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NUCLEAR REGULATORY COMMISSION

Title: Private Fuel Storage: Oral Argument

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

Location: Rockville, Maryland

Date: Wednesday, April 6, 2005

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING BOARD
(ASLB)

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ORAL ARGUMENT

In the Matter of:

PRIVATE FUEL STORAGE, LLC,	Docket No. 72-22
Independent Spent Fuel Storage Installation	ASLBP No. 97-732-02-ISFSI

Wednesday, April 6, 2005

Hearing Room
Nuclear Regulatory Commission
Two White Flint North
11545 Rockville Pike
Rockville, Maryland

The above-entitled matter came on for hearing, pursuant to notice, at 1:00 p.m.

BEFORE:

MICHAEL C. FARRAR	Chair
DR. PAUL B. ABRAMSON	Administrative Judge
DR. PETER S. LAM	Administrative Judge

APPEARANCES:

On Behalf of Private Fuel Storage, LLC:

SEAN BARNETT, ESQ.
PAUL GAUKLER, ESQ.
JAY E. SILBERG, ESQ.
of: Shaw, Pittman, LLP
2300 N Street, NW
Washington, D.C. 20037

On Behalf of the State of Utah:

JAMES R. SOPER, ESQ.
DENISE CHANCELLOR, ESQ.
CONNIE NAKAHARA, ESQ.
ASSISTANT ATTORNEYS GENERAL
of: Office of the Attorney General
160 East 300 South, 5th Floor
P. O. Box 140873
Salt Lake City, Utah, 84114

On Behalf of the Nuclear Regulatory Commission:

SHERWIN E. TURK, ESQ.
LAURA C. ZACCARI, ESQ.

of: Office of the General Counsel
Mail Stop O-15 D21
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Also Present:

DARANI REDDICK
AMY ROMA

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

1:00 p.m.

CHAIRMAN FARRAR: We are gathered here today to hear the oral argument of counsel on the State of Utah's motion asking the Board to reconsider our February 24th Decision finding in the Applicant's favor on the last issue in the case, that of F-16 aircraft accident consequences.

Let me ask, before we go any further, for Counsel to introduce yourselves and tell us, or rather, reintroduce yourselves and tell us which parts of the argument you will each be handling. For the State?

MS. CHANCELLOR: Denise Chancellor, for the State of Utah. I will be handling the first issue, Your Honor.

MR. SOPER: Jim Soper for the State of Utah, and I will take the remaining issues.

CHAIRMAN FARRAR: Okay.

MR. SOPER: And with us is Connie Nakahara for the State of Utah, of course. She doesn't have a microphone today.

CHAIRMAN FARRAR: Okay. For the Applicant?

MR. GAUKLER: Paul Gaukler, Shaw Pittman

representing PFS. I will be arguing the first two issues today. Mr. Barnett?

MR. BARNETT: Sean Barnett, representing PFS. I will be arguing the last issue on the F-16 accidents.

CHAIRMAN FARRAR: Okay. And the gentleman with you?

MR. GAUKLER: And we have a gentleman with us, Mr. Silberg, who I'm sure will be talking at some time.

CHAIRMAN FARRAR: For the Staff?

MR. TURK: Good afternoon, Your Honors. I'm Sherwin Turk, with the Office of the General Counsel, I will be presenting the argument for the Staff today.

I would like to introduce with me, at counsel table to my immediate right, is Dr. Gordon Bjorkman, who I'm sure you recall from the hearings. And to his right is Laura Zaccari, who I have been privileged and lucky to be able to draw into this web today, for her brief appearance with us this afternoon.

I would also like to introduce a few, or mention a few people who are with us today in the audience. They include Darani Reddick who was counsel

to us during the proceeding, who is no longer working with us on this case. I believe she is back there.

Also Robert Shumaker, one of our witnesses on cask issues, Dr. Kamp who was one of our witnesses on aircraft crash impacts angles and speeds. Dr. Denis Damon for probability issues.

Also, in the audience, from the Staff is M. Wayne Hodges, management of SFPL, spent fuel project office, Dr. Mahendra Shaw and Stewart Brown, who is the current project manager for the Private Fuel Storage application.

And I thank them all for their attendance and participation.

CHAIRMAN FARRAR: Thank you, Mr. Turk, and thank all of you. It is nice to see all of you again. Let me introduce ourselves, briefly. I'm Mike Farrar, I'm a lawyer, Chairman of the Board. My colleague, Peter Lam, who is a PHD nuclear engineer, I've previously introduced Paul Abramson, as a PHD physicist, and a 20 year Wall Street lawyer, but neglected to mention, it does not appear on his web site bio, he is also a registered professional nuclear engineer.

This is a complicated case, and let's take a minute to review what is before us, and what is not,

today. Two years ago we had 45 days of hearings open to the public, on seismic, wilderness, and aircraft issues.

Judge Lam and Judge Kline, and I, had a series of three to nothing decisions, seismic and wilderness, in favor of the Applicant. Aircraft against the Applicant, where we held that there was a greater than one in a million per year probability of an F-16 crash into the site.

We then let the Applicant show that such a crash would not, or attempt to show that it would not be consequential. So that led, last year, to 16 days of hearing. Those were closed. As you all understand, safeguards information, because it involved the crashing of planes into concrete and steel structures.

February 24th we had a split decision, Judge Abramson and I in the majority, Judge Lam dissenting, holding that there was less than one in a million probability of an F-16 crash impacting the outer cask, that is the overpack at a speed and angle sufficient to breach the internal canister holding the spent fuel.

So, in effect, we didn't reverse our prior decision, but it was superseded based on a more

complete analysis. That decision went to the Commission, which under the Agency's regs now has the authority to issue the license. I know they have called for briefs on whether they should do so.

As far as I know they haven't acted, and that is something that is independent of what we do. We thought, on February 24th, we were done, but the State filed a March 7th motion. There have been a series of additional briefs from the other parties.

We have issued some directives as to what to cover. And the State is, in effect, now asking us to reverse ourselves. Their appeal to the Commission has been deferred, in the meantime.

For those of you who haven't seen oral arguments, we have the parties briefs, this is not the time for the lawyers to make speeches, it is the time, the argument is for our benefit. We ask some questions, you may think we are being rude interrupting them, but they are used to it. They are here to answer our questions so that we can explore the ramifications, look for inconsistencies, challenge assumptions, and generally ask both sides hard questions.

Don't read into our questions that you can figure out what our leanings are, because if you

listen to all the questions you will come to the opposite conclusion.

We have structured this hearing so as not to touch, directly, on safeguards matters, so that it could be open to observation. So sometimes the lawyers will refer obliquely, or by reference, to documents, to safeguards information.

If any lawyer feels they need to refer to things directly, let us know, and we will save that for the end of the hearing, we will clear the room, and we will have a safeguards session.

The order of the proceeding today, there is one argument the State has, there is one issue that the State says we neglected to cover. That will be the first half of the argument. We will probably take a break after that.

Then there are several issues the State says we covered, but incorrectly. And those we will deal with after the break. We would like to hear, at that point, the argument on the seven accidents first, before the other issues.

Two things are not included because they are beyond our jurisdiction. The question of terrorism, dating to the days of the Atomic Energy Commission, we do not deal with deliberate matters.

The theory, which we spell out on page AA footnote 33 of our opinion, was that the protection against terrorism comes not from Board hearings to evaluate it, but from government efforts to prevent it.

The other issue not in front of us is whether what is the right choice, for the country, on how to permanently or temporarily deal with spent fuel. Pages C2 to 3 of our Decision, we refer to the fact that the Commission has said that is a political question, not in terms of partisan politics, party politics, but policy choices among competing societal values that are for our elected and appointed representatives to deal with.

Our role is, simply, to pass judgement on whether the Applicant's proposal, which is in front of us, meets environmental and safety standards.

A word to State Counsel. I know you usually prefer to go to a higher tribunal and say the lower court was wrong, and there is a little trepidation in coming to the deciding tribunal and saying you are wrong. Please feel free to do that point blank and in great candor.

We are not offended by the fact that you are saying we were wrong, and that is why we are here, to hear that. The only person offended by your motion

was our intrepid law clerk, Amy Roma, who thought she was leaving here early to go make her fortune, and so she is concerned about being stuck here.

But other than that we are prepared to go up there. Are there any preliminary matters?

JUDGE LAM: If I may add to the Chairman's remark? I am not the one who will be offended by the State's motion.

MS. CHANCELLOR: Your Honor, just one procedural matter. I spoke with Mr. Gaukler, I didn't have a chance to speak with Mr. Turk. We prefer to do the argument from our desk, we've got so much stuff, rather than use the podium, if that is okay.

CHAIRMAN FARRAR: Andy, can we accommodate the camera?

MS. CHANCELLOR: And I notice the State has one microphone, PFS and the Staff have two.

CHAIRMAN FARRAR: We stole yours to do the podium on the theory that we wouldn't rarely be asking anybody at the table any questions. Is Andy in there?

The State would prefer to argue from their table. How about the camera? Okay. Then let's take just a moment. Well, Mr. Gaukler, Mr. Barnett, where do you want to argue from?

MR. GAUKLER: Here is fine.

MR. BARNETT: The table is fine, Your Honor.

CHAIRMAN FARRAR: Okay. Mr. Turk, is that fine with you?

MR. TURK: I will follow the other examples.

CHAIRMAN FARRAR: Okay.

