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In The Matter Of:

PRIVATE FUEL STORAGE, L.L.C.

MARVIN RESNIKOFF

October 29, 2001

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NUCLEAR REGULATORY COMMISSION

Docket No. 72-22 Official Ex. No. PFS 240

In the matter of PFS

Staff _____ IDENTIFIED

Applicant RECEIVED _____

Intervenor _____ REJECTED _____

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Contractor _____ DATE 6-25-02

Other _____ Witness Resnikoff

Reporter R. Davis

PRIVATE FUEL STORAGE, L.L.C.

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
THE ATOMIC SAFETY AND LICENSING BOARD
In the Matter of

: Docket No. 72-22
PRIVATE FUEL STORAGE L.L.C. : ASLBP No.
: 87-732-02-ISFSI

(Private Fuel Storage Facility) :
Washington, D.C.
Monday, October 29, 2001

Deposition of
MARVIN RESNIKOFF
a witness, called for examination by counsel
for Applicant pursuant to notice and
agreement of counsel, beginning at
approximately 10:40 a.m. at the law offices
of Shaw Pittman, 2300 N Street, N.W.,
Washington, D.C. 20037, before Marilyn
Feldman of Beta Reporting & Videography
Services, notary public in and for the
District of Columbia, when were present on
behalf of the respective parties:

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[1] PROCEEDINGS

[2] MR. GAUKLER: I just want to say [3] that for this deposition, we will send the [4] copy to Dr. Resnikoff for his review and to [5] correct any errors. [6] Whereupon, [7] MARVIN RESNIKOFF [8] was called as a witness and, having been [9] first duly sworn, was examined and testified [10] as follows:

[11] EXAMINATION BY COUNSEL FOR PFS

[12] BY MR. GAUKLER:

[13] Q: Please state your full name for [14]

the record.

[15] A: Marvin Resnikoff.

[16] Q: Dr. Resnikoff, my name is Paul [17] Gaukler. You have already been deposed [18] before on this proceeding, correct?

[19] A: That's correct.

[20] Q: You know that I'll be asking you a [21] series of questions this morning, and if at [22] any time you don't understand one of my

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[1] questions, you will ask me to clarify the [2] question. Will you do that, please?

[3] A: Yes.

[4] Q: Thank you. Please describe for me [5] generally your familiarity with the PFS [6] project.

[7] A: Well, I have been working on this [8] application since its inception, working on [9] many of the contentions, including work on [10] this earthquake contention.

[11] The work has primarily been on [12] transportation cask vulnerability; aircraft [13] accidents; the recent sabotage contention [14] that was introduced; travel to look at the [15] potential — the proposed site.

[16] Q: When did you do that?

[17] A: That was in the beginning; that [18] was — I don't remember. When did this [19] start? Was it '96?

[20] Q: The license application was filed [21] June 1997, and the state filed its petition [22] to intervene in September of 1997.

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[1] A: Yes. I don't remember when that [2] trip was, when we all went out there.

[3] Q: What was the purpose for your trip [4] out to the site?

[5] A: To look at the site along with [6] others, including the hearing board and, you [7] know, the NRC. I also reviewed a lot of the [8] discovery documents.

[9] Q: So the record is clear, the trip [10] you are referring to the site is the trip [11] that the licensing board went on with the [12] parties. You were on that trip?

[13] A: Yes.

[14] Q: That was approximately [15] January 1998. Does that sound correct?

[16] A: That sounds right.

[17] Q: Are you familiar the state's [18] contention in Utah L concerning the [19] geotechnical issues?

[20] A: I am.

[21] Q: What is the basis of your [22] familiarity with that contention?

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[1] A: My role in Utah L is to — you'll [2] tell me if I'm answering your question [3]

directly — my role in Utah L is to look at [4] the radiological consequences of an [5] earthquake.

[6] Q: When did you become involved with [7] Utah L for that purpose approximately?

[8] A: Well, I looked at the original [9] petition, the entire petition that went into [10] the — the contentions that went in, but I [11] only looked at it briefly at the time.

[12] My participation is much more [13] recent. It's only within the past few [14] months that I have actually looked at [15] earthquake issues. I reviewed all the [16] safety analysis report. I reviewed the [17] Holtec work concerning particularly this [18] focused area of radiological consequences. [19] I reviewed some of the recent commission [20] decisions.

[21] Q: On Utah L?

[22] A: On Utah L.

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[1] MR. GAUKLER: I would like to have [2] marked as Exhibit 1 a licensing board order [3] dated June 15, 2001, entitled "Memorandum [4] and Order Requesting Joint Scheduling Report [5] and Delinquent Contention Utah L."

[6] (Utah L, Part B Exhibit No. 1 [7] was marked for identification.)

[8] BY MR. GAUKLER:

[9] Q: Have you had a chance to review [10] what has been marked as exhibit 1?

[11] A: I have. I have to say I haven't [12] read this before. I read the commission [13] decision, but I didn't read this particular [14] order.

[15] Q: Does this particular order on [16] page 2-3 reflect your understanding of what [17] contention Utah L comprises?

[18] A: On page 2, which did you say?

[19] Q: Page 2-3, beginning with "Utah L [20] geotechnical," you see there are two [21] subparts, a subpart A and a subpart B. [22] Under subpart B, there are six further

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[1] subparts that go over to page 3.

[2] My question to you is, does this [3] comprise what you understand Utah L to be [4] generally?

[5] A: The part that I'm focused on is [6] the part that deals with 72.104(a), dose [7] limits.

[8] The safe shutdown earthquake and [9] other issues like that, that's somebody [10] else. Someone gives us the accelerations, [11] tells us what they are, and that's our [12] starting point. So I'm familiar with B 2.

[13] Q: That refers to the dose limits [14] under 72.104(a)?

[15] A: Right.

[16] Q: For example, you wouldn't be [17] testifying to the first paragraph in B, [18] where it talks about whether PFS should be [19] required to use a probability methodology [20] with a 10,000-year return period?

[21] A: My part of it is to do the part [22] that deals with 72.104(a), and as it

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[1] pertains to that part in that paragraph 1, [2] B 1, that's my role.

[3] Q: B 2, you mean?

[4] A: No, B 1, where it says "and any [5] failure of an SSC that exceeds the [6] radiological requirements of 10 [7] CFR 72.104(a) must be designed for SSC [8] Category 2."

[9] What it has to be designed for, we [10] are not focused on that; just the part that [11] deals with the radiological consequences, [12] that section of that phrase.

[13] Someone has to come to the [14] conclusions of what the consequences are of [15] our analysis.

[16] Q: Whether they should be assigned to [17] a 10,000-year basis or a 2,000-year basis, [18] would that be somebody else's determination?

[19] A: Right.

[20] Q: What were you asked to do [21] specifically with respect to Utah I, Part B?

[22] A: We were asked to do two things.

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[1] One is to look at the radiological [2] consequences, and the second is to look at [3] whether the certificate of compliance and [4] the NRC analysis has asked all these issues. [5] So we are looking at it to see whether there [6] are any unreviewed safety questions.

[7] Q: When you talk about the [8] certificate of compliance, what are you [9] referring to specifically?

[10] A: The HI-STORM certificate of [11] compliance.

[12] Q: Issued by the NRC to the [13] HI-STORM 100 storage cask?

[14] A: Yes.

[15] Q: Who asked you to undertake these [16] tasks?

[17] A: You mean who specifically in the [18] state office?

[19] Q: Yes.

[20] A: Denise Chancellor.

[21] Q: With whom have you discussed these [22] analyses or your work other than your

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[1] counsel?

[2] A: Other than with counsel, let's [3] see: I was in one teleconference with the [4] other state experts. And also Matt Lamb, [5] who you have met previously in my office, [6] and I have worked on these matters together.

[7] Q: When you say with other state [8] experts, who were those experts?

[9] A: Steve Bartlett, Farhang Ostadan, [10] and — I can't remember his first name, [11] maybe it's Walter, Arabasz. I can't [12] remember the first name.

[13] Q: What was the purpose of your [14] conversation with Dr. Bartlett, Dr. Ostadan, [15] and Dr. Arabasz?

[16] A: Essentially, it's coordination so [17] everybody knew what everybody else was [18] working on. That was the purpose of the [19] teleconference. It lasted about 45 minutes.

[20] Q: When did this take place, [21] approximately?

[22] A: Last week, Thursday or Friday.

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[1] Q: Thursday or Friday last week?

[2] A: Yes. It couldn't have been [3] Thursday. Wednesday or Friday.

[4] Q: What conclusions did you reach [5] with respect to the coordination of the [6] effort?

[7] A: Well, for our role, nothing [8] different from what I just mentioned to you, [9] that we are working on the radiological [10] consequences. The earthquake people wanted [11] to know what we had come up with.

[12] Q: What did you tell them?

[13] A: I knew we were going to get into [14] that. Has the state given you any of our [15] work? I mean, it's recent work, within the [16] past three weeks. But we just sent a copy [17] of this to Connie Nakahara Wednesday or [18] Friday, one of these two days again, I think [19] Friday. Has she passed that on to you? I [20] have copies of that in case she hasn't.

[21] (Utah I, Part B Exhibit No. 2 [22] was marked for identification.)

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[1] THE WITNESS: What we talked about [2] are the conclusions in this spreadsheet.

[3] BY MR. GAUKLER:

[4] Q: Would you identify for me what has [5] been marked as Exhibit 2?

[6] A: This is a spreadsheet, [7] calculations on potential for concrete [8] cracking.

[9] Q: So you discussed this calculation [10] with Dr. Bartlett, Dr. Ostadan, and [11] Dr. Arabasz?

[12] A: Yes, that's right. I wouldn't say [13] the exact details, but just whether con-

crete [14] could crack under an earthquake, yes or no, [15] not the specific details of it.

[16] Q: What did you tell them with [17] respect to whether concrete could crack [18] under an earthquake?

[19] A: Well, in our judgment, it could, [20] under the most recent earthquake [21] accelerations that were given to us.

[22] Q: What is the significance of the

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[1] concrete cracking, as far as you are [2] concerned?

[3] A: As far as we are concerned, it [4] would increase the direct gamma doses; the [5] concrete cracking would increase the direct [6] gamma doses at the boundary fence post.

[7] Maybe I should wait for you to ask [8] a question, but I should say that we, [9] together with others, are now in the process [10] of determining the exact amount.

[11] Q: The exact addition to the gamma [12] dose at the boundary?

[13] A: Yes, that's right.

[14] Q: You and others. Who are the [15] others?

