entitled
19 to be defended.
20 Then if there's that much left to do, I
21 would suggest that you could better use the next
22 half hour by reorganizing or organizing your future
23 cross-examination, and all of us can put the time
24 to good use. And there's no sense proceeding for a
25 half hour out of six hours. That doesn't save

1 anybody anything. Perhaps between now and our next
2 meeting you can -- it's been difficult with the
3 documents being packed away and so forth, so
4 perhaps a fresh start sometime a week of June 3rd
5 would be more effective.
6 MR. TURK: And I don't think I have six
7 hours, your Honor. I'm very hesitant to give you
8 an exact number. But I think it's between two to
9 six.
10 JUDGE FARRAR: Well --
11 MR. TURK: At the mean.
12 JUDGE FARRAR: We had a rough plan as of
13 yesterday. I would encourage, Mr. Turk, when you
14 get back, reorganize yourself, come up with a new
15 estimate, pass it on the to the State and the
16 Applicant and you all can figure out the most
17 efficient way to spend the week of June 3rd to 7th.
18 And we still hold open the possibility of June 8th,
19 but we can't be here and the state capitol seems
20 iffy. If somebody has, you know, a brainstorm,
21 we'd be happy to entertain it.
22 MR. GAUKLER: One possibility might be
23 to check another hotel, see if they have a room for
24 six days. I' be happy to do that in the next week.
25 JUDGE FARRAR: I think we tried that

1 earlier this month to try to find some other space.
2 Off the record.
3 (Discussion off the record.)
4 JUDGE FARRAR: Back on the record. I
5 think we've accomplished what we can this evening.
6 Parties are going to continue to work together on a
7 future schedule which is difficult to construct,
8 and once it's constructed it's important to try to
9 hold it together as best we can and continue to
10 make progress.
11 So we will adjourn at this time. It's
12 5:15 on Friday six weeks after we started. We made
13 good progress, not perhaps quite as much as we
14 hoped, but the issues have been complicated and
15 that is why we've been here. And we'll resume, at
16 least at this point, on Monday, June 3rd in this
17 very room.
18 (Discussion off the record.)
19 MR. GAUKLER: Do you have any objection
20 to admission of Exhibit 102 A, which is a portion
21 of Dr. Arabasz's deposition?
22 MS. CHANCELLOR: That's fine. No
23 objection.
24 JUDGE FARRAR: There being no objection,
25 Exhibit 102 A will be admitted.

1 (APPLICANT'S EXHIBIT-102A WAS ADMITTED.)

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4 (The proceeding was concluded

5 for the day at 5:15 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.