MR. TURK: I would point out that I've asked our audio visual person to bring back the projector, the overhead projector, for a portion of the argument. I would like to present some visual information.

CHAIRMAN FARRAR: Okay, fine.

MR. TURK: But I won't need that during the first part of the argument.

CHAIRMAN FARRAR: Ms. Chancellor, I think you said you were going to go first?

MS. CHANCELLOR: Right.

CHAIRMAN FARRAR: Go ahead.

MS. CHANCELLOR: Good afternoon, Your Honors. I would like to first note that in the Order that you issued on March 30th, we will not be discussing, today, the existence of any evidence in the hearing aircraft or seismic, that would allow, at least, a rough calculation, or worse case analysis of

the radiation dose that might result from loss of part of the overpack shielding.

And I would note that PFS does refer to the seismic PID, Partial Initial Decision, in their response in footnote 6. And to the extent that they attempt to address this issue that has been ruled out, I'd state an objection now.

CHAIRMAN FARRAR: Didn't you -- you said our Decision was inconsistent because we had dealt with it in seismic and not here, isn't that what prompted the response?

MS. CHANCELLOR: That is correct. But it doesn't open the door for a rough calculation of what the dose consequences are.

MR. GAUKLER: Your Honor, our position is differently. We agree that we are not doing the calculation, but we can show that any degradation is immaterial. That issue is before the Board.

CHAIRMAN FARRAR: Let's hold that until later in the argument. Go ahead, Ms. Chancellor.

MS. CHANCELLOR: I would like to address issue number one, by first looking at the legal underpinnings of the first hearing, what was actually decided there. And the issues that unfolded and led to hearing two.

And the scope of that hearing, and I think we need to do that in order to understand the issues relating to the overpack and to any procedural remedy.

And I will refer to PIDs as partial initial decisions. In the initial hearing on aircraft crashes, hearing one, the Board set out legal standards. And those legal standards refer to design basis accidents, the relation of the design basis to the design criteria, that SSCs, structures, systems and components, must be analyzed for events within the design of the facility, to include the adequacies of SSCs for prevention of accident consequences, including man-induced design basis event.

That SSCs must be designed to withstand postulated accidents, and I would also add, to that, 72.128, that spent nuclear fuel storage must be designed to ensure adequate protection under accident conditions, including suitable shielding, and also design with confinement systems and structures.

The Board's legal conclusion, the conclusion of law, in hearing one was, and I will read from the next to the last page of that decision, pursuant to 72.90, 72.94, and 72.98, proposed sites for an ISFIS, must be examined with respect to the frequency and severity of external man-induced design

basis events that could affect the safe operation of the ISFIS.

The facility must be designed to accommodate the effects of credible accidents, and must include them in the design basis of the facility. See 10CFR72.122(b)(1).

And then the Board concluded: PFS has not provided reasonable assurance that F-16 aircraft accidents do not pose a significant threat to the facility. Consequently, the PFS application for part 72 license to construct and operate an independent spent fuel storage facility, in Skull Valley, cannot be granted at this juncture.

So the Board has decided that there are certain regulations that PFS doesn't meet. That was the essence of hearing one. So the question then is, what is it that the Board is going to decide in hearing two?

And you have set out a technical standard, that PFS must meet the 10 to the minus 6 criteria. To be sure, the Board must take account of the underlying regulations in determining whether there will be a breach or not.

Those regulations enunciate NRC's in-depth philosophy for providing safe storage of spent nuclear

fuel. SSCs must be designed to withstand postulated accidents, and PFS, in their second joint report, I think they summed this up appropriately when they said, what is the issue that the Board must decide?

You must decide whether the prerequisites for issuing a license have been met. And we don't believe that the prerequisites have been met under the existing decision.

CHAIRMAN FARRAR: But don't we only look at prerequisites that are put in issue by an Intervenor's Contention? Now, granted, this is a complicated case where we had one hearing, and I know you all said the Applicant should go back and redo its application, and you would file a new contention, and we decided not to do that.

But then we had 15 pre-hearing conferences, where we talked about getting ready for the hearing that eventually happened last August and September. And I thought, as we were doing that, that that was defining what the specific issues were that were going to be faced in that hearing.

MS. CHANCELLOR: A lot of those pre-hearing conferences were about safeguards, and the schedule, and how we were to proceed, and whether the Staff should be submitting RAIs, and PFS' response

time.

CHAIRMAN FARRAR: Amy took it upon herself to analyze the transcripts of each of those conferences, and the word shielding never appears.

MS. CHANCELLOR: But, Your Honor, the word MPC, we always spoke in terms of cask breach. The cask is a storage cask, or it is the HI-STORM cask system.

Never, ever, have we referred to the canister or the MPC as a cask. And it wasn't until your PID, this last decision, that you set the standard as a release of radioactive materials from the MPC.

CHAIRMAN FARRAR: I will grant you that it is surprising, looking back at those conferences, that everyone used the short form cask breach. But at some point you used it, the Applicant used it, we used it, and the Staff used it.

At some point there was, though, the focus on the canister. And because we had one or two conferences dealing with the issue of, the three part issue, as opposed to the two part issue, where the Applicant said they would take on proving that there would be no canister breach.

And if they did that, that would be the

end of the case, and no one disagreed with that.

MS. CHANCELLOR: But, Your Honor, that is the way they present their case. That isn't a -- it is not PFS, it is not how PFS presents its case as to what the regulatory standard is. Nothing that the parties do can change what the legal standard is.

And if PFS chooses to just show breach of the MPC, that is their litigation strategy, that is not the standard.

CHAIRMAN FARRAR: No, but if they -- what I'm asking is, if they succeed in that, then the regulatory standards fall into place in the manner in which we were all discussing them at those conferences.

JUDGE ABRAMSON: Perhaps, Ms. Chancellor, I can pick up this though for a second. The question you are putting before us is whether or not we should have considered reduction in the shielding as how it influences, as how it plays into the regulatory standard.

To my recollection, and perhaps you can help me, but we have asked you to identify every place in the record where this matter was put before us, and the best we could find were a place where you put it in a proposed finding, or you put it in a proposed key

determination.

Help me with this. We are faced with matters that are put in litigation before us. The Commission is faced with whether or not regulatory standards are met.

Help me understand how you believe we should consider a matter that has not been put before us, without reopening the record?

MS. CHANCELLOR: I beg to differ that it hasn't been put before you, and I beg to differ that the Commission is not the only that deals with regulatory standards.

If you will look in our proposed findings, we laid out there what the legal standard was, that there needs to be confinement system, barriers, between the spent fuel and the environment. And those barriers, plural, have not been maintained in this instance.

We address the overpack. We didn't present evidence on the inventory of fissile material in the MPC. We didn't present evidence, yet we still retain the right to challenge excessive doses if we ever got to hearing three.

With respect to criticality we didn't put on any evidence as to a moderator that would somehow

affect the K-effective as to whether we'd reach criticality or not.

Because the Board severed radiation consequences from this hearing, we were precluded from introducing evidence such as loss of shielding. That is for the next phase of the hearing.

CHAIRMAN FARRAR: But you did an offer of proof that covered criticality, and what would have happened if the canister were breached. You didn't do that offer of proof, at least as I read it, did not extend to what would happen if a portion of the shielding is blown away.

MS. CHANCELLOR: We were very careful, in that offer of proof, to tell you that this was just a nascent effort, it was just the beginnings, that we hadn't -- those reports that we submitted were from September of -- is it 3 or 4? I'm getting the years mixed up.

CHAIRMAN FARRAR: Three right.

MS. CHANCELLOR: Of 2003. And what, and besides, an offer of proof is more of a place holder to show that, procedurally, or under a due process standard, that we are entitled to go forward at that time.

An offer of proof should not be used

against us, now, as to the scope of hearing two.

JUDGE ABRAMSON: So let's come back to the basic question. What is it you propose should happen, procedurally, here?

MS. CHANCELLOR: You want to get there, already?

JUDGE ABRAMSON: Yes, please.

CHAIRMAN FARRAR: Before you get there --

JUDGE ABRAMSON: She has limited amount of time.

CHAIRMAN FARRAR: But before you get to that, I need to know why with it never being mentioned, by anybody, as far as we can tell; why we should have known that the question of the increased radiation dose, from loss of shielding, was in front of us.

And the reason I ask this question is, when an Applicant files an application there are a thousand issues to be dealt with. And the Staff deals with them, and the Staff passes on a thousand of them, and an Intervenor brings one, or five, or ten, or a hundred in front of us.

We don't deal with the other 900 that the Staff dealt with. We only deal with what Intervenors bring in front of us. So my question is how would we

have known that we should have, that the loss of shielding, diminution of shielding, and increased result in radiation dose was something that was fairly in front of us?

MS. CHANCELLOR: Well, as you recall, in our findings we have a table of strains that the parties came up with, with respect to the overpack. Everybody thought it important enough to develop strains for the overpack.

We put PFS and the Staff, and the Board, on notice, that there would be rupture of the overpack. Now, that doesn't specifically spell out loss of shielding. But rupture of the overpack, and in paragraphs 86 and 87 of our findings, we conclude that none of the scenarios analyzed by any parties show that the overpack outer shell, or inner shell, is safe from rupture, and there is no evidence, in the record, that a HI-STORM 100 cask, REV zero, will not result in a breach of overpack, and not result in an increase in radiation dose.