[16] A: My understanding is the state has [17] hired some people — and I don't have their [18] names — the state has hired some others to [19] investigate the issue of how much cracking.

[20] Q: When you talk about gamma [21] radiation, what is gamma radiation, basic [22] physics?

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[1] A: Well, there are certain [2] radionuclides in the canister that release [3] high-energy photoelectric emissions similar [4] to light but of much higher energy, such as [5] cesium 137, cobalt 60, and the concrete and [6] steel generally shield this material and [7] pull the doses to less than 25 millirems a [8] year of the fence post. By the shielding [9] now present, this material can be released [10] and the exposures would be higher.

[11] Q: You are talking about this [12] radiation that would come from the canister [13] that could go through the cask?

[14] A: That's right.

[15] Q: You are not talking about the [16] release of radioactive materials itself as [17] such?

[18] A: We have not looked into that yet [19] as to whether if a canister toppled and the [20] concrete was not cylindrical but ovate, [21] whether that would also affect the canister [22] itself. We have only looked into the issue

PRIVATE FUEL STORAGE, L.L.C.

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[1] so far of cracking of concrete.
 [2] Q: You say "so far." Do you intend [3] to do analysis of that sort or not?
 [4] A: Yes.
 [5] Q: When do you plan to undertake [6] those analyses?
 [7] A: We are working on it right now.
 [8] MR. GAUKLER: For the record, I [9] would like to reserve my option of taking [10] the deposition on these new analyses when [11] they are completed.
 [12] MS. CURRAN: Um-hmm.
 [13] BY MR. GAUKLER:

[14] Q: You say you had this conversation [15] with Dr. Bartlett, Dr. Ostadan, and [16] Dr. Arabasz of approximately 45 minutes. [17] Did you describe to them how you computed [18] the cracking in the concrete?
 [19] A: No. Actually, we didn't talk [20] about that.
 [21] Q: What did they express? Did they [22] express agreement with you that the concrete

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[1] would crack?
 [2] A: They didn't have a view. We [3] didn't talk about it. No, they didn't have [4] a view on that.
 [5] Q: Did they express a view with [6] respect to the consequences of the concrete [7] cracking or not cracking?
 [8] A: Did they express a view?
 [9] Q: Yes.
 [10] A: Not that I recall.
 [11] Q: Do you recall what they said in [12] general?
 [13] A: Not really. A lot of the [14] discussion was about magnitude of [15] earthquakes. You know, this is an area that [16] is really up to them, and frankly, I wasn't [17] very familiar with it. We started from [18] accelerations, you know, we go from what [19] numbers are in the reports for accelerations [20] and then proceed from there.
 [21] We have looked at, you know, other [22] Holtec reports such as tip-over analysis,

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[1] and they did express a view about that, as [2] to whether a canister would tip over. They [3] thought yes, that would happen.
 [4] Q: At what point would it happen; did [5] they express that?
 [6] A: I don't recall that. Our analysis [7] doesn't depend on tip-over.
 [8] Q: Your analysis in Exhibit 2 does [9] not assume tip-over, it just assumes a cask

[10] is standing up?
 [11] A: That's right.
 [12] Q: Have you done any analysis as to [13] what would happen if a cask would tip over?
 [14] A: We are looking into that right [15] now. That's exactly the issue that I [16] mentioned previously. We are looking as to [17] whether the concrete would ovate — is that [18] a verb?
 [19] Q: By "ovate," what do you mean?
 [20] A: It would go from round to —
 [21] Q: Elliptical?
 [22] A: To oval.

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[1] Q: Oval, okay.
 [2] A: Whether it would impact the [3] canister itself, whether any radioactive [4] material could be released. We are looking [5] into that issue right now, and that involves [6] tip-over.
 [7] Q: What are you assuming for this [8] calculation of tip-over?
 [9] A: We haven't done this analysis yet.
 [10] Q: What accelerations are you going [11] to use for the tip-over analysis?
 [12] A: We are going to look at the ones [13] that are in the last three columns.
 [14] Q: The last three columns, referring [15] to Exhibit 2?
 [16] A: Yes.
 [17] Q: Could you describe for me the [18] accelerations in the last three columns in [19] Exhibit 2? I take it you are referring to [20] the bottom part of the page, where we have [21] headings on the top of "1,000-year return [22] period," "2,000-year return period," "DSHA

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[1] peak seismic event — I take it "DSHA" [2] means deterministic seismic hazard analysis?
 [3] A: Yes.
 [4] Q: Then we have DSHA ground motion [5] hazard, according to PFS SER. Then we have [6] HI-STORM SAR with revision 9, then PFS SAR [7] revision 21 DSHA. Then we have PFS SAR with [8] a 2,000-year return period, and we have 84th [9] percentile peak accelerations for East [10] Fault. That's what you are referring to [11] down there?
 [12] A: Exactly.
 [13] Q: You are going to be using the —
 [14] A: Latter three.
 [15] Q: Latter three that I just talked [16] about?
 [17] A: Yes.
 [18] Q: Who has provided to you these [19] accelerations?

[20] A: Well, the sources, we have gotten [21] these from the SAR in some of the recent [22] submissions.

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[1] Q: Did you get them or did one of the [2] other experts get them and supply them to [3] you?
 [4] A: No, the documents were provided by [5] the Utah AG's office.
 [6] Q: Then you reviewed them and pulled [7] out these numbers for these particular [8] accelerations?
 [9] A: Yes.
 [10] Q: I'm curious with respect to the [11] last one, 84th percentile peak [12] accelerations, East Fault, what document did [13] that come from? There's not one identified [14] there; that's why I am asking.
 [15] A: I don't recall. I may have it [16] with me. You know, during the break, I can [17] just see whether I do or not, or I could [18] make a call to the office.
 [19] Q: Okay.
 [20] A: But I don't recall off the top of [21] my head where that number came from, which [22] document.

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[1] Q: But it came from a document as [2] opposed to another expert?
 [3] A: Yes, that's right.
 [4] Q: Would you please tell me what [5] documents you had a role in preparing with [6] respect to Utah L?
 [7] A: We have looked at SAR, the most [8] recent revisions. Is that what you are [9] asking?
 [10] Q: I am asking what documents did you [11] have a role in preparing.
 [12] A: Oh, what role in preparing.
 [13] Q: Yes. Obviously, I take it, you [14] prepared Exhibit 2.
 [15] A: We also participated in the [16] response to PFS interrogatories.
 [17] Q: I think you nodded, but you need [18] to answer the question. You did prepare [19] Exhibit 2?
 [20] A: Yes. Is that what you asked?
 [21] Q: Yes.
 [22] A: I thought you asked what documents

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[1] in addition.
 [2] Q: I asked you that, and then I was [3] going to ask you what documents in addition [4] as well.
 [5] A: I must be a mind-reader here.
 [6] Q: So you prepared Exhibit 2 and you [7] also assisted in preparing the state's [8] responses to PFS's interrogatories?

[9] A: Yes.

[10] Q: Any other documents you had a role [11] in preparing?

[12] A: No, I don't believe so, to the [13] best of my recollection.

[14] Q: What documents have you reviewed [15] with respect to the Utah L issues that you [16] have worked on?

[17] A: We have reviewed a lot of Holtec [18] documents. I'm not sure I can name them [19] all. I can provide you a list, if that [20] would be helpful to you.

[21] Q: You reviewed the Holtec safety [22] analysis report?

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[1] A: Yes, as it pertains to cask [2] crack- ing.

[3] Q: Have you reviewed any other parts [4] of the Holtec safety analysis report on [5] other issues?

[6] A: Well, in that section involving [7] cask cracking, which I believe was [8] section 3.4, there were a couple appen- dices, [9] appendix A and B, that were referred to; we [10] reviewed those. There have been a lot of [11] calculational packages that Holtec has [12] prepared for PFS, and we reviewed those.

[13] Q: What topics did those calculation [14] packages involve?

[15] A: Multi-cask response is one that I [16] remember. I can't remember the names of all [17] of them. We read these just for the purpose [18] of focusing on the subject matter that we [19] are looking at.

[20] Q: Which is radiological doses?

[21] A: Yes, and whether there were any [22] unreviewed safety questions.

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[1] Q: Were you reviewing safety [2] ques- tions regarding Utah L or just [3] gener- ally?

[4] A: Generally as it concerned cask [5] cracking.

[6] Q: Did you identify any?

[7] A: Yes, it appeared to us that safety [8] analysis report, the Holtec safety analysis [9] report has not been updated to take into [10] account — and the PFS safety analysis [11] report has not been updated to take into [12] account these higher accelerations, these [13] greater accele- rations. It has been updated [14] for other issues but not for cracking, not [15] for cask cracking.

[16] That still refers to the lesser [17] accelerations that really have been re- viewed [18] by the NFS — excuse me, by NRC in their [19] safety evaluation re- ports; some of the [20] numbers that appear in the first two columns [21] where under those accelerations, the

cask [22] would not crack.

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[1] Q: Did you identify any other [2] uni- identified safety issues or unresolved [3] safety issues other than concrete crack- ing [4] that you claim is unresolved?

[5] A: Yes, there was one other and that [6] pertains to cask heatup, assuming the casks [7] toppled. We did look at that issue. The [8] safety analysis report has a bounding case [9] which assumes a cask is entirely covered or [10] the inlets are all blocked, but it doesn't [11] have — and in that case, the concrete would [12] heat up after a certain period of time, 33 [13] hours. It doesn't consider the case of [14] casks lying on the ground in a horizontal [15] position for a long period of time.

[16] So that was another issue, and [17] that also involves concrete cracking or [18] degrading. So that was the second issue [19] that we considered unresolved.

[20] Q: That was with regard to concrete [21] cracking then?

[22] A: Yes.

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[1] Q: Have you done any further analysis [2] on that issue as it relates to concrete [3] cracking?

[4] A: We haven't. Our purpose was just [5] to look at what the safety analysis reports [6] had to say about this. If all the casks [7] fell over and they all had to be righted, in [8] our opinion, it would probably take longer [9] than 33 hours, and so we considered that an [10] un- reviewed safety question.

[11] Q: You didn't mention that in your [12] response, the state's responses to the PFS [13] interrogatories, did you?

[14] A: I don't recall.

[15] MR. GAUKLER: Let me introduce as [16] Exhibit 3 the State of Utah's Ob- ject- ions and [17] Response to Applicant's Seventh Set of [18] Formal Discovery Requests to Intervenor [19] State of Utah, dated September 28, 2001.

[20] (Utah L, Part B Exhibit No. 3 [21] was marked for identification.)