We had separate findings for the MPC, and separate findings for the overpack. And we laid out our case for the overpack. And so I think it is obvious, from this conclusion, that we are saying that there would be an increase in dose.

And just like we didn't get to the inventory of fissile material for the MPC, we didn't get to the shielding with respect to the overpack.

JUDGE ABRAMSON: Ms. Chancellor, with respect to the proposed finding, when you made that proposed finding where, in the record, did you cite to the proposition that this reduction in shielding had any effect?

And where, in the record, did you cite with that proposed finding to support these propositions? Anywhere?

MS. CHANCELLOR: With respect -- maybe you didn't hear my answer to the last question. My answer is that we were not required to cite to the record, because that is an issue for hearing three. It deals with radiation dose consequences.

JUDGE ABRAMSON: How can we make a proposed finding on something that is not in front of us, then?

MS. CHANCELLOR: It is in front of you.

JUDGE ABRAMSON: You are saying that you made a proposed finding, that we should find that the overpack was ruptured. What did you cite, in the record, when you made that proposed finding, that indicated that that was an issue in front of us, in

addition to the issue which we talked about, ad nauseam, for months, that there would be release of radiation, and fission products because of a rupture of the canister that is contained within the overpack, and shielded by the overpack?

MS. CHANCELLOR: Well, Your Honor, you have to read our legal standards, and in addition to our findings of fact. You put our legal standards, and our findings of fact together, and you arrive at the conclusion that the overpack doesn't meet the -- a rupture of the overpack can cause an excessive dose of radiation.

JUDGE ABRAMSON: Did you point us to that in your proposed findings, did you mention that combination, was there anything in there that would have led us to focus on that?

MS. CHANCELLOR: What led, what should have led you to focus on that was the actual conclusion.

JUDGE ABRAMSON: Let's turn now, to my question. Let's presume, for a moment, that this should have been considered, and was not. And let's presume both, I'd like to hear you address both possibilities.

A, that it was in front of us and B, that

it was not in front of us. What do you propose we should do procedurally?

MS. CHANCELLOR: I thought I had to address the evidence in the record. But --

JUDGE ABRAMSON: If you have something to add to the record, please.

CHAIRMAN FARRAR: Go ahead, Ms. Chancellor.

MS. CHANCELLOR: I know this is for the benefit of the Board but I will continue. PFS, in its reply findings, in paragraph 65, it does -- it mentions the overpack. It states that the State inappropriately applied the DOE ductility ratio to the overpack.

In findings R-67 it quotes Dr. Soler as criticizing Dr. Sozen's reference as to high strains in the overpack, paragraph R-76, it criticizes PFS --

JUDGE ABRAMSON: Yes, we understand all the references to what happened to the overpack, and we are quite familiar with the analysis of the overpack. I wish you would get on with the question that we need to address here, rather than wasting some of your precious time on this.

MS. CHANCELLOR: Your Honor, I think I can manage my own time. Dr. Soler admitted that the

overpack is a barrier, and part of our legal standard that we enunciated in our findings, is that there must be barriers between the spent fuel and the environment.

And Dr. Soler did testify that there would be a loss of some of those barriers from an impact with the overpack.

PFS' approach has been, it refers to Achem's razor on Einstein's principle. And Dr. Cornell explained it this way. To make the most resource efficient demonstration that establishes compliance with the relevant standards.

And Mr. Gaukler, in a pre-hearing conference call said, I wouldn't try -- I wouldn't say we tried to find the precise point at which you have a release, or may not have a release. We picked the point for our analysis and showed that that point in our analysis was below ten to the minus six.

We talked, and this whole exercise which is following Einstein's principle, don't go beyond, don't give more detail than what you really need, to take on complex calculations than what you may need.

And then Mr. Gaukler talked about basically it is a cutting system. We analyze it and we show it to be okay, you throw it out, or you don't

analyze it. And it stays in, it stays in the counting bin.

So PFS is doing this counting exercise. And my question is, has PFS set itself a standard that is too difficult to meet? Making the analogy of the R-factor in hearing one.

PFS hasn't put in the accounting bin the loss of shielding from the overpack. And by not --

CHAIRMAN FARRAR: Let me interject there. At one point I seem to recall we had a witness on the stand, and I asked a question about, okay, what if the canister isn't breached, but the fuel got all, I think I used the word jumbled up inside?

And Mr. Gaukler went apoplectic and said that is not the issue in the case, it doesn't matter what happens inside the canister as long as it is not breached. I wish someone would have jumped up then and said Mr. Gaukler is wrong, that is not the only issue in the case, there is an issue about increased radiation dose because of the shielding being damaged.

Now, we all know the shielding was damaged, we mentioned in there it being damaged, and if you read between the lines of our opinion, there is greater than a one in a million possibility that the shielding is damaged to some extent.

But nobody ever said that was a radiation dose issue that we had to deal with in terms of the regulation.

JUDGE LAM: Now, I don't want to do the State's bidding. But I thought, earlier, I heard Ms. Chancellor was saying the approach the Applicant has taken, it is Applicant's litigative strategy.

The Applicant, earlier in this proceeding, had proposed a failure criteria that if and when the MPC is breached it would be considered failure. Now, I think I heard Ms. Chancellor earlier saying that is the Applicant's business. The State is under no obligation to point out any deficiency in that failure criteria.

Would that be an answer to Judge Farrar's question?

MS. CHANCELLOR: Certainly, Your Honor. That is, exactly, our point. That the way in which PFS has litigated this case is this un-analyzed event probability. And they took a risk with that.

And this Achem's razor, Einstein's principle approach, is just do barely enough, and no more. And we are saying you've come up short. And --

CHAIRMAN FARRAR: Then, on that note, deal with Judge Abramson's question, if you would, if we --

and as I understood his question, it was two parts.

If we agree with you that this was fairly in front of us, and we didn't deal with it, what should we do? And if we disagree with you that it was fairly in front of us, but the Applicant runs the risk of the strategy they chose to adopt, what do we do? Maybe the answers are the same in both, but those are two different ways of looking at the question.

MS. CHANCELLOR: I think, first of all, you have to decide whether the Applicant has waived its right to go forward with the hearing on consequences. I think, certainly, you should find that they haven't met the standard.

CHAIRMAN FARRAR: But how do we get started? We say, okay, is this what you are asking, we write an opinion, we say we have the State's motion for reconsideration, it is granted to this extent. We should have dealt with the matter of the shielding.

And, in fact, there is more than a one in a million chance of some shielding being, some amount of shielding being destroyed, or dissipated. And, therefore, we rule that what?

MS. CHANCELLOR: PFS has not met applicable regulatory standards, they cannot -- you cannot say that they have proven that there won't be

an excessive dose at the boundary, and that they haven't met section 72.122(b) and section 72.128.

JUDGE LAM: That is assuming the loss of shielding would lead to unacceptable site boundary doses.

MS. CHANCELLOR: We don't know that, Your Honor, because we were prohibited, we fought tooth and nail to deal with dose consequences in this hearing.

JUDGE ABRAMSON: And am I correct in hearing that it is your view that one of the issues before us is the proposition that the Applicant has given up its right to present evidence on that?

MS. CHANCELLOR: That is correct, Your Honor. And that is in the PID. That is what --

JUDGE ABRAMSON: The possibility of that is mentioned in the PID, as I recall. Is that not right, do you think we concluded in the PID that that is the case?

MS. CHANCELLOR: I don't think you concluded. But in the pre-hearing conference, when the Chairman ruled on this, the Chairman said that PFS may be prejudiced forever. I think I remember --

CHAIRMAN FARRAR: How many additional votes did I have for that position?

MS. CHANCELLOR: Probably just one.

CHAIRMAN FARRAR: No, I don't think I had any.

MS. CHANCELLOR: If you recall a conversation about being short-shrifted, and the question came up whether PFS and NRC had waived its right to a hearing on dose consequences, you advised that PFS and the Staff were not prepared to go forward, and that they may have given up that right forever, from the transcript, 14662 to 63, to the Applicant not prevail on cask breach probability.

The Board will, at some later date, decide whether the Applicant has waived its right to proceed seriatim with the consequences phase of the proceeding.

CHAIRMAN FARRAR: I remember saying that and believing it reasonably strongly, and having no support from my colleagues. Not no support, but no willingness to make that sort of ruling at that point.

JUDGE ABRAMSON: Well, whether or not, let's take the next step, Ms. Chancellor. Let's presume, for a moment, that this proceeding follows the normal course of license applications where the Applicant has a right to get its license, provided he can demonstrate, to everybody's satisfaction, and the Commission, that it is safe, meaning us, when issues

are brought before us, the Commission, the Staff, when issues are brought before them, and the Commission is the ultimate arbiter of these, within our organization.

So let's presume, for a minute, that this would take the same path that other, that the balance of this proceeding has taken. And let's assume that we do agree that this is an issue that should have been dealt with, just assume that for a moment.

And let's assume, in the same line of thought, that we have to deal with it. As I recall, there is a long line of cases that says something to the effect that in the context of reopening a record, and we have closed the record, and there is an issue which I wanted you to address procedurally, about whether this record needs to be reopened or not.

But, as a matter of fact, this Board has declared the record closed, so let's not deal with that one for a moment. But there is a long line of cases which says two-prongs are, basically, the same thing.

One says before you reopen a record you have to be convinced that the matter you are going to consider would lead to a materially different result, and there is another line of cases that says

essentially the same thing in another way, what it says is we have to be convinced that the matter to be brought before us has safety significance.

We, I don't think, are in a position to address whether or not the reduction in radiation shielding that might have occurred from the events we are talking about, has safety significance, or would lead to a materially different result.

How would you propose we gain that information, assuming that we decide to go forward?

MS. CHANCELLOR: Your Honor, we have always contemplated three phases in this proceeding. At one stage it was two, then it was three. We are not asking for the record to be reopened with respect to the probability of cask breach.

We are saying that if PFS and the Staff have not waived its right to a hearing on consequences, that you cannot find that in the second phase that PFS has prevailed, and you need to go on to a third phase.

JUDGE ABRAMSON: Now, let's pursue that just one more step, and then I will stop with this line of inquiry, and that is this.

We have, in the record, an enormity of information relating to analyses of what would happen

to the overpack during these incidents. Could you point to a particular analysis that we've accepted, which you think would indicate how much shielding is removed?

And my colleague has pointed out, for example, that the probability of some neighborhood child hitting one of these casks with a slingshot, and knocking a pebble off is high probability, but it wouldn't do much damage.

So the question is do we have information we've accepted, we had a lot of information presented to --

MS. CHANCELLOR: I understand your question, Your Honor, but I think it calls for an expert to analyze that. Like you, I'm not a registered engineer.

JUDGE ABRAMSON: I'm sorry, that wasn't the question. We have information, in front of us, in the record that we've accepted and reviewed. Are you proposing there be entirely new information on how much cask damage there would be?

MS. CHANCELLOR: No, what I'm saying is that as a lawyer I don't have the ability to analyze the record to determine what part of the analysis we can point to, to show loss of shielding in the

overpack. That is what I'm saying. As a lawyer I'm not competent to do that.

CHAIRMAN FARRAR: But in the ancient Vermont Yankee case, which someone had the lack of taste to mention, he thought there --

JUDGE ABRAMSON: Only because it was half his lifetime ago.

CHAIRMAN FARRAR: The thought there was, when you get to -- and we're not -- don't get us wrong, we're not characterizing your motion as a motion to re-open. But, if we looked at this where we are now as being in the nature of re-opening, you don't reopen unless there's something presented to you that says this at least has the possibility of being a serious matter.

MS. CHANCELLOR: That is correct. And usually you support that with expert affidavits.

CHAIRMAN FARRAR: Right. Why is that not a --

MS. CHANCELLOR: Your Honor, I don't really think we are -- this is not a re-opening. This is getting to phase three. This is because we bifurcated two and three. You can't --

CHAIRMAN FARRAR: I'll grant you this is a very unusual situation. It may never come up again.

But, we went through a whole lot of preparation without the word shielding ever being mentioned. And so that's why we're -- you know --

MS. CHANCELLOR: But we talked about casks.

CHAIRMAN FARRAR: Well, we talked about casks. But, in reading all those transcripts over again, it seems like everyone was talking about casks.

And what they meant was the internal canister.

MS. CHANCELLOR: Well, maybe.

CHAIRMAN FARRAR: Well, that's a good question. Well, let's --

MS. CHANCELLOR: Your Honor, I'd like to reserve the balance of my time.

CHAIRMAN FARRAR: Let's do that. Thank you Ms. Chancellor. Mr. Gaukler, I had forgotten whether it was you or Mr. Barnett that was going to address us. All right.

MR. GAUKLER: Your Honor, before I begin, we have some -- the record and the pleadings. And we just want to hand the books up and referring to various points.

MS. CHANCELLOR: What's this for?

MR. GAUKLER: It's just copies of

exhibits, excerpts from exhibits.

CHAIRMAN FARRAR: So you can refer to these without mentioning safeguards?

MR. GAUKLER: I'll refer to them without with mentioning safeguards and also just for the convenience of the Board.

CHAIRMAN FARRAR: All right.

(Pause.)

MR. GAUKLER: Your Honor, I want to start off by saying that the State has never raised issues in this case. It would be entirely inappropriate at this point in time to do so.

This Board identified, after a long series of discussions with the parties, issues that were to be litigated in both this phase and the third phase. And that's in an April 15th scheduling order of the Board.

And no where is there any mention of increase doses due to lack of shield*.

CHAIRMAN FARRAR: If they had raised it, it would have been a legitimate issue.

MR. GAUKLER: Yes, if they had raised it and provided sufficient support, it would have been legitimate.

CHAIRMAN FARRAR: It's certainly within

our -- within the parameters of the case to have done this if they had raised it.

MR. GAUKLER: But it would have been basically geared -- as potential is developed and trimmed by the parties to their expert report. And as reported in their April 15th order, the contention does not prove it.

And they should have raised it either before then so it would have been included in that order or then as not part of the issues to be tracked.

Let me walk through that very briefly. Judge Lam, do you have a question?

JUDGE LAM: Yes, Mr. Gaukler. Earlier in this proceeding, if you remember, the state was adamantly objecting to how the consequence hearing had evolved into a probability hearing.

Very early on I remember this. They say no, this is not what we wanted to do. Now, today you also heard Ms. Chancellor was saying, well, since the Applicant had chosen to do the consequence hearing by probability analysis, whatever failure criteria, whatever method they had developed, it's at own risk.

So, their silence should not be taken as condoning your approaches. Now, how would you answer to that rationale?

MR. GAUKLER: I would answer that, Your Honor, by stating that the State has a burden to come forth. And the Board identified the issues in the April 15th order.

That's Tab 5 in the book I've shown you. And, if you see there, the Board talks -- after the parties had filed expert reports where we clearly defined issue as a radiological release.

And, if you note behind Tab 1, I have excerpts from Dr. Cornell's* report where we get our approach and analysis. And we define the issue as one of radiological release and felt that in that probability, the State filed expert reports. Dr. Thompson, where they talked about radiological release, and Dr. Thorne, where they talk about criticality where you would have a breech in the cask.

At nowhere in any of their expert reports did they ever suggest loss of radiological shielding giving rise to excess doses.

CHAIRMAN FARRAR: But,k in our April 15th Order, which you just referred to, we refer to rupturing a casks. Could they -- first off, I wish we hadn't said that.

But, when you go back to the pre-hearing conference that we were talking about, that's the

language everybody used. No one said hey, wait a minute, we're talking about the internal canister.

I think we were using cask as the whole unit and getting to the center of a known and now let's be careful here, let's watch our language, let's use canister.

Everybody at that conference talked about cask. Now, could the state not have concluded from that we're talking about that they read rupture of a cask differently than we meant it.

MR. GAUKLER: If you look at the order, Your Honor, and you divide it into three phases --

CHAIRMAN FARRAR: Right.

MR. GAUKLER: -- the second one was the probability that such a crack would rupture a cask.

CHAIRMAN FARRAR: Yes.

MR. GAUKLER: You were talking about rupturing to be breech of something, not -- that doesn't necessarily infer loss of radiological shielding.

But the important thing is, the third phase of the hearing, you say and that those consequences of the resulting radiological release. So, obviously, we were talking about a radiological release, a release of radioactive material.

Now, cask is a generic term that includes both the cask overpack and the canister. So people were talking short hand in terms of breaching the cask or rupturing the cask, in terms of causing the release of radioactive material.

And, if you look at the pre-hearing transcripts, that's exactly the way the parties were talking. Now, in terms of Judge Lam's point, the State has a burden to come forward.

And we've talked about, in our five findings* on pages, I believe, 21 and 22, we cite cases on the State's burden to go forward. And I think particularly appropriate is one of the cases that we cite there, which is the Supreme Court's decision in the Vermont Yankee Nuclear Power Corporation Case, 1978.

And there it says -- I'm going to quote, I believe from page 554, it says administrative proceedings should not be a game or a form to engage in unjustified obstructionism by making cryptic and obscure references to matters that aught to be considered and then, after failing to do -- to bring the matter to the Agency's attention, seeking to have that Agency's determination vacated on the grounds of the Agency failed to consider matters first

represented.

And, as stated just before that, it is incumbent upon interveners who wish to participate to structure their participation so that it's meaningful so that it alerts the Agency to the intervener's position and contentions.

Here the State has never alerted, despite the Board's April 15th, 2004 order identifying the issues as one, rupture of a casks, and two, those consequences from a radiological release.

The State never cam forward to tell the parties, the Board, PFS, what it's position was.

JUDGE ABRAMSON: Mr. Gaukler, excuse me. As you know, I was new to this case at that point, when they were trying to summarize where they had been.

Help me understand this. As I read this, they're talking about the third phase dealing with -- and I'm quoting from the order of the dose consequences of the resulting radiological release.

I mean, would you help me understand whether or not the term resulting radiological release might encompass increased radiation due to reduction in shielding?

Or would it only encompass the matters

that we actually heard at trial, which were puncture of the inner-most container and actual physical release of radioactive products?

MR. GAUKLER: Release to me means release of materials, radioactive materials. That's a radiological release. That's the way I think the term is commonly used.

JUDGE ABRAMSON: In your view that's the common use of the term in the industry?

MR. GAUKLER: Yes. And I would also point to the State's findings where they repeatedly identify the issue as one of loss of containment or loss of radioactive materials.

You can turn to Tab 8 in this book. This is excerpts from the State's findings. And, at the top of page 8, the State says the broad issue for the Board to decide is whether PFS has proven that cumulative probability of a release of radioactive material from aircraft crashes and ordnance impacts at the PFS facility is less than one in a million.