[22] BY MR. GAUKLER:

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[1] Q: Do you recognize what has been [2] marked as Exhibit 3?

[3] A: I do.

[4] Q: What part, if any, of Exhibit 3 [5] were you responsible for preparing?

[6] A: Well, that's exactly what I was [7] reading. Counsel underlined a sentence in [8] there that said 4(c), but that was exactly [9] what I was reading.

[10] Q: Okay.

[11] A: I beat her to the punch.

[12] Q: So you were responsible for [13] preparing the response 4(c)?

[14] A: Yes, and it does refer indirectly [15] to what I just said.

[16] Q: It does?

[17] A: Yes.

[18] Q: Where does it refer to that?

[19] A: It says, "Holtec's conclusion that [20] the dose rate at the PFS site or the [21] boundary will be small and localized does [22] not hold for more than one cask tip-over."

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[1] If there were a field of casks [2] that tipped over, it would take, in our [3] opinion, longer than 33 hours to right them. [4] If the concrete degraded, then the exposure [5] rate would increase at the fence post. So [6] it's encompassed by that.

[7] Q: You don't refer to the 33 hours to [8] upright the cask in here, do you?

[9] A: No, it doesn't say that.

[10] Q: Was there any other part of the [11] interrogatories that you had a role in or [12] responsibility in preparing the re- sponse?

[13] A: I have to take a minute to look it [14] over.

[15] Q: Okay.

[16] A: Not specifically, no. I mean, [17] counsel may have used our response in 4(c) [18] in other parts, but 4(c) is what I really [19] remember working on.

[20] Q: Did you consult with any other [21] experts in preparing your response to 4(c)?

[22] A: No.

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[1] Q: What did you do to prepare for [2] today's deposition?

[3] A: I reviewed our calculations. I [4] reviewed the commissioner's decision. I [5] think that's it.

[6] Q: Did you talk to anyone else [7] besides your counsel in preparing for [8] today's deposition?

[9] A: No.

[10] MR. GAUKLER: I would like to [11] introduce what I believe is your resume. [12] This will be Exhibit 4.

[13] (Utah L, Part B Exhibit No. 4 [14] was marked for identification.)

[15] THE WITNESS: Counsel, can I add [16] to my last response?

[17] BY MR. GAUKLER:

[18] Q: Certainly.

[19] A: I did review the — I think it [20] says, "Holtec SAR for the HISTORM," those [21] sections that I talked about earlier.

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[22] Q: Very good, thank you. Do you

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[1] recognize what has been marked as Exhibit 4?

[2] A: I do.

[3] Q: Is that an accurate summary of [4] your educational and professional background [5] and expertise?

[6] A: Well, it's not recent. I thought [7] that was going to be the first question, and [8] that's why I wrote this third of a page on [9] the train, thinking about what I had done in [10] the last year.

[11] Q: Would you please tell me in what [12] respect it's not recent and doesn't include [13] your recent experience?

[14] A: I'm happy to turn this over to you [15] except I don't think you can read it.

[16] Q: Just tell us.

[17] A: Okay. These are the activities I [18] have worked on in the past year or so. I [19] have worked on license termination plan at [20] Connecticut Yankee. I have worked on [21] groundwater contamination at the Department [22] of Energy facilities.

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[1] We are preparing a book for a [2] coalition of public interest groups who work [3] specifically on the Portsmouth gaseous [4] diffusion plant, and INEEL — that's [5] I-N-E-E-L, all in caps — high-level waste [6] tanks, looking at their integrity.

[7] We worked for the State of Nevada, [8] and this involved cask response to a [9] potential accident and the consequences. We [10] worked on the Baltimore Tunnel fire in [11] looking at what would be the consequences if [12] a cask from Calvert Cliffs went through the [13] Baltimore tunnel.

[14] We worked on a transportation [15] accident analysis for the State of Nevada, [16] looked at emergency response and potential [17] health consequences, and that involved [18] looking at cask response to an accident. We [19] have done similar work for some counties in [20] Nevada, White Pine County, Churchill County, [21] and Clark County.

[22] For the State of Utah, in addition

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[1] to this proceeding, we worked for the [2] governor's office on the timing and capacity [3] of a proposed Yucca Mountain repository. We [4] have worked on aircraft accidents for the [5] attorney general's office.

[6] I guess, as I pointed out earlier, [7] we have worked on Utah RR, the proposed [8] contention. We worked for public interest [9] groups in Massachusetts, a group called Crew [10] on Cleanup of the NMI Starmer uranium basin [11] under a

TAG grant from the EPA.

[12] Finally, we have done work in [13] Texas on personal injury cases involving [14] uranium mining and milling. I should say we [15] have also worked on personal injury cases in [16] Louisiana for oil pipe cleaners. That's [17] what I could think of on the train coming [18] down. I have worked on all of those.

[19] Q: Your current position is what?

[20] A: I'm the senior associate at [21] Radioactive Waste Management Associates. It [22] involves five of us in the office. There

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[1] are two environmental engineers — one of [2] them you have met, Matt Lamb, and another [3] one, Bayat Hintermann — Rachel Hawkins, who [4] is a chemical engineer, and an office [5] manager and myself.

[6] Q: Your academic training as set [7] forth in your resume is in physics; is that [8] correct?

[9] A: That's correct.

[10] Q: Did you consult with any other [11] experts in the work you did concerning Yucca [12] Mountain, its timing and capacity?

[13] A: Oh, we probably talked to Bob [14] Halstead, who works for the State of Nevada, [15] on those issues. He's the transportation [16] adviser to the State of Nevada. We probably [17] talked to him about these issues.

[18] MR. GAUKLER: I would like to [19] introduce two other things related to your [20] background. I would like to introduce [21] Exhibit 5, which is entitled "Publications [22] of Marvin Resnikoff, Ph.D., 1985/1998," and

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[1] as Exhibit 6, "Marvin Resnikoff, Ph.D. Court [2] Proceedings."

[3] (Utah L, Part B Exhibit Nos. 5 [4] and 6 were marked for [5] identification.)

[6] BY MR. GAUKLER:

[7] Q: Is Exhibit 5 an accurate list of [8] your publications from 1985 through 1998?

[9] A: It doesn't include the most recent [10] ones. It would have to be updated.

[11] Q: Are there any recent publications [12] that you believe are relevant to the issues [13] that you are working on with respect to Utah [14] L, Part B, since 1998?

[15] A: I think the ones that are most [16] relevant relate to cask response to an [17] accident; those are the most relevant. And [18] there have been more recent ones than appear [19] here. So I could update this list for you.

[20] Q: I would like to have it updated [21]

then, particularly in terms of those that [22] you believe are relevant.

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[1] A: I'll put an asterisk next to it. [2] Similarly, the court proceedings, Exhibit 6, [3] there are more recent ones.

[4] Q: Any recent ones that are relevant [5] to what you are doing on Utah L, Part B?

[6] A: No, not really.

[7] Q: Would you mind giving me an update [8] on that in any event?

[9] A: Sure.

[10] Q: Going back to Exhibit 5, are there [11] any particular publications that you believe [12] are relevant to the work you are doing on [13] Utah L, Part B?

[14] A: The publications that are most [15] relevant relate to cask response. There are [16] probably some that are earlier than [17] January '85, since I worked on cask response [18] since 1975. So there are probably some [19] documents that are relevant earlier than [20] this. But you want to know on this list are [21] there some that are particularly relevant?

[22] Q: That's my question, yes.

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[1] MS. CURRAN: It makes sense to [2] give Marvin a little time.

[3] BY MR. GAUKLER:

[4] Q: Want to look at that over lunch [5] and get back to me on that?

[6] A: Okay.

[7] Q: When you talk about cask response, [8] what do you mean by "cask response"?

[9] A: The issues that we worked on [10] involve transportation casks, and the other [11] issues that we worked on that pertain to [12] this subject involve some of the issues in [13] this proceeding, and also some other [14] proceedings that we worked on involving [15] heatup of casks.

[16] Q: What other proceedings are you [17] referring to?

[18] A: I have to refer to Exhibit 4. [19] Point Beach, Prairie Island, and Palisade [20] reactors are some of the other proceedings [21] we have worked on. Some involved hearings [22] before state commissions. The Palisades

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[1] reactor involved a federal court proceeding.

[2] Q: What work did you do with respect [3] to Point Beach?

[4] A: This is to the best of my [5] recollection, okay?

[6] Q: Okay.

[7] A: It was the issue of alternatives. [8] These were hearings before — Point

Beach [9] and Prairie Island were hearings before [10] various state commissions. One, I believe [11] was the Public Utility Commission in the [12] State of Wisconsin, Point Beach reactor, and [13] it involved the cost of one reactor versus [14] another reactor — excuse me, the cost of [15] one storage cask versus the cost of another.

[16] These hearings took place sometime [17] ago so I don't really recall well the exact, [18] you know, the exact discussions that took [19] place. It might have involved sabotage.

[20] Q: Which one might have?

[21] A: The Point Beach reactor might [22] have. I think there was a discussion of

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[1] that.

[2] Q: What did Prairie Island involve, [3] as far as you recall?

[4] A: I don't really remember. We were [5] working on behalf of the Sioux tribe. I do [6] remember that.

[7] Q: What did Palisades involve?

[8] A: That involved the issue of whether [9] an environmental impact statement should be [10] prepared for the Nuclear Regulatory [11] Commission.

[12] Q: What technical issues were [13] involved in that context?

[14] A: Sorry?

[15] Q: What technical or regulatory [16] issues were involved in that context?

[17] A: The potential environmental impact [18] is my best recollection of what we worked on [19] there.

[20] Q: Do you recall what you identified [21] as potential environmental impacts there?

[22] A: I have to say I don't.

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[1] Q: I take it from your previous [2] responses, the work that you have done that [3] you believe is most relevant to the issues [4] you are going to be covering with respect to [5] Utah L, Part B, is work involving the [6] response of casks, as you have mentioned [7] that?

[8] A: Dose consequences, yes, [9] radiological consequences.

[10] Q: When you say response of casks, [11] are you referring to it in any other way [12] than meaning radiological dose consequences?

[13] A: Just to make it perfectly clear, [14] we first estimated whether cracking could [15] occur, for one issue. If cracking did not [16] occur, and therefore — that was our issue, [17] whether cracking occurred or not, and then [18] if cracking occurred, then our next step was [19] to determine the size of the crack and what

[20] the radiation exposure would be at the [21] boundary.

[22] Those last two steps, we haven't

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[1] yet done and we are not going to do all of [2] that part of it. The actual size of the [3] crack, there will be other consultants that [4] are going to be looking into that.