And then we turn to page 19 through 23, which I attached here. You see the State repeatedly referring to -- for example, on page 19 -- determining the probability of breach of confinement.

On the next page, page 20 -- will not

cause the release of radioactivity, will not cause a radiological release.

JUDGE ABRAMSON: And, Mr. Gaukler, sorry, let me interrupt you again.

MR. GAUKLER: Yes.

JUDGE ABRAMSON: You know it's my habit. I asked Counsel for the State, and I'd like to ask you the same question along the same line. Let's presume for a minute that this is a legitimate concern that has not been put before us directly.

How would you propose that the Commission come to grips with this allegation? And, when I say the Commission, I mean the Staff, this Board, everybody who has to get involved with the ultimate issuance of a license.

Let's presume for a moment that there is not at this moment, as the State alleges, a demonstration that this reduction in shielding does not cause excessive site boundary dose.

And let's presume it hasn't been put before us in this proceeding. What would you propose we do? And then I want to come back to asking you to help me understand your view, as I asked the state to do, of how the process evolves from a very broad, general contention down to what actually gets

litigated.

And let's address the first one. How should the Commission, staff, and us come to grips with this if it were in fact important? First of all, how should we decide whether it's important? And second, how should it go forward?

MR. GAUKLER: First of all, Your Honor, the Board is a board of limited jurisdiction, as Judge Farrar pointed in addressing issues that I raised before.

It's the Staff's job to review an application to make sure it meets all of the prerequisites, all of the regulatory requirements. Now, while the Staff may not have maybe checked the mark or put in this report post-radiation dose -- loss of radiological fuel is no concern here.

They obviously would have looked at that issue in this respect. So I think the Staff has already done that, is what I'm saying, Your Honor. That's part of the review process.

That's part of their responsibility, to make sure that we meet the requirements. In this respect I would point to the Board that in the seismic proceeding, this board -- and we cited this in our brief, and I believe the relevant page is behind Tab

10.

The Board said specifically that local deformation will not significantly affect the shielding performance of the storage cask since the same mass of steel and contract will still be present, because radiation shielding is dependent on mass rather than thickness.

Re-arrangement of the mass present in the shielding will not result in significant changes in radiation dose levels since the loss of mass in one location of the cask will be offset by increase in mass in another location.

CHAIRMAN FARRAR: But that was in the context of seismic where you're having a tip-over, not a crash of a fast moving, large object that does a substantial amount of damage.

MR. GAUKLER: But we were talking about 4,000 cask tip-overs, okay. So, together.

JUDGE LAM: No. If I may add to what you just read, Mr. Gaukler, that passage, I happen to have written that particular sentence to cite in our seismic decisional*.

The rationale behind what I had written on behalf of my colleagues in the licensing board, was that there was no evidence that the carbon steel outer

shell would have been damaged in a seismic event.

Therefore, whatever material contained inside the overpack, would remain there. That is a compelling rationale. In here perhaps we're dealing with a different scenario where the outer shell is broken.

MR. GAUKLER: First of all, whether the outer shell is broken, the Staff has already determined in the context of issuing the COC for the Holtec HI-STORM 100 that a breech of the outer shell is not of concern.

And I would point the Board to Staff Exhibit FF. And we've got experts behind Tab 11. And this was a -- I refer to page 3-8. And this is referred to also in our footnote on page 3-4 where we talk about this issue.

And here the Staff is analyzing the impact of tornado missiles with respect to the HI-STORM 100. And it indicates the -- and I'm reading from the second paragraph, the middle of the paragraph.

The Staff indicates in the safety evaluation report, the analysis of missile penetration indicates that the worst case may result in penetration of the overpack outer steel shell, but not penetration of the concrete shield.

That's what it states. And that's what the analyses show. And then it concludes down at the bottom, the conclusions, the Staff concludes that the tornado missile analysis are adequate and acceptable.

So the Staff has found acceptable in the context of issuing the COC for the Holtec HI-STORM 100 that a breech of the outer steel shell is not a concern in terms of loss of radiological, generally just in terms of safety.

CHAIRMAN FARRAR: They stopped by saying it's not a concern. Do you want us to read into that it's not a concern in terms of anything, including loss of shielding? Do you think that's --

MR. GAUKLER: After I read that sentence, and want to look at the full COC, which is not in the record.

JUDGE ABRAMSON: Is it accurate, Counselor, that the kind of damage that would be done by a tornado-driven missile, as it's called in the tornado vernacular, would be comparable to the damage that's projected to be caused by these kind of F-16 impacts?

MR. GAUKLER: We are talking about a missile impacting a cask and causing damage.

JUDGE ABRAMSON: Right. But, it's a

missile driven by tornado winds, right? And so, one has to at least -- and I'm not an expert in this area.

I assume since you were involved, you at least are familiar with what kinds of things were looked at. I'm used to thinking of two by fours coming in at tornado wind speeds, not F-16s coming in at the kinds of speeds we've been looking at. Is that a fair comparison?

JUDGE LAM: I happen to know a little bit about tornado missile. I was adding to Judge Abramson's question. I would like to hear your response to Judge Abramson's question.

MR. GAUKLER: Well, the details of the tornado missiles in terms of what we're analyzing is not in the record. But the result is in the record in terms of this penetration.

And, if you look at what we have here, we have -- with respect to the bounding speeds that both the Staff and PFS analyzed, the bounding speed, our analysis show no penetration of the outer steel shell.

The State's is different. But our bounding analysis shows no penetration, therefore no loss of material. Now, with respect to our sensitivity case where we analyzed at a higher speed than the bounding speed, in which we did our fancy

calculation, we show that in the tip-over situation, there were a couple evidence of a steel shell that would be lost.

And if you look at page, State Exhibit 272, which is Tab 9, you'll see that that's the State's visual simulation of our analysis at this higher speed that was beyond our basic bounding speed.

And you see that most of -- a loss of minimal -- part of the outer steel shell. So, the point is that the Staff has looked at this issue in the context of the HI-STORM 100 COC.

It has determined that the penetration or breech of the outer steel shell is not of consequence. We don't have that in our bounding analysis of either PFS or the Staff.

And even in where they go beyond our bounding analysis, at most, we get something, a penetration, a breech. So I think that we've shown our bounding analysis fully supports our case, even assuming the State were right.

CHAIRMAN FARRAR: Let me ask you this --

JUDGE ABRAMSON: Can I ask a question about this figure?

CHAIRMAN FARRAR: Go ahead.

JUDGE ABRAMSON: Mr. Gaukler, I'm looking

at Tab 9, at the lower figure on page 5 of that tab. I'm sorry, the audience doesn't have this. This is safeguards related material.

But, let me just ask you a question about that. If I look at that, it looks like there is, as you've suggested, some loss of concrete and some penetration of the outer steel shell. Is that correct?

MR. GAUKLER: If you look at the next page, you will see that at a later time, at the top of the next page --

JUDGE ABRAMSON: Right.

MR. GAUKLER: -- it does show some loss of the outer steel shell.

JUDGE ABRAMSON: So, that's the worst case that anybody calculated in these analyses, that's the worst amount of damage that's ever been put in front of us?

MR. GAUKLER: That's the worst damage that we found. I can't speak for the State. The State never provided a detailed image of what damage they found.

JUDGE ABRAMSON: And, as I recall, this was for an impact speed that was worse than what was analyzed in our decision, our PID.

MR. GAUKLER: That is correct.

JUDGE ABRAMSON: So this is a lower probability event than we've determined was necessary to look at.

MR. GAUKLER: That is correct, Your Honor.

CHAIRMAN FARRAR: Mr. Gaukler, time is getting short. Let me ask you a series of questions. There's no doubt in your mind that if the State had properly raised this, this was in the gambit* of their original contention, right?

MR. GAUKLER: If raised initially, yes.

CHAIRMAN FARRAR: Okay. So, we don't have a problem about the scope of the original contention. This is fairly embraced.

JUDGE ABRAMSON: Let me make sure I understand it. If raised, and if properly supported?

MR. GAUKLER: Right. It's not within the scope of the contention as developed by the parties and then framed by the Board based upon that development by the parties. And that --

CHAIRMAN FARRAR: Let me just go back to when Judge Bollwerk* was working with you to reshape this contention, the original contention cover. There's no question.

MR. GAUKLER: The original contention is

very broadly written. It says acting probability that you haven't shown that you don't have a credible accident.

JUDGE ABRAMSON: So, Mr. Gaukler has run out of time to address my procedural question.

CHAIRMAN FARRAR: We're going to get to that. Don't worry about time.

JUDGE ABRAMSON: Okay.

CHAIRMAN FARRAR: Now, at the end of Hearing 1, we jumped right in and said, in effect, the Applicant lost Hearing 1, but they get a chance at Hearing 2 to show no consequences.

In other words, why is it not a matter of parity or equality to say, all right, the State lost Hearing 2, but now they automatically get to go to Hearing 3?

So, it can't be that the Appellant gets a second chance and a third chance, and we know the culture for the rules. You can always amend -- if you lose you can always amend your application and come back.

So, but even just limiting it to this narrow situation, you lose on Hearing 1 and we automatically say you get Hearing 2. Why don't we just as automatically say to the State you lost on

Hearing 2, you get Hearing 3?

MR. GAUKLER: First of all, if we had won on Hearing 1, that would have been the end of the day. Nobody would have had the right for the hearing because we would have met the requirements that were established.