[5] Then the other issue is heatup, [6] potential heatup of the cask in a horizontal [7] position and the potential degradation of [8] concrete, which also involves the issue that [9] we are working on, radiological [10] consequences. As I said, we are just [11] looking into that now.

[12] Q: What background or work have you [13] done that's relevant to evaluating the [14] cracking of concrete?

[15] A: This is a straight physics [16] engineering issue. We are looking into [17] stresses on the steel shell and on the [18] concrete due to an earthquake.

[19] We have essentially in this case [20] taken the calculations that have previously [21] been done by PFS and Holtec and are updating [22] them to put in the new numbers. So this is

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[1] not different than other issues that I have [2] taken courses on at college, like statics.

[3] Q: Since college, what work have you [4] done involving cracking or potential [5] cracking of concrete?

[6] A: This is the first time we have [7] worked on the potential cracking of [8] concrete. Excuse me, maybe I should say the [9] second time.

[10] We looked also into — for the [11] aircraft contention K, we looked into the [12] issue of an MK84, inert bomb or — not an [13] inert bomb — canister striking the [14] concrete, and we looked into that issue of [15] whether the MK84 would penetrate the [16] concrete. So we previously looked into that [17] issue.

[18] Q: That was also in the context of —

[19] A: Those are the two times. Right [20] now, looking into cracking, and this [21] previous analysis that we did.

[22] Q: The previous analysis was also

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[1] part of this PFS licensing proceeding, [2] correct?

[3] A: Yes, that's right.

[4] Q: What work have you done previously [5] with respect to thermal degradation of [6] concrete from heat?

[7] A: Previous to this PFS proceeding, [8] or looking at Utah H, heating up of [9] concrete?

[10] Q: Let's go first to the PFS [11] pro-

ceeding.

[12] A: Coursework on thermodynamics in [13] college, computer work, understanding [14] computer programs that were used — Fluent. [15] That's the previous work.

[16] Q: So there would be nothing since [17] college up to the PFS proceeding; is that [18] correct the way I interpret your answer?

[19] A: No.

[20] Q: In what way am I interpreting [21] incorrectly?

[22] A: No. I have worked on heatup of

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[1] casks for a long time, heatup of [2] transportation casks. So I have looked into [3] heatup of casks.

[4] Q: What about transportation casks, [5] they don't involve concrete, do they?

[6] A: No, they don't involve concrete.

[7] MS. CURRAN: Paul, it's been about [8] two hours —

[9] MR. GAUKLER: Hour and 15 minutes.

[10] MS. CURRAN: Can we take a break [11] sometime soon?

[12] MR. GAUKLER: Sure. Why don't we [13] take a break and have another short session [14] before lunch. That sounds reasonable to me.

[15] (Recess)

[16] BY MR. GAUKLER:

[17] Q: Have you ever done an original [18] calculation of the strength of steel or [19] concrete when subjected to stresses, [20] external stresses?

[21] A: Original calculation? So far, our [22] calculations have been to use the procedures

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[1] that were in the PFS SAR and update the [2] numbers, so our work is in Exhibit 2.

[3] Q: I take it from your answer that [4] you have never done in the past any original [5] calculations or design calculations that [6] concern the strength of steel and concrete [7] when subjected to external stresses?

[8] A: No, I wouldn't say that. We have [9] looked into the issue of the penetration of [10] steel and concrete, and as I mentioned to [11] you before, I did that as far back as 1975, [12] looking into the consequences of an air [13] crash with a plutonium container as part of [14] a lawsuit for the State of New York attorney [15] general. So we have looked into that issue.

[16] Q: Have you ever done any design [17] calculations involving the strength of steel [18] and concrete as part of the

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design of a [19] structure or component?

[20] A: No.

[21] Q: Have you ever done any evaluation [22] of the thermal degradation of concrete as

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[1] part of the original design of a structure [2] or component?

[3] A: Design work, no.

[4] Q: Have you ever done any calculation [5] of the thermal degradation of concrete other [6] than what you have done in this case here?

[7] A: Other than what we have done in [8] this proceeding?

[9] Q: Yes.

[10] A: No.

[11] Q: Looking at Exhibit 6, this is your [12] list of court proceedings. What area of [13] expertise were you qualified for in these [14] proceedings generally?

[15] A: For these court cases, generally, [16] they have involved dose calculations.

[17] Q: Have you ever been qualified as an [18] expert in any other area other than what you [19] have described as dose calculations?

[20] A: What do you mean?

[21] Q: Have you ever been certified to [22] testify and have you testified in an area

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[1] other than radiological dose consequences?

[2] A: I have testified before an NRC [3] hearing panel in 1980 concerning heat-up of [4] the spent fuel pool at the Zion reactor.

[5] Q: Can you recall any other [6] proceeding?

[7] A: We have testified in numerous [8] cases involving proposed low-level waste [9] facilities, and that involved risk [10] assessments, is what I would say.

[11] Q: Risk assessments involving [12] radiological doses or release of radiation?

[13] A: Yes, yes, movement of groundwater, [14] potential dose to the public.

[15] MS. CURRAN: We just need a [16] moment.

[17] (Discussion off the record)

[18] BY MR. GAUKLER:

[19] Q: Do you want to add anything to [20] your previous answers?

[21] A: As you say, I have been taken to [22] the woodshed. That's what you said in the

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[1] previous —

[2] Q: Yes, I recall that.

[3] A: I think when I described I [4] calculate radiation exposures, you know, [5] radiation doses, I don't think it gives a [6] full explanation for what's entailed.

[7] For instance, we calculated — I [8] calculated radiation exposures in the case [9] of a plutonium cask that could be penetrated [10] in this work done for the State of New York [11] in 1975. Well, that involved penetration of [12] a cask, how much gets out, and what the dose [13] consequences are. In other words, there [14] were a whole bunch of steps. To say it was [15] just dose consequences doesn't really give a [16] full explanation of what was happening.

[17] All of these cases involve — all [18] of these are just court proceedings that are [19] on this page. They are not administrative [20] proceedings; they are just court [21] proceedings, and almost all the court [22] proceedings are of personal injury cases.

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[1] Q: Let me ask the question [2] differently then. Have you ever testified [3] as an expert in any court proceeding or [4] administrative proceeding involving the [5] stresses and strains on concrete and the [6] cracking of concrete?

[7] A: No, but —

[8] Q: The answer is no?

[9] A: "No, but" is the answer.

[10] Q: What do you mean by the "but" in [11] that answer?

[12] A: I'm glad you asked me that. Some [13] of these are just elementary engineering and [14] physics calculations that we did to involve [15] the extent of concrete cracking.

[16] Q: When you say "some of these," you [17] are referring to Exhibit 2?

[18] A: Yes.

[19] Q: My question wasn't that. My [20] question was, have you ever testified [21] concerning the cracking of concrete in any [22] court or administrative proceeding? That

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[1] was my question.

[2] A: I think a fair answer is no.

[3] Q: Have you ever testified in [4] previous court or administrative proceedings [5] concerning the thermal degradation of [6] concrete?

[7] A: Other than the PFS proceeding [8] where we drafted testimony, the answer is [9] no.

[10] Q: You understand that you have been [11] identified by the State of Utah as a witness [12] with respect to Utah L, Part B?

[13] A: Yes.

[14] Q: What do you expect to be the [15] general topic of your testimony?

[16] A: Gee, I thought we covered this. I [17] thought this has been asked and answered.

[18] Q: Is it fair to say radiological [19] dose calculations?

[20] A: Yes. But to take it from the top, [21] we are calculating whether the concrete will [22] crack —

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[1] Q: Okay.

[2] A: Under earthquake accelerations and [3] under tip-over. We are also calculating [4] flattening of the concrete. Finally, for [5] tip-over, we are looking into the thermal [6] aspects of — thermal degradation of [7] concrete. Then we are looking into the [8] radiological consequences of that.

[9] Where we have gotten so far is we [10] have estimated whether concrete will crack, [11] and the next steps are to look into the size [12] of the crack and dose consequences.

[13] We have looked into — more [14] precisely, we have reviewed the safety [15] analysis report to see whether the bounds [16] are exceeded in estimates of casks lying [17] horizontal; that is, at a 33-hour time [18] period, and to see whether the cask will [19] heat up if laid horizontally, and how much [20] time would be required for that heatup to [21] take place so that the concrete parameters [22] will be exceeded.

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[1] I think that's a full range of [2] what we are doing.

[3] Oh, I also mentioned that in [4] addition to calculating the dose [5] consequences, we are answering this [6] corollary question of whether these are [7] unreviewed safety questions.

[8] MR. GAUKLER: I think I am at a [9] point where it makes sense to break for [10] lunch.

[11] (Whereupon, at 12:15 p.m., a [12] luncheon recess was taken.)

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[1] AFTERNOONSESSION

[2] (1:35 p.m.) [3] Whereupon, [4] MARVIN RESNIKOFF [5] was recalled as a witness and, having been [6] previously sworn, was examined and testified [7] further as follows:

[8] THE WITNESS: Should I get to the [9] homework assignment?

[10] EXAMINATION BY COUNSEL FOR PFS

[11] CONTINUED

[12] BY MR. GAUKLER:

[13] Q: Yes. Why don't you report on that [14] first.
[15] A: 84th percentile acceleration that [16] we mentioned in the spreadsheet appears here [17] in this paper produced by Stone & Webster, [18] titled "Update of Deterministic Ground [19] Motion Assessments, Revision 1," April 2001, [20] prepared by Geomatrix Consultants.
[21] Q: Okay.
[22] A: It's on page 3.

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[1] Q: That's the 84th percentile for the [2] deterministic seismic hazard analysis?
[3] A: Yes.
[4] Q: Very good.
[5] A: Then I haven't updated this [6] publication list during lunchtime, but we'll [7] send it to you.
[8] Q: Okay.
[9] A: But I did put a mark next to [10] issues that relate to casks, storage and [11] transportation casks. I put a mark next to [12] each of those.
[13] Q: That's on the original there?
[14] A: It's actually on the copy.
[15] Q: Okay.
[16] A: Should I transfer it all over —
[17] Q: Could you put it on the original?
[18] A: Sure.
[19] Q: You can do it at a break.
[20] A: Sure.
[21] MS. CURRAN: Would you like me to [22] do it now?