CHAIRMAN FARRAR: Right.

MR. GAUKLER: Because Your Honor thought that we did not, we went on to the next step and --

CHAIRMAN FARRAR: But, we give you automatically a next step when you lose. Why doesn't the State automatically get a next step when it loses in the manner it lost this time on Hearing 2?

MR. GAUKLER: Because we've shown that we meet the requirements by being left with one time -- to the minus six.

CHAIRMAN FARRAR: Except I'm talking about the shielding.

MR. GAUKLER: Because they never properly raised that. The parties spent a long time developing the issues in this case, spent a long time -- fifteen days -- preparing.

CHAIRMAN FARRAR: Assume for the moment, for this question, that they had properly raised it. Now, somewhere in the evidence here there's some

damage to the shielding.

Should we turn around and say, okay, you did show some damage to the shielding greater than one in a million? So now we're going to automatically give you Hearing 3 and you're going to get to deal with radiation dose increases because of that.

Why is that not putting them on an equal footing with you?

MR. GAUKLER: Going back to the Board's procedural question, which assume it was properly raised.

CHAIRMAN FARRAR: Right.

MR. GAUKLER: Right now I'm assuming it was properly raised.

CHAIRMAN FARRAR: Right.

MR. GAUKLER: Assume it was properly raise,d how do you treat the issue? Okay.

CHAIRMAN FARRAR: Right.

MR. GAUKLER: Assuming they were properly raised, I think that we've already shown that's not material. And we don't think there's any need to go forward from that point on.

CHAIRMAN FARRAR: Wait, because this is -- because everybody in this room but us knows that with a level of damage to the shielding you're talking

about, it's inconsequential?

MR. GAUKLER: Based on what's in the record already, based upon the fact that the Staff has approved the HI-STORM COC with damage of this type, yes.

CHAIRMAN FARRAR: Well, I hate to say it, but what you -- I know what you're trying to argue from that document. But I'm not sure it gets you there.

Getting back to Vermont Yankee and the notion -- and this is not a motion to re-open. But, assume we were in the nature of a motion to re-open, why isn't the next step to confirm what you just said, the filing of expert affidavits by everybody, telling us what the amount, what the loss of the amount of shielding that stems from the worst case we considered, what the radiation dose consequences of that are?

Because, if we got those affidavits, we'd get one of three situations. Everyone would agree it's trivial, or likely trivial. Everyone would agree it's likely substantial.

Or there would be disagreement. Wouldn't that help us resolve this case?

MR. GAUKLER: Well, the State has never

filed a motion to re-open the hearing.

CHAIRMAN FARRAR: No, I know that. And I'm not saying that that's what I'm talking about. In other words, here we are. The State says, Board, with all due respect, you blew it, you missed something that we fairly raised.

Suppose we agreed with them. I'm not saying we do. Suppose we agreed, the next step is, wow, we've got to go do something. Well no, we don't have to do something under that Vermont Yankee case.

We don't have to do something if nothing's really at stake here. If the amount of loss of shielding is radiologically inconsequential, why shouldn't someone tell us that now?

And then we can cut through all this and say it doesn't matter if we missed it because nothing's at stake here.

JUDGE ABRAMSON: And perhaps let me say, it wasn't just the Applicant or the interveners, or the Staff who missed it. To my knowledge, this issue was never raised ever while I have been involved with this case.

So the question is, it's now been put before us that we should have dealt with it. And the question is, is there a nice simple way to at least

determine whether A, it would lead to a materially different result, and B, it has safety significance, which I think are the same.

MR. GAUKLER: I think it's really outside of the scope of this hearing. And, if really there is an issue that in the Board's mind that this hasn't been addressed properly in some manner, shape, or form, I think the function is of the Staff to look at that issue.

CHAIRMAN FARRAR: Mr. Gaukler, you and your colleagues, and everybody, all the lawyers here at the tables here have been around a long time. Courts and agencies frequently rule on alternative grounds.

Why aren't -- why isn't it even in your interest for us to say for you to get a decision that says, well, the State didn't raise this, would don't think, but even if they did, it's a no, never mind because there's nothing at stake here?

Why aren't you better off with that kind of decision? You may be right that we should rule in your favor on the first question. But you don't know that we're going to rule in your favor on that because I've told you -- because we've asked some questions that leave that in a little bit of doubt.

Why isn't it in everyone's interest to tell us quickly is anything at stake here?

JUDGE LAM: Well, for that matter, how would your interest or your client's interest be harmed by us examining this issue?

MR. GAUKLER: I think the point is that we've been going on this for eight years. You've been dealing with the consequences hearing for two years.

We've clearly identified how we were proceeding. Further delay just is -- you know, justice delayed, justice denied becomes -- at that point in time it almost becomes justice delayed, justice denied.

CHAIRMAN FARRAR: But you don't know that the State's not going to prevail on its motion for reconsideration. If they prevail on a motion for reconsideration and say, let's go to Hearing 3, then your client will know what delay is about.

And remember what we said in our opinion. The delay wasn't -- you know, the Commission sat there and said, finish this by the end of 2003. And we finished it not by the end of 2004.

We wrote an appendix to our opinion and said it wasn't our fault. You and the Staff took a lot of time to deal with this. So don't be talking to

me about delay here.

MR. GAUKLER: I wasn't intending any blame or fault anywhere. I'm just saying that, you know, we've been at this a long time. And I think the State had every opportunity to raise this.

CHAIRMAN FARRAR: You may be right. You can take your chance. And you may win on that. I'm not saying you're not going to win. I'm not saying you are going to win.

I'm saying, why isn't it in the interest of efficiency, in the interest of us knowing what's at stake here? I don't like to spend a lot of time on an issue that perhaps you people think is, perhaps everyone in the room thinks is meaningless.

Now, we could -- what's wrong with the following? At the end of the day we take the case under submission, we start working on our opinion, and in parallel we give the parties time to file an expert affidavit saying that under the bounding case the amount of damage to the overpack that was sustained does not have increased radiation dose consequences in terms of what the regulation requires.

There's no delay there at all. Some two or three weeks from now that comes in and we keep writing our opinion. And our opinion gets out just as

fast as it did.

Isn't that what Vermont Yankee talks about? Vermont Yankee says when you're in -- and I'm talking about in the nature of re-opening, while the State's motion is for reconsideration, there's some elements that are in the nature of re-opening here.

And Vermont Yankee says, before you re-open, you make sure that you have an issue that's consequential. We don't know if this issue is consequential or not.

Or are you telling us you can establish from the record, pulling together stuff from the seismic opinion, stuff that may be in the record about what happens in the canister transfer building when the canister is outside of the casks?

MR. GAUKLER: Well, you have repeated statements by Dr. Bjorkman and Dr. Soler saying that the damage to the cask here is irrelevant. That is the key to statements on the record which reflects their professional judgment having worked in the nuclear industry many years, Dr. Soler having worked with many years, that this type of damage is just irrelevant.

CHAIRMAN FARRAR: Irrelevant for purposes of no increased dose, or irrelevant for the purposes

that he thought was -- the limited purposes that you're arguing were all that was in front of us at the time?

MR. GAUKLER: His statement in terms of his belief that the damage was irrelevant, was a broad across statement in terms of meeting the requirements.

JUDGE LAM: I thought I heard Dr. Bjorkman and Dr. Soler when they talk about no damages were done to the cask system, they specifically make references to no damage were done to the integrity of the MPC.

If my memory serves me right, I don't think anybody was saying there is no damage to the overpack.

MR. GAUKLER: No, we're not saying there's no damage. Certainly deformation to the overpack, I'm not saying there's no damage to the overpack.

JUDGE LAM: Well --

MR. GAUKLER: And that was not the -- you know, I didn't mean it like that.

JUDGE ABRAMSON: Let's see if we can cut through this. Because, what I was interested in is what procedures -- I'm sorry to drag you back to that.

But what's a procedural question? Let me just, by the way, mention that I think we have -- it's

both been argued in the written briefs on this reconsideration motion, and it's clear in the record that the technical people view the overpack as a, quote, sacrificial barrier in a sense.

And you've put in front of us some information that indicates a worst case structural damage to the overpack in an even that's less likely than the one we consider bounding.

Come back to me now on the question of procedure. It seems to me -- and correct me or help me understand what you're saying. You're suggesting that a, the Staff has already dealt with this question by virtue of the fact that they've issued the -- what's it called, COC?

MR. GAUKLER: COC.

JUDGE ABRAMSON: Yes, a. B, if it needs to be dealt with, it's not for this board to deal with because the matter is not properly before us. Is that correct?

MR. GAUKLER: That is correct, Your Honor.

JUDGE ABRAMSON: And therefore we should deny this motion for reconsideration on this point because the matter is not properly before us and that the matter itself has been or should be dealt with by the Staff, not by us.

MR. GAUKLER: That is correct, Your Honor.

JUDGE ABRAMSON: Thank you

JUDGE LAM: Now, Mr. Gaukler, the manner you just talked about how the Staff had dealt with this issue, it's less persuasive than I would like to hear.

If my memory serves me right, tornado missile, the usual boundings object is a telephone pole. And for design basis tornado we are probably talking about 200, 300 miles per hour wind.

The amount of energy involved pale in comparison to what we are talking about here, a crashing F-16. So, assuming your citation is correct, the Staff had concluded a tornado missile does not pose a risk to shielding.