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[1] MR. GAUKLER: Whichever is most [2] efficient.
[3] THE WITNESS: I did want to [4] mention though that the two Nevada papers [5] which I mentioned that are going to be [6] released, they are sitting in the governor's [7] office and Senator Reed's office right now. [8] Similarly, the Utah report that we did on [9] Yucca Mountain repository capacities is also [10] soon to be released, which should be any day [11] now.
[12] BY MR. GAUKLER:
[13] Q: Those papers also deserve [14] asterisks, in your opinion?
[15] A: Okay.
[16] Q: Is that correct?
[17] A: I will. They are not on the list.
[18] Q: I understand.
[19] MS. CURRAN: He didn't understand [20] the question.
[21] BY MR. GAUKLER:
[22] Q: Those three papers, you also would

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[1] identify with an asterisk on the list, [2] correct?
[3] A: Yes.
[4] MS. CURRAN: They are relevant to [5] the contention?
[6] THE WITNESS: Yes. [7] I take it back. The Utah one is [8] not. The Nevada papers are, and I'll [9] asterisk them.
[10] BY MR. GAUKLER:
[11] Q: Excuse me. Utah papers are not — [12] can you say that again?
[13] A: The Nevada papers are relevant, [14] and the Utah one which talks about the [15] capacity of repositories is not relevant to [16] this particular issue.
[17] Q: I understand. Anything else to [18] report on that you have left over from the [19] morning?
[20] A: No.
[21] Q: Those two papers from Nevada are [22] soon to be released for what purposes?

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[1] A: One deals with the Baltimore [2] Tunnel fire and the temperatures in the [3] tunnel and the amount that could be released [4] from a container, and the possible — the [5] potential doses.
[6] Q: The second paper?
[7] A: The second paper is a much longer [8] paper, 140 pages or so, relating to [9] potential transportation accidents in the [10] State of Nevada, in Las Vegas, and emergency [11] response. We have talked to emergency [12] responders in Las Vegas, decontamination. [13] But it also deals with the amount of [14] material which could be released in an [15] accident.
[16] There was one point I wanted to [17] correct that I said this morning, and that [18] relates to the size crack in a cask due to [19] an earthquake. We are going to be deciding [20] that in consultation with other experts. I [21] said this morning that others are going to [22] be deciding that, and I just wanted to

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[1] clarify that.
[2] Q: Very good. Do you know which [3] other experts you are going to consult with [4] on that?
[5] A: We are going to talk with the [6] three that I mentioned earlier as a start, [7] and I don't know where that will leave us.
[8] Q: The three you mentioned earlier [9] are Bartlett, Ostadan, and Arabasz?
[10] A: Right.
[11] Q: At the end, before we broke, you [12] summarized for us I believe the areas

you [13] are going to be covering in your testimony, [14] and just to make sure the record is clear, I [15] want to summarize them and make sure I have [16] them correctly.
[17] The first one is you are going to [18] look at whether the concrete of the cask [19] will crack standing upright, when the cask [20] is upright?
[21] A: That's right.
[22] Q: Second, you are going to examine

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[1] whether the concrete will crack if the cask [2] tips over?
[3] A: Right.
[4] Q: Third, you are going to [5] investigate deformation of the concrete if [6] the cask tips over and whether that might [7] somehow cause a breach of the canister?
[8] A: Right. And also flattening; I am [9] also looking at flattening.
[10] Q: When you say "flattening," what do [11] you mean?
[12] A: Flattening of a concrete cask as [13] it hits the pad in a tip-over accident.
[14] Q: Then the fourth thing is [15] thermodegradation of the concrete if the [16] cask remains on its side for an extended [17] period of time?
[18] A: Right. If I could mention one [19] other thing which I neglected to mention —
[20] Q: Okay.
[21] A: I think by the end of the day, [22] we'll have it all. We did also look into

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[1] what is the gamma ray dose rate for an [2] unshielded canister as preliminary to [3] calculating what it would be for a cracked [4] overpack.
[5] Q: Have you done that calculation [6] already, the gamma ray dose estimate for an [7] unshielded canister?
[8] A: Yes, but it's not written up. We [9] did that Friday. It's not written up yet.
[10] MR. GAUKLER: I would ask for a [11] copy of that when it's written up.
[12] MS. CURRAN: (Nodding)
[13] BY MR. GAUKLER:
[14] Q: I take it that all these scenarios [15] concern the storage cask as it is installed [16] on the pads; is that correct?
[17] A: Yes.
[18] Q: There are several scenarios. The [19] second, third, and fourth scenarios that we [20] talked about involve tip-over of the cask. [21] Am I correct, if tip-over didn't occur, [22] those three scenarios would not be relevant,

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[1] assuming tip-over did not occur?

[2] A: That's right.

[3] Q: I would like to have you look at [4] Exhibit 3, which is the State of Utah's [5] objections and responses to the requests. I [6] want to focus on the part of the responses [7] for which you were responsible, which is [8] interrogatory response 4(c), and it's on [9] page 13. Do you have that?

[10] A: Yes.

[11] Q: Is this response intended to [12] encompass the five things that you mentioned [13] before?

[14] A: I think more could be said such as [15] we have said today, you know. This is [16] somewhat abbreviated.

[17] Q: Let's walk through the response [18] and talk about the various sentences and how [19] you would expand them today, if at all.

[20] In the first sentence you say, [21] "the analysis performed by Holtec in the [22] HI-STORM TSAR does not bound cask tip-over

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[1] caused as a result of an earthquake at the [2] PFS facility."

[3] What analysis specifically are you [4] referring to there?

[5] A: Well, I think it's discussed in [6] the next quote.

[7] Q: So it's the cask tip-over analysis [8] that Holtec did?

[9] A: Right. The tip-over accident [10] could cause — that's what that first [11] sentence is referring to.

[12] Q: In what sense does it not bound [13] the cask tip-over caused as a result of an [14] earthquake at the PFS facility?

[15] A: Well, there were no such [16] calculations that were done. The analysis [17] that was done simply says it would cause [18] localized damage without going into how the [19] dose rate would change. The analysis [20] doesn't talk about cracking and the analysis [21] doesn't say anything about heatup.

[22] Q: Let me introduce what you are

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[1] looking at. I would like to have this [2] marked as Exhibit 7, please.

[3] (Utah L, Part B Exhibit No. 7 [4] was marked for identification.)

[5] BY MR. GAUKLER:

[6] Q: Do you recognize what has been [7] marked as Exhibit 7?

[8] A: Yes, I recognize it.

[9] Q: What is it?

[10] A: Final Safety Analysis Report for [11] the HI-STORM 100 Cask System.

[12] Q: On page 11.2-6, it discusses [13] tip-over analysis?

[14] A: Yes.

[15] Q: Is that what you are referring to [16] in your response to 4(c)?

[17] A: Yes.

[18] Q: You say that Holtec didn't do an [19] analysis of the radiation?

[20] A: Yes.

[21] Q: Isn't it true that Holtec did [22] conclude that — I refer you to

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[1] page 11.2-8 — "there should be no [2] noticeable increase in the ISFSI site or [3] boundary dose rate because the affected [4] areas will be small and localized?"

[5] Did Holtec conclude that?

[6] A: They did.

[7] Q: Do you disagree with that?

[8] A: The answer is we probably will [9] disagree with that. We haven't done those [10] calculations yet.

[11] Q: When you say "those" calculations, [12] you are referring to what?

[13] A: I am talking about, under these [14] new earthquake accelerations, what the [15] deceleration will be when the cask — the [16] top end of the cask hits the pad, and [17] therefore how much will be the thinning, the [18] flattening out of that area. We haven't [19] done that calculation yet.

[20] Q: How are you going to go about [21] doing that calculation?

[22] A: This calculation depends on the

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[1] fact that the cask just tips over with a [2] beginning zero angular velocity.

[3] Q: When you say "this" calculation —

[4] A: The calculation that was done.

[5] Q: That Holtec did?

[6] A: That comes to this conclusion, the [7] supporting documents for this.

[8] Q: The Holtec calculation?

[9] A: Yes. It assumes that cask starts [10] at zero velocity, angular velocity, and then [11] comes to the conclusion that the top of the [12] cask hits the deceleration of 45 G, and [13] therefore, the fuel assemblies are not [14] damaged.

[15] Under a greater horizontal and [16] vertical acceleration, we haven't determined [17] what the initial velocity is going to be [18] when the cask goes over, and therefore, [19] whether the damage will be greater than [20] Holtec has calculated. And we are in the [21] process of doing that calculation. That's [22] what we intend to do.

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[1] Q: What accelerations will you be [2]

using in your calculation?

[3] A: The ones that are in this [4] spreadsheet, Exhibit 2.

[5] Q: There are several accelerations in [6] this spreadsheet. Are you going to use any [7] particular one?

[8] A: Oh, we are definitely going to — [9] one of the most important ones is the third [10] column from the right.

[11] Q: Third column from the right, which [12] is —

[13] A: PFS SAR, revision 21, DSHA.

[14] Q: Why is that particularly relevant?

[15] A: Because it's important for us to [16] determine whether that dose would lead to [17] greater than 25 millirem per year at the [18] boundary.

[19] Q: That's PFS SAR rev 21 DSHA shows [20] .67 G for the horizontal acceleration and [21] .69 G for the vertical acceleration?

[22] A: Right.

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[1] Q: Why have you picked that one out [2] of all of them?

[3] A: We are going to do all of them, [4] but that one is important to determine if [5] the dose rate at the boundary will be [6] greater than 25 millirems a year.

[7] We are focused on that number for [8] all of the accidents — for all of the [9] conditions that we have discussed, because [10] if it exceeds 25 millirems a year in an [11] uncontrolled area, then other calculations [12] kick in; namely, one has to go to [13] a 10,000-a-year return period, in my [14] understanding from talking to counsel, of [15] the commissioner's decision.

[16] Q: The 25 millirem limit you are [17] talking about, what limit does that refer [18] to?

[19] A: A yearly limit.

[20] Q: Does that reflect normal [21] operations, do you know?

[22] A: I have to say this is moving into

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[1] an area which is — we are doing the [2] calculations and others are going to do the [3] interpretations of them. But it's the dose [4] at the fence post, the yearly dose at the [5] fence post.

[6] Q: Do you know what the limits are at [7] the fence post for accident conditions, the [8] regulatory limits?

[9] A: I think you need another witness [10] for this one.

[11] Q: If you don't know, that's fine.

[12] A: I know for certain accidents, that [13] EPA's protective action guide is 5 rem over [14] the duration, not just the year. It gets [15] into an interpretation which I'm

really not [16] competent to talk about right here.

[17] Q: In your opinion, is that third [18] column from the right the appropriate one to [19] do this analysis, as opposed to some other [20] column?

[21] A: My understanding is that this is [22] the 1,000 year earthquake accelerations.

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[1] Q: The .67 and .69 G?

[2] A: Yes.

[3] Q: Going back to what you were [4] talking about before, you are going to [5] calculate the angular velocity at which the [6] cask tips over?

[7] A: Yes, and we are also going to look [8] into the potential cracking if it tips over.

[9] Q: How do you plan on calculating the [10] angular velocity if the cask tips over?

[11] A: I haven't worked out the details [12] yet.

[13] Q: Have you ever calculated that [14] before?

[15] A: I probably have, yes, sometime ago [16] in statics.

[17] Q: Do you recall when?

[18] A: Well, we are probably going to [19] look into the time history of earthquakes, [20] you know, the amount of time that a force is [21] applied, certain accelerated force, to see [22] what potential angular velocity is. That's

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[1] my initial off-the-top-of-my-head feeling as [2] to how I would do it.

[3] Q: How are you going to calculate the [4] cracking of the concrete, the extent of the [5] cracking of the concrete?

[6] A: I don't know the answer to that [7] off the top of my head, as we sit here.

[8] Q: Have you done that before?

[9] A: That calculation, I haven't done [10] before, no.

[11] Q: Once you have that information, [12] what is the next step in your calculation?

[13] A: The next step, in consultation [14] with some of the state engineers, is to [15] determine the size of the crack and then to [16] do a Monte Carlo calculation to determine [17] what the dose is at the boundary. That's [18] the procedures that we would use.

[19] Q: When you do this, are you [20] following established procedures from some [21] document that you could reference me to?

[22] A: The document that I looked at — I

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[1] have looked through quite a few NRC [2] documents to see whether there's any [3] guidance on this, and the only one that I [4] could find so far — and this isn't a [5] complete, exhaustive search yet — is the [6] True study, Transportation of Radionuclides [7] in Urban Environments, that was done [8] in 1980.

[9] In that one, they looked at [10] material released, but they also have a [11] scenario where the cask is cracked, a [12] transportation cask is cracked, and then [13] they do a calculation as to what the dose [14] would be. Under various accidents, they [15] have various size cracks. That's the one [16] that I saw that was most relevant.

[17] Q: Do you know what the relationship [18] is between the size of the crack and the [19] amount of radiation released through the [20] crack?

[21] A: Off the top of my head? The [22] larger the crack, the more released. I

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[1] don't have a view off the top of my head as [2] to how much that would be. The effective [3] shielding would be removed or reduced.

[4] Q: How does the Monte Carlo method [5] come in to play?

[6] A: The Monte Carlo method would trace [7] rays, gamma rays coming out of the canister [8] in the various ways they could go through [9] the canister.

[10] I know the court transcriber can't [11] catch my fingers, but I'm trying to show [12] that the rays that go directly through the [13] crack will not be attenuated compared to [14] those that go at an angle through the crack. [15] If the crack is larger, more rays can go [16] through directly, and also, more rays will [17] be less attenuated, and one has to sum over [18] all these rays. That's what the Monte Carlo [19] calculation will do.

[20] Q: Is there a document you can direct [21] me to where a Monte Carlo has been used in a [22] similar type of application?

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[1] A: We would go back to the True [2] report to see what they used, and of course, [3] that was done in 1980. I'm sure there is [4] something more recent that we could use. [5] That's the general procedure that we would [6] follow. I am sure you will want it as soon [7] as we have it done.

[8] Q: This assumes no damage to the [9] canister, I take it?

[10] A: It assumes no damage to the [11] canister, right. That was another scenario [12] that you hadn't discussed yet.

[13] Q: Have you used the Monte Carlo [14] technique in this manner before?

[15] A: We haven't. I have just read of [16] them, but I haven't actually used it.

[17] Q: Anything else involved in the [18] scenario involving concrete cracking if the [19] cask tips over; any step in the process we [20] haven't discussed or that we have missed [21] that you plan on doing?

[22] A: Anything else involved?

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[1] Q: Yes.

[2] A: Well, the orientation of the cask [3] or casks and the number of casks are [4] important as well. The shielding of one [5] cask to another is also important. We would [6] have to take all that into account.

[7] Q: How do you plan on taking that [8] into account?

[9] A: I am not sure I have the answer to [10] that right off the top of my head, but the [11] dose right now is right at the limit. If [12] you assume a person stays there for 365 days [13] a year all the time, the dose is right now [14] at the 25 millirem per year limit, and [15] that's why any of these other analyses are [16] important if they increase the dose.

[17] Q: Have you reviewed those [18] calculations that have been done in the PFS [19] SAR for the fence limit?

[20] A: Yes.

[21] Q: What limit did those come up with?

[22] A: My best recollection is they

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[1] estimate a dose 5.82 millirems a year [2] for 2,000 hours a year.

[3] Q: Do you disagree with that [4] analysis?

[5] A: Yes, because if a person is there [6] all the time — this is an uncontrolled [7] area.

[8] Q: What is your basis for assuming a [9] person will be there all the time?

[10] A: It's an uncontrolled area, and [11] therefore, a person could be there all the [12] time.

[13] Q: Do you have any factual basis to [14] know that person is going to be there all [15] the time?

[16] A: It's my understanding that an [17] uncontrolled area is an area that is not [18] controlled by the applicant, so therefore, [19] it's available to be there all the time.

[20] Do I know of a specific person or [21] generic person who would be there all the [22] time? I don't.

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[1] Q: Do you know how the regulation is [2] to be interpreted and applied in terms of [3] people being at the fence? Is that [4] something you are familiar with or not?

[5] A: My understanding is — I don't [6] know specifically how. I definitely would, [7] you know, review the regulation.

[8] Q: Are you aware that the state had [9] at one point in time filed a contention [10] challenging the radiation dose calculation [11] at the fence?

[12] A: Yes. I probably had a hand in [13] writing it up.

[14] Q: Let's show it to you. On second [15] thought, I don't want to mark this as an [16] exhibit. Let's just look at this. The [17] reason I don't want to mark it is there is [18] proprietary information in this that I don't [19] want made a part of the record.

[20] A: I should hand this back to you?

[21] Q: No, you can look at it.

[22] A: What am I looking at if it's

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[1] private?

[2] Q: Do you recognize this document?

[3] A: No.

[4] Q: For the record, this is a document [5] entitled "State of Utah's Request for [6] Consideration of Late-Filed Contentions EE [7] and FF," dated December 23, 1997.

[8] Turn to page 13, FF, "inadequate [9] analysis of radiation shielding." Is that [10] the contention you recall the state having [11] filed concerning the dose at the boundary?

[12] A: I don't remember this. Was this [13] filed in some of the beginning contentions [14] that were filed?

[15] Q: It was filed in December of 1997, [16] as indicated. The first contentions were [17] filed just before Thanksgiving 1997. This [18] was filed roughly a month after that.

[19] A: I am lost as to the relevance of [20] this document with what we are talking [21] about.

[22] Q: Just tell me if you have seen this

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[1] document or reviewed this document.

[2] A: I probably have, but I don't [3] remember it. But this is not talking about [4] direct gamma dose from casks with a crack in [5] it.

[6] Q: All I'm asking is if you have seen [7] it or had a hand in preparing it.

[8] A: I just don't recall.

[9] Q: That's all I need to know.

[10] MS. CURRAN: That's it?

[11] MR. GAUKLER: Yes.

[12] MS. CURRAN: Can I keep my copy?

[13] MR. GAUKLER: Yes, subject to the [14] requirements. I just don't want to make it [15] a part of the record.

[16] BY MR. GAUKLER:

[17] Q: Let's go on to the next scenario, [18] unless you have something to add. I think [19] we have gone through the calculation of the [20] dose with the Monte Carlo method, et cetera.

[21] A: You want me to phrase the [22] questions and ask them?

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[1] Q: Do you have anything else to add [2] in that scenario, talking about concrete [3] cracking when the cask tips over; again, [4] what we have discussed?

[5] A: No, that's what we would do as our [6] general procedure.

[7] Q: Let's go to the next scenario. We [8] were talking about the cask tipping over and [9] the concrete deforming or flattening. How [10] do you go about calculating deformation or [11] flattening of the concrete; have you decided [12] that?

[13] A: I'm not certain how that would go. [14] We know what the acceleration is as the cask [15] hits the pad, and then the next relates to [16] the stresses. I don't off the top of my [17] head know how this calculation would go.

[18] Q: Are you assuming that the concrete [19] is going to crack in this instance in this [20] type of analysis?

[21] A: There are two scenarios that we [22] would look at. One is cracking. But then

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[1] you asked me about flattening —

[2] Q: Right.

[3] A: And I answered I didn't know how [4] that would go.

[5] Q: I guess my question is, in this [6] scenario, which is one of the scenarios you [7] are going to talk about, deforming and [8] flattening, are you assuming in this [9] scenario as well that there is cracking of [10] the concrete in addition to deformation and [11] flattening which might affect the canister?

[12] A: Yes, both may happen, and I don't [13] know what the answer is as we sit here.

[14] Q: Have you ever done a calculation [15] for deformation or flattening of the [16] concrete cask?

[17] A: No.

[18] Q: How are you going to figure out a [19] way to calculate the effect of the [20] flattening or deformation of the concrete [21] cask on the canister?

[22] A: As we sit here, I don't know how

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[1] that calculation would proceed. We would be [2] in consultation with the engineers. The [3] state has to discuss how that would go.

[4] Q: Are these the three experts we [5] talked about before or somebody else?

[6] A: We would first go to those.

[7] Q: Have you ever done a calculation [8] on the effect of a steel canister in this [9] type of scenario?

[10] A: No. I should say that that [11] calculation hasn't been done either by [12] Holtec. Other than this qualitative [13] statement that appears in the final safety [14] analysis report, that calculation is not at [15] Holtec either. It just says "flattening."

[16] It's sort of a qualitative [17] argument, and the dose argument is also [18] qualitative, no effect. You are asking me [19] quite detailed questions about something [20] which Holtec just has qualitative answers [21] to. But we intend to do it quantitatively. [22] It also hasn't been done by the NRC and it

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[1] isn't discussed in their SER.

[2] Q: Are you aware that in Holtec's [3] tip-over analysis that they did, they [4] concluded that the GEs overseen by the [5] canister would be within the design basis of [6] the canister?

[7] A: The fuel assemblies, the cask [8] deceleration would not be greater than 45 G, [9] and therefore, the fuel assemblies would not [10] degrade. That's right; that's what was [11] stated. But we are not talking about [12] material getting out of the canister, we are [13] talking about just the reduction of the [14] shielding.

[15] Q: Around the canister?