I do not know if that analogy is meritorious here. And, furthermore, you know, I understand everybody invests a lot of time on procedural matter here.

But I think site boundary dose would necessarily involve a component of shine*. If there's a loss of shielding, we know there will be a shine*. Now, would that be material to our proceeding? I don't think we know the answer yet.

CHAIRMAN FARRAR: Mr. Gaukler, while we

listen to Mr. Turk -- and the way this is going, we're going to give everybody another chance. I think what we're facing here, the State argued bitterly they wanted to deal with consequences all at once.

And we agonized over that decision. And we went in your favor over the State's objection. We said, okay, we'll just deal with probability. So they start -- and now I know you say they could -- you know, they didn't specifically focus on this.

But there is some element of an argument that they have that we didn't let them do it then, and we're not letting them do it now. Why is the Vermont -- when we come back to, we want a more considered answer about -- maybe it will be the same answer.

But I want to give you some time to consider. Ms. Chancellor, you can be thinking about it also, whether it isn't a much neater solution to get some expert affidavits here and see if we're dealing with an issue that's of any consequence.

Mr. Gaukler, we'll come back to you. Mr. Turk, I assume you can abandon your prepared outline and deal with what we've been talking about here, or not as you see fit.

MR. TURK: I thank you for that invitation. There's a lot in my outline that I will

abandon. But there's a lot that I really will need to cover.

CHAIRMAN FARRAR: Okay.

MR. TURK: Let me just note, I've been watching my time piece. The State took 30 minutes, which was the full allotted time that they had. PFS used about, according to my clock, roughly 40 minutes --

JUDGE ABRAMSON: I have 35.

MR. TURK: -- out of their 20. And I was allotted 20. So, please forgive me in advance if I exceed my 20. I think I may need to do that given the scope of the arguments that we've heard and the questions that the Board has raised already, which I will also need to address.

CHAIRMAN FARRAR: Or I could say that all of this so far is narrowed and focus the issues and you aught to be able to get to them very quickly because, -- go ahead.

MR. TURK: That would be a most unappreciated temptation.

(Laughter.)

MR. TURK: Let me say first of all that you don't give yourself enough credit. Your decision is correct. Your decision of April 15th, 2004 was

correct.

You scoped the issue correctly. The State wants you to set that aside. But they're wrong. And you should consider very carefully whether you need to set aside over a year of litigation based upon arguments of Counsel and your previous due consideration because the State has now come to you with a new issue.

And let me -- I will explain what that's a new issue. I would also like to first address, before I do anything further, the question of remedy.

If you find that the State has been wronged, I would ask you to certify that determination to the Commission under 10 CFR 2.718I, because that would be a significant determination that would radically affect the course of the proceeding and could well engender serious delay in the completion of the proceeding, which the Commission has indicated is long overdue.

And that's the remedy I would propose to you if you go the way the State is suggesting.

CHAIRMAN FARRAR: How about if we go the way I have suggested, which is while we're writing our opinion give parties two weeks to give us an expert affidavit?

Surely you're not going to suggest that's something I should certify to the Commission.

MR. TURK: I think it's fair to expect that the State will present an affidavit to you which raises a concern about dose consequences. Having brought the issue to your attention today, they're not going to give you an affidavit that says, by the way, don't worry about dose consequences.

So, if you do invite affidavits, you're inviting a dispute. Whether or not you find a genuine dispute of material fact, I can't answer. But you certainly are going to invite a dispute between experts.

CHAIRMAN FARRAR: And if and when we got those would be a nice time to certify to the Commission whether they want us to go forward or not.

Surely we're not going to certify against a possibility that might happen that isn't going to involve any delay whatsoever. But, move on. I don't need an answer on that.

MR. TURK: I'd like to address now the question of why were you right back in April of 2004 - -

CHAIRMAN FARRAR: I'm more interested in hearing that.

MR. TURK: -- in framing the issue the way you did.

JUDGE LAM: I didn't --

JUDGE ABRAMSON: I know why he was right.

MR. TURK: No, I appreciate hearing that the Licensing Board's law clerk, Ms. Roma, searched the record, because we did also. We performed a search of all of the pre-hearing conference transcripts.

And there were 15 of them by my count, approximately 16. We also did a search of all of the expert testimony, all of the cross examination in the case.

We find no mention in any of the transcripts of loss of shielding as an issue that you needed to consider. Why? The answer comes down to argument that was held before you in March 2004 as to what are the issues that you need to address in this phase of the hearing.

The State was represented in that argument. Ms. Chancellor presented argument for the State. PFS and the Staff were also present. And both Mr. Gaukler and I presented our arguments.

In that oral argument Ms. Chancellor stated to you, clearly the issue that the State raises

is one of penetration, release of radioactive materials, and the resulting dose consequences.

I'd like to distribute at this time if I may a full copy of the transcript of the March 30th, 2004 telephone conference. And I thank Ms. Zaccari* for joining me at table, because she's always been most helpful to me.

She deserves much more credit than I can possibly give her.

CHAIRMAN FARRAR: I notice that Darani was not smart enough to rejoin in with them.

(Laughter.)

MR. TURK: Actually, I had to borrow both of them from their current assignments.

(Pause.)

MR. TURK: I would ask you to first take a look at a statement at transcript page 14585 where Judge Farrar stated that there are four things we need to deal with today.

Quote, first is the question of what is and is not going to be litigated, close quote. At transcript page 14594 Ms. Chancellor stated, quote, the culture -- and here she's referring to NRC practice -- the culture is that the intervener shapes its case.

It goes forward with its case, and then the burden shifts to the Applicant. And the Applicant then has to defend against what the intervener comes forward with.

What we have come forward with is -- put these in brackets there -- penetration, criticality, and radiation doses. I don't believe that PFS concedes that if we show penetration, ergo there is unacceptable radiation consequences.

MS. CHANCELLOR: Mr. Turk omitted some of that quotation.

CHAIRMAN FARRAR: We've got it in front of us.

CHAIRMAN FARRAR: Okay.

MR. TURK: Throughout that telephone conference call there was repeated discussion by Ms. Chancellor of what is the case that they are presenting, what is their theory of the case.

JUDGE LAM: Now, Mr. Turk, are you saying, based on this transcript, when Ms. Chancellor talked about penetration, she was talking about penetration of the MPC?

MR. TURK: Yes.

JUDGE LAM: Is that what she wanted us to understand?

MR. TURK: Yes.

JUDGE LAM: Okay.

MR. TURK: If you look at page 14600, in response to you, Judge Lam, Ms. Chancellor stated, and here she was referring to expert reports, which had been presented already, if you recall the State at that point had presented an expert report, it was our first cut at the aircraft crash analysis.

And in that page they state that their expert reports show, quote, there will be penetration, that there will be unacceptable radiation release, and she goes on to talk about potential for criticality, and elsewhere.

She states, that is the case that we have presented to date. Again, she is referring specifically, they are not just to penetration of a cask structure, and you might ask, well what did she mean by that?

But here she is stating, very clearly, that she is talking about release. At transcript page 14601 she states, we feel that we can make a very strong presentation that within acceptable bounds there will be penetration such that there will be unacceptable radiation release and potential for criticality. That is our case of breach.

CHAIRMAN FARRAR: And the criticality required a moderator, either water or jet fuel, getting inside the canister?

MR. TURK: As I understand how criticality occurs you would need water to enter the MPC in order for there to be any chance of criticality.

JUDGE ABRAMSON: Mr. Turk, let me ask you the same question I asked Mr. Gaukler, and that is, how would -- how does the Staff, you as a lawyer and the Staff, as you understand it, understand the meaning of the term radiation release, does it encompass increased radiation, or does it include only the physical release of fission products?

MR. TURK: It is a fission product release, or other release --

JUDGE ABRAMSON: Escape of materials from the MPC, not decreased shielding?

MR. TURK: Yes.

JUDGE ABRAMSON: Is that your understanding of the common use of this term in NRC proceedings?

MR. TURK: Yes. Now, we also --

JUDGE LAM: Could it be -- excuse me, Mr. Turk. Could it be interpreted more broadly as if I had a high dose source that is shielded by lead, when

the lead is removed, then the radiation would increase dramatically?

What you just said, with that case is preclude from the term of radiation release?

MR. TURK: That would not be a release, that would be increased dose resulting from a loss of shielding, but that is not a release of radioactive materials.

JUDGE LAM: Right, but how about release of radiation?

MR. TURK: That is not a release of radiation, that is increased emission of radiation, but not a release of material, of radioactive materials.

CHAIRMAN FARRAR: Why aren't we far better off to have some affidavits in front of us that tell us whether this is a problem, then write an opinion that deals with how these words should have been parsed when different people might have been using them for different purposes at the conference?

MR. TURK: Because it would create an unfair procedural result at this time, after a year and a half, or two years of litigation, where all parties proceeded on the common assumption that the Board had.

That what we are talking about here is a breach of the MPC. For you to now say, well let's look at another issue that the State is bringing to our attention, would be to look at an issue that was never raised and, therefore, is not before y.

CHAIRMAN FARRAR: That assumes the answer, that assumes that you prevail on that argument. I'm asking, what if you don't prevail, or whether that argument is a real close one, that comes down to how we parse these various words?

You know, there is other people, other than us, that are going to look at this case. The Commission is going to look at it, and depending on who wins or loses there, one or another, the Courts of Appeals is going to look at it.