[16] A: Right. Then we are going to look [17] into this other scenario, which is whether [18] the canister would deform when the cask hit [19] the ground; if a cask tipped over, whether [20] the deformation of the concrete would [21] actually affect the canister itself.

[22] There have been calculations by

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[1] Holtec for that scenario in which they [2] conclude that deformation would not be [3] excessive and it would be elastic, and they [4] would actually be able to retrieve the [5] canister from the concrete overpack. And we [6] are going to redo those calculations with [7] these higher accelerations. So we'll look [8] at the Holtec analysis for that calculation.

[9] Q: That calculation, that last [10] response, being the effect of the [11]

deformation on the canister?

[12] A: Right.

[13] Q: On that one, do you just intend to [14] repeat the Holtec previous calculation with [15] different inputs?

[16] A: Say that again.

[17] Q: On that one, do you just intend to [18] repeat the Holtec calculation with different [19] inputs, or what?

[20] A: Yes, but we may go to Marks [21] Engineering Handbook to see whether that [22] calculation has been done right. Marks

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[1] Engineering Handbook has a lot of these [2] geometries.

[3] Q: Have you looked at that [4] previously?

[5] A: Yes.

[6] Q: In the context of this case?

[7] A: Yes.

[8] Q: Going back to the exhibit which [9] has interrogatory response 7(c), Exhibit 3, [10] page 13-14, you say in the response, "in the [11] event of an earthquake, more than one cask [12] would be expected to tip over."

[13] What is the basis for that [14] statement?

[15] A: We are not the ones who are going [16] to do that. We are going to depend on one [17] of those three engineers to assist us in [18] that analysis of cask tip-over.

[19] Q: Bartlett, Ostadan, or Arabasz?

[20] A: Right. We are going to be [21] discussing it with them.

[22] Q: Who is going to determine, first

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[1] of all, whether a cask will tip over under a [2] particular acceleration? Will you be [3] determining that?

[4] A: We are going to be doing some of [5] the calculations and the engineers are going [6] to be doing some of the calculations, the [7] state engineers. And I'm expecting they are [8] going to do more on this subject than we [9] are.

[10] Q: So it's fair to say you are not [11] going to make a determination whether a cask [12] is going to tip over under a particular [13] earthquake acceleration?

[14] A: That's fair to say, but it's going [15] to be a collaboration.

[16] Q: Who is going to make the [17] determination whether more than one cask [18] will tip over?

[19] A: I think it's the same answer; it's [20] going to be a collaboration.

[21] Q: How would you determine whether [22] more than one cask will tip over?

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[1] A: We are going to have to depend on [2] the seismic people for this kind of [3] determination.

[4] Q: To do your calculation of doses in [5] the situation of tip-over, don't you need to [6] know how many casks will tip over?

[7] A: Yes — yes and no, excuse me. Our [8] results are not just depending on casks [9] tipping over to be cracked.

[10] Q: Excuse me?

[11] A: Our calculation for doses doesn't [12] just depend on casks tipping over to be [13] cracked.

[14] Q: I understand that.

[15] A: A cask could be cracked, you know, [16] in one of these other scenarios. I didn't [17] know whether you are using a legal mechanism [18] to box me in here.

[19] Q: No. I was just asking, in the [20] scenarios where you have tip-over, which are [21] the tipping over and cask cracking or the [22] deformation of the cask and potential effect

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[1] on the canister, if you would need to know [2] how many tip over in those scenarios —

[3] A: Yes.

[4] Q: To calculate the dose. [5] On page 14 of the response, you [6] say that "cask tip-over at the PFS facility [7] could result in thinning of the metal skin [8] and the concrete in the storage casks, which [9] would cause increase of gamma radiation."

[10] Which scenario does that refer to?

[11] A: I don't think this is too [12] precisely worded, okay? We didn't mean [13] thinning of the metal skin, we meant [14] thinning of the concrete. The metal skin [15] sits around the concrete, so if there were [16] deformation, the metal would deform, but we [17] didn't mean it would be thin.

[18] Q: How should it read?

[19] A: The dose reduction is due to [20] concrete primarily; the gamma dose reduction [21] is due to concrete primarily, not due to the [22] metal skin on the outside.

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[1] Q: How should this sentence read, in [2] your opinion, today, to capture the thought [3] you are trying to convey?

[4] A: Well, I would leave out "of the [5] metal skin and." "Could result in thinning [6] of the concrete in the storage cask."

[7] Q: Does this sentence have any [8] relationship or application with respect to [9] deformation as we have talked about it?

[10] A: Yes, that's what I am talking [11] about.

[12] Q: So thinning and deformation would [13] be the same thing, in your opinion?

[14] A: Yes.

[15] Q: Then you say "absent an [16] earthquake, the yearly dose rate at the [17] fence post could be as high as 25 millirem [18] per year." That goes back to our discussion [19] that you are assuming an individual [20] spends 365 days a year at the site?

[21] A: That's right.

[22] Q: Otherwise, you are doing the

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[1] calculation the same as done by PFS in the [2] SAR, do you know?

[3] A: Would I assume? I didn't [4] understand the question.

[5] Q: Other than the amount of time that [6] the individual spends at the fence, will you [7] do the calculation the same as done by PFS [8] in the SAR?

[9] A: We have looked over those [10] calculations and they seem to be right.

[11] Q: Let's go to the next scenario you [12] mentioned, which is thermodegradation of the [13] concrete if it's on the horizontal position [14] for an extended period of time. How do you [15] plan to go about doing the calculation for [16] this scenario?

[17] A: As we sit here, I am not exactly [18] certain how we are going to do this. This [19] calculation was not done by Holtec and was [20] not done by the NRC in their SER.

[21] What Holtec did was take a [22] bounding case of soil that was mounded over

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[1] the cask. Essentially, it's called a [2] diabatic heatup situation; just looking at [3] all the heat and the heat is not lost and [4] looking at the temperature rise over time.

[5] In other words, they bounded the [6] case, and that's where they came to the [7] conclusion it would take 33 hours before it [8] got to a temperature where concrete would [9] degrade.

[10] To do more exact calculation, [11] where earth is not mounded over, where one [12] does not take a bounding case but a more [13] realistic case — off the top of my head, I [14] don't have an answer right now as we sit [15] here.

[16] It's a thermodynamic calculation [17] where one part is insulated, the bottom [18] part, where there's no — cooling would [19] ordinarily occur for a standing cask.

[20] I don't know the answer to that as [21]

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we sit here today. One has to develop a [22] thermodynamic model, you know, using one of

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[11] the more sophisticated programs like Fluent [2] or ANSYS.

[3] Q: Have you used those programs to [4] develop a model in the past?

[5] A: We haven't, but I have talked to [6] some people who might be able to do them for [7] us, but we haven't done those yet.

[8] Q: What people have you talked to?

[9] A: I talked to a fellow named [10] Dr. Tony Hirt, who is in Santa Fe, New [11] Mexico; happens to be an officemate of mine [12] in graduate school.

[13] Q: Where is he now?

[14] A: I think, as I said, in Santa Fe. [15] I don't have his card with me right now. [16] But he has run these models, and that's why [17] I have talked to him about it.

[18] Q: So you need to calculate the [19] temperature of the concrete over time?

[20] A: Yes.

[21] Q: Assuming you did that, how would [22] you calculate any reduction in shielding?

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[1] A: What?

[2] Q: How would you calculate any [3] reduction in shielding, assuming you would [4] calculate the temperature over time of the [5] concrete?

[6] A: I'm not certain how we would do [7] that right off the top of my head. If we [8] reached a temperature where the concrete [9] would degrade, I'm not sure how I would [10] calculate that either as we sit here.

[11] That's one question that has to be [12] answered. The other is whether this is a [13] question that has actually been reviewed or [14] whether this is an unreviewed safety [15] question. That's another issue we are [16] addressing, which I mentioned earlier.

[17] The certificate of compliance, in [18] other words, has in it a 33-hour time [19] period; that number appears in the [20] certificate of compliance. So that's the [21] number that — so our concern is can the [22] casks be righted, can the situation be

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[1] restored in less than a 33-hour time period.

[2] Q: What does the length of time the [3] cask is on its side depend on, do you know?

[4] A: What does it depend on?

[5] Q: Yes.

[6] A: It depends on how rapidly the [7] company can actually stand them all up. [8] It's like pick-up sticks. You can't get to [9] the center one until you do the ones on the [10] outside, and you have to make an aisle so [11] that you can get to them all. So the issue [12] is whether one can stand up as many as 4,000 [13] casks within 33 hours.

[14] Q: Does it depend on how many will [15] fall over, too?

[16] A: Yes.

[17] MR. GAUKLER: Do you want a break, [18] Dr. Resnikoff?

[19] THE WITNESS: If this is a good [20] stopping point.

[21] (Recess)

[22] BY MR. GAUKLER:

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[1] Q: After lunch, you also said you [2] were going to do a calculation of a canister [3] with no shielding; is that correct?

[4] A: Yes.

[5] Q: I take it that would just be one [6] canister with no cask around it?

[7] A: Yes.

[8] Q: What is the purpose for that [9] calculation?

[10] A: I thought it would be useful as a [11] start for the Monte Carlo calculation. I [12] could be wrong.

[13] Q: So that calculation doesn't have [14] any independent purpose of its own other [15] than to support the other calculations?

[16] A: Right. I don't believe it does.

[17] Q: Let's go back to the Exhibit 2, [18] which is the calculation for cracking of [19] concrete with the casks standing up. Now to [20] date, that's the only calculation you have [21] done so far?

[22] A: Yes, other than this other one

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[1] that is previous, the one you just [2] mentioned.

[3] Q: The canister with the shielding, [4] which is not independent by itself, but [5] supports the other calculations?

[6] A: Yes.

[7] Q: In this calculation, would you go [8] through and kind of tell me what you have [9] done here in this calculation, Exhibit 2?

[10] A: Yes. We went through all the [11] steps that were done in the HI-STORM SAR.

[12] MR. GAUKLER: I would like to have [13] marked as Exhibit 8 part of the final safety [14] analysis report of the HI-

STORM.

[15] (Utah L, Part B Exhibit No. 8 [16] was marked for identification.)

[17] MS. CURRAN: Now you are talking [18] about volume 1?

[19] MR. GAUKLER: Yes, part of [20] volume 1. This is an excerpt of volume 1, [21] pages 3.4-62 and 3.4-63.

[22] MS. CURRAN: Just to clarify, this

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[1] is revision zero?

[2] MR. GAUKLER: Of the FSAR, as [3] opposed to the safety analysis report that [4] was filed as part of the acceptance of the [5] issuance of the CFC.

[6] MS. CURRAN: Okay.

[7] THE WITNESS: Could I just take a [8] moment?

[9] MR. GAUKLER: Certainly.

[10] (Discussion off the record)

[11] THE WITNESS: Okay, I'm with you. [12] I hadn't seen the final safety ANSYS report. [13] I saw revision 8 of the HI-STORM TSAR.

[14] BY MR. GAUKLER:

[15] Q: The final safety analysis report, [16] as I understand it, was issued after the CFC [17] report, just for the record. I'm not [18] completely sure; I believe that's the way it [19] works.

[20] It's my understanding this is an [21] up-to-date one for the HI-STORM, and that [22] there should be no difference between this

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[1] particular section we are looking at now in [2] the FSAR and the previous —

[3] A: No, it looks the same.

[4] Q: It looks the same as the section [5] you had?

[6] MS. CURRAN: Of the TSAR.

[7] MR. GAUKLER: Yes.

[8] THE WITNESS: Yes, it looks the [9] same.

[10] BY MR. GAUKLER:

[11] Q: So the steps you are trying to [12] follow were the steps shown on pages 3.4-62 [13] and 3.4-63, under the heading "potential for [14] concrete cracking"; is that correct?

[15] A: Yes. We calculated the numerator [16] on page 3.4-62. The number that appears [17] there is 1,321, and we calculated that for [18] the different accelerations, calculated the [19] tensile stress.

[20] Q: This is the tensile stress for [21] what that you were calculating?

[22] A: You notice the first column that

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[1] we have, which is the thousand-year return [2] period, and when you look down, you see [3] flexural stress psi 1326. That's more or [4] less 1321, that appears on page 3.4-62. All [5] our other calculations with different [6] accelerations calculated different flexural [7] stress.

[8] Q: The stress or strain that you were [9] calculating is the stress and strain on [10] what?

[11] A: In steel shell. Then we compared [12] that to the allowable concrete strain — we [13] compared the strain on the steel shell, [14] which is what is done in TSAR, to see [15] whether the concrete would crack or not.

[16] Q: Do you know whether the analysis [17] takes credit for the resistance of the [18] concrete to cracking?

[19] A: The analysis —

[20] Q: Does the analysis take credit for [21] the resistance of the concrete to cracking, [22] do you know?

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[1] A: Well, it has the concrete strain.

[2] Q: In what respect does it have the [3] concrete strain?

[4] A: The allowable concrete strain is [5] listed there.

[6] Q: You are referring to page 3.4-63 [7] in the document I gave you, that's 65.8E-06?

[8] A: That's right.

[9] Q: That's entitled the "allowable [10] concrete strain," correct?

[11] A: Yes.

[12] Q: That's the strain at which [13] concrete would be allowed to crack?

[14] A: Yes.

[15] Q: Would you take into account the [16] resistance of the concrete to cracking in [17] the calculation of the stresses or strains [18] seen by the concrete?

[19] A: I don't see that here in this [20] calculation.

[21] Q: The calculation only calculates [22] the strain from the steel shell, right,

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[1] based on the steel shell?

[2] A: Yes, that's right.

[3] Q: It doesn't include the concrete, [4] correct?

[5] A: It has the concrete strain, and [6] that's how they conclude there is [7] considerable margin against tensile [8] cracking. We did the same calculation, and [9] it appeared to us there wasn't this margin. [10] In fact, they seem to have gone over that [11] limit.

[12] Q: Using the steel used in [13] calculating, you can assume there was no [14] concrete in the steel and you still get

the [15] same result in the first step of your [16] calculation, correct?

[17] A: I'll go back and take a look at [18] this point you have raised. I mean, it's my [19] understanding the calculations were done [20] correctly, but I want to think about this [21] issue that you raised about the resistance [22] of the concrete.

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[1] Q: Isn't it true this calculation [2] assumes essentially a hollow steel tube and [3] is very conservative in that sense?

[4] A: It assumes, yes, a steel tube, [5] that's right, but one issue I need to look [6] at is whether it's just the steel tube or [7] whether it's actually a weighted steel tube. [8] But this is an issue I need to go back and [9] take a look at.

[10] Q: Okay.

[11] A: If our calculations change, we'll [12] change this spreadsheet and send you a copy.

[13] MR. GAUKLER: We'll take a break [14] so I can review what I have and see if I [15] have further questions.

[16] (Recess)

[17] BY MR. GAUKLER:

[18] Q: A couple of questions on this [19] calculation on Exhibit 2, the one you have [20] done about the cracking. Did you do any [21] calculation, assuming that property [22] represented the cracking, of the effect such

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[1] cracking would have on the radiation doses [2] at the boundary?

[3] A: Not yet is the answer; we haven't [4] done that yet. We are going to.

[5] Q: What type of impact would you [6] expect it to have on the boundary, the doses [7] at the boundary? Would it double it, more [8] than double it, less than double it? Do you [9] have an opinion or not?

[10] A: I don't think I have an opinion [11] right now at this point. You are asking me [12] questions that haven't even been done by [13] Holtec.

[14] Q: I am asking if you have an [15] opinion; that's all.

[16] You had referred to at one point [17] that you thought the calculations PFS had [18] done at the boundary were appropriate except [19] for your difference of opinion on how long a [20] person should be assumed at the boundary.

[21] A: Yes.

[22] Q: I want to show you the calculation

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[1] and ask you if this is the calculation you [2] remember looking at. I would like

to have [3] this marked as the next exhibit, please.

[4] (Utah L, Part B Exhibit No. 9 [5] was marked for identification.)

[6] BY MR. GAUKLER:

[7] Q: These are some excerpts from the [8] Private Fuel Storage Facility Safety [9] Analysis Report, section 7.3.3.5, "Dose [10] Rates at Distances from the PFS Array of [11] Storage Casks." Is this the calculation you [12] had in mind?

[13] A: Yes. I mean, it says 5.85, I [14] say 5.82; but otherwise, yes.

[15] Q: The 5.85, that's based on 4,000 [16] GWd/MTU burnup and 10-year cooled PWR spent [17] fuel?

[18] A: That's correct; all 4,000 casks [19] have that burnup.

[20] Q: Do you agree, if you assume a more [21] realistic burnup fuel rate, they calculate a [22] lower dose rate of approximately 2.10

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[1] or 2,000 hours?

[2] A: If you had cooler fuel, lesser [3] burnup, you would have a smaller dose.

[4] MR. GAUKLER: I have no further [5] questions.

[6] EXAMINATION BY COUNSEL FOR NRC

[7] BY MR. O'NEILL:

[8] Q: Just a couple of quick points on [9] unreviewed safety questions. I want a [10] little clarification about exactly what you [11] meant by "unreviewed safety questions," and [12] specifically what basis or standard you [13] would use in determining what constitutes [14] unreviewed safety question.

[15] A: Let me give a few examples. In [16] Exhibit 9 — is it Exhibit 9? Excuse me, in [17] Exhibit 8, the potential for concrete [18] cracking on page 3.4-62, there's a number [19] for the tensile stress of the steel shell [20] of 1,321 in the numerator, but that assumes [21] an earthquake of, as you can see from our [22] Exhibit 2, that assumes — this

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[1] thousand-year return period earthquake, of [2] horizontal acceleration .04 G and vertical [3] acceleration .39 G.

[4] But the latest numbers for more [5] recent sampling has this number as almost 50 [6] percent greater for each of these numbers. [7] That's what I meant.

[8] This number, the tensile stress in [9] steel shell, assumes the lesser earthquake [10] and it doesn't take into account the new [11] numbers that appear. That's what I meant by [12] that as an unreviewed safety question.

[13] Q: Okay.

PRIVATE FUEL STORAGE, L.L.C.

[14] A: I mean, I realize that this [15] number 1321 and the certificate of [16] compliance have in it this horizontal and [17] vertical acceleration, so it all goes [18] together as a glove.

[19] You know, you have horizontal and [20] vertical accelerations and you have this [21] number, 1321, but if you then transfer the [22] cask over to the PFS site, you are dealing

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[1] with accelerations which are outside the [2] certificate of compliance blanket.

[3] Q: I want to make certain I know what [4] documents you are referring to here. You [5] said the certificate of compliance?

[6] A: Yes, I did, and I was pointing at [7] that time to the FSAR done by HI-STORM. But [8] the SER is based on these numbers.

[9] Q: The other thing is we want to [10] request that any additional information, [11] calculations or documents that are provided [12] will also be provided to the staff. Do you [13] agree with that request?

[14] A: Absolutely. [15] There was one other issue I [16] referred to earlier, and I thought I could [17] just put it on the record, which is [18] this 33-hour time period for cask heatup, [19] which also — that number also appears in [20] the certificate of compliance. It's a [21] bounding calculation that was done by [22] Holtec.

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[1] And if the time period 33 hours is [2] exceeded, then that also is a situation [3] which is outside the parameters for which it [4] was originally calculated. So that's [5] another issue that, when I was referring to [6] the certificate of compliance, that was [7] another issue I was referring to.

[8] MR. O'NEILL: Thanks. I have no [9] further questions.

[10] MS. CURRAN: Before we go off the [11] record, I just want to tell you that the [12] copy you gave Dr. Resnikoff, half of [13] Exhibit 5, is now marked.

[14] That's a list of his publications [15] from 1985 up through maybe '98, and he has [16] marked the ones that are relevant to [17] contention L in some respect.

[18] MR. GAUKLER: Okay, I appreciate [19] that.

[20] FURTHER EXAMINATION BY COUNSEL FOR

[21] PFS

[22] BY MR. GAUKLER:

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[1] Q: Dr. Resnikoff, are you aware that [2] Holtec has done some site-specific [3]

calculations for PFS on various matters; [4] that conditions at the site may vary from [5] the CFC?

[6] A: I'm aware of it, but these two [7] issues I have raised aren't ones that have [8] been done by Holtec.

[9] MR. GAUKLER: No further [10] questions.

[11] MS. CURRAN: I would just like to [12] say for the record that if Holtec has done [13] some calculations that are relevant to this [14] contention, I assume you have provided them [15] to us.

[16] MR. GAUKLER: I assume we have, [17] too.

[18] I would also put on the record [19] that when you complete your calculations, I [20] would like to get a copy of them.

[21] And I reserve the right to [22] continue the deposition with respect to such

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calculations as may be appropriate.

(Whereupon, at 3:15 p.m. the deposition of MARVIN RESNIKOFF was adjourned.)

Lawyer's Notes



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