And why don't we want to resolve this issue not by parsing words? Now, maybe you win on the parsing of words, fine. You can take that chance.

MR. TURK: It is more thana parsing of words. And there is more in the transcript that I'm going to point you to that will show it is not a parsing of words.

But you may believe that you reach some efficiency by looking for affidavits. I believe the opposite. You will have inefficiency because you will

see someone, somewhere, claiming there is some terrible result from this loss of shielding.

The Staff understands how much loss of shielding may be entailed, we have our own view as to whether this is significant or not. But you will need to get affidavits. And I came to show you that you will have an inefficient outcome.

And I think, procedurally, you would make a very grave mistake to go that way.

JUDGE LAM: But can we, Mr. Turk, can we be better off, just for the sake of argument, if a storage cask is stripped naked of its concrete, where MPCs are standing out there, there would be a bounding analysis.

And assuming, in that case, there is no dose problem in the site boundary, then this issue is definitively behind us.

JUDGE LAM: If you did that, Your Honor, you would be taking a hypothetical case, which none of the analyses have shown will ever happen. All of the analyses in front of you, by the State, by the Staff, and by PFS, show that the overpack of the cask remains either intact, or virtually intact during an aircraft --

CHAIRMAN FARRAR: Okay, take that case,

instead of Judge Lam's case, take that case. You say, we had a big long hearing here, and one thing we did, we saw a lot of computer runs, and one thing was that you or Mr. Gaukler's picture, that we just talked about, the damage --

MR. GAUKLER: That was State exhibit 272.

CHAIRMAN FARRAR: And so there is, what you could argue, is the worst case and very little happened to the shielding. Now, I think your analyses that appears somewhere in the SAR, or somewhere, says that even if you got 4,000 casks you don't get anywhere near 5 REM.

So I assume one cask with a little bit of denting in it, that is child, maybe that is child's play for an analysis that says no big deal here.

MR. TURK: I wouldn't quarrel with you if we had an evidentiary record to support it. And I think that if we went to the evidentiary record, that is what the evidence would show, and that is probably the decision you would reach.

The question is, do you need to reach that, how much delay would you occasion by going there, and why start down that path?

CHAIRMAN FARRAR: Because I don't know if we need to reach it because we didn't -- the State

filed a Motion for Reconsideration. A lot of times you file a Motion for Reconsideration and the people you file it with say go away, we have been dealing with you for a long time, you lost, you lose again. We are sitting here having oral argument.

JUDGE ABRAMSON: Mr. Turk, let me ask you a more fundamental question. We heard a lot of structural analyses, we saw a lot of evidence on structural analysis about damage to the overpack, and some bending of the inner canister.

We've made a ruling that the bounding case was a certain case, and that we used that to evaluate our analyses. Is my recollection correct that the record will indicate, to us, the amount of structural damage to the overpack associated with that bounding case?

MR. TURK: I believe it does, particularly if you look at the computer analyses, where you have the entire event visually presented, and you see what happens to the cask.

JUDGE ABRAMSON: That is what I'm thinking. Now, if that is the bounding case, and that is an event which has a probability of occurrence of less than one in a million a year, therefore that is a more severe case than would happen at an event that

is one in a million a year.

Let me finish --

MR. TURK: You are talking about the State exhibit that PFS provided in this report that --

JUDGE ABRAMSON: No, I'm talking about the bounding case that we used when we reached our conclusion and wrote the PID. That bounding case had a probability of occurrence, we found, of less than one in a million a year.

And we haven't dealt, yet, with the State's arguments that maybe we were wrong on that number. But let's assume, for a moment, that our finding continues on that.

We have, in front of us, a case we have accepted, which indicates to us a certain amount of structural damage to the overpack. That is the bounding case, that is the worst case structural damage and we've already accepted that from the point of view of looking at the MPC.

Would we be improper in saying that is the right amount of structural damage to consider when looking at this question of reduction in shielding?

MR. TURK: I believe that would be the correct amount of damage to look at.

JUDGE ABRAMSON: And would you, could we

reasonably expect there to be material differences in computed radiation at site boundary, given that the start from that particular amount of damage?

I know you are worried about us getting completely disparate expert opinions. But if we were to request to the parties that they submitted a technical expert affidavit, indicating to us the increase in site boundary dose caused by the amount of reduction in shielding associated with one cask being damaged by the amount indicated in that bounding case, would you expect to have widely disparate technical results?

MR. TURK: I wouldn't expect experts to widely diverge. And I use the word experts --

JUDGE ABRAMSON: I understand, I understand.

MR. TURK: -- with a certain meaning, to mean people who are truly qualified and who understand how to do the analysis, and would do it correctly.

I'd like to point out something else, in terms of what is the issue before you, or what was presented to you. When we had our defining moments in March and April of 2004, where the Board looked to see what are the issues we need to address, the State had presented to you its radiation dose consequence

analysis.

That analysis didn't point to a loss of shielding, that analysis started with a postulated hole in the MPC. The State, at that time, was never precluded from saying to you, loss of shielding could occur, and here are the dose consequences.

The only case they presented, and Ms. Chancellor specifically refers to it in her statements of March 30th, the only case she presented to you was an increase radiation dose due to a postulated hole in the MPC.

If -- they have not been precluded from coming to you, at that point or any time later, and saying there will be dose consequences due to loss of shielding. They are truly raising it to you now for the first time.

The issue that the agency must decide, in licensing this facility, is whether regulatory limits are exceeded by any credible design basis accident. The issue that you have to decide is what has the State raised before you, and does PFS pass muster when that issue is looked at.

And that issue is not the broader regulatory question of the dose consequences resulting from loss of shielding.

JUDGE ABRAMSON: So now help me with the procedural I have been asking people who aren't involved with the Staff's process. What is the process whereby the Staff would look at this, assuming they have not, and we don't take it up, because it is outside the purview of, outside the scope of this hearing?

MR. TURK: We are well aware of the structural analysis that were conducted by PFS, the State, and by Staff, and Staff experts from the National Laboratories.

The Staff, I'm going to have to make a statement --

JUDGE ABRAMSON: No, the --

MR. TURK: -- expert --

CHAIRMAN FARRAR: What Judge Abramson wants to know is this something the Staff looks at? He doesn't want you to tell us that you've looked at it, and what you have concluded, because then our friends from Salt Lake would say --

MR. TURK: The Staff could look at --

JUDGE ABRAMSON: -- here we are, in phase three, let's go.

MR. TURK: If the Staff determined there was a reason to look further at the evidence that has

been presented, we would look at it. We would do that based on our expertise in determining what are the issues that need to be addressed in order to ensure public health and safety protection.

JUDGE ABRAMSON: So what I'm hearing from the Staff is A, this is not before us, and we can only litigate what is before us. B, this is a matter the Staff will look at if there is any reason to believe it has a material safety implication?

MR. TURK: That is correct.

JUDGE ABRAMSON: And, therefore, if there is a question of violation of that section of the Code that refers to site boundary dose, the Staff has or will look at it to make sure that this question is adequately answered?

MR. TURK: Yes.

JUDGE LAM: Now, Mr. Turk --

MR. TURK: I'm sorry. When I say yes, let me qualify. We won't necessarily do a full scale evaluation if we determine this to be immaterial or to have no real consequence. But if we see that there is some reason to have a concern, then we would take it further and say, okay, let's go into it in depth.

So there is always a threshold determination of do we need to look at something.

Just as Judge Lam pointed out to tornado missile, it may be a telephone pole, or an automobile that is looked at.

But, for instance, in the case of tornado missiles we wouldn't necessarily look at a tornado with winds of over 1,000 miles per hour. We would have to determine, first, is that the event that needs to be evaluated. There is a threshold determination that is made before you go into the detailed examination of a technical issue.

JUDGE LAM: Mr. Turk, my question was, have the Staff made a threshold determination, in this instance, that this is worthy of a second look, or first look?

MR. TURK: I don't know if I can get at that, Your Honor.

JUDGE LAM: No, I don't want to know the answer, or your conclusion. I say, have you made that threshold determination?

MR. TURK: I don't know that I can answer that. But I would say that if there were a concern, it would be looked at by the Staff.

JUDGE LAM: So your answer to Judge Abramson's question has been hypothetical?

MR. TURK: Yes.

JUDGE LAM: If there is a concern you would look at it?

MR. TURK: Yes. Let me point out one more thing in that same transcript of March 30th. And I'm sorry to prolong this, but I think it is important to note.

Ms. Chancellor states, at page 14635 to 636, quote, the State has put PFS and Staff on notice that this is how we are going to pursue our contention, the issue that is still remaining.

CHAIRMAN FARRAR: What page?

MR. TURK: At 14635 to 636. She goes on to say that PFS and the Staff have known for six or nine months what the issue is. And that is, precisely, the point. The issue raised by the State, which they put us on notice of, was the possibility of a breach of the MPC, and that is it.

When Judge Farrar declined to rule, in that telephone conference, what the issues would be, but instead decided to wait until Judge Abramson could join in the conference, he stated at page 14640, this is a key matter, that we want to make sure we get right and think about. It does determine the course of the proceeding.

I submit, Your Honor, if you decided the

issue correctly there is no reason to reconsider because the State is raising an issue now for the first time.

Throughout the course of the proceeding -- I'm sorry?

CHAIRMAN FARRAR: But weren't we talking, there, about the key issue that determined the course of the proceeding, whether we were going to do phases two and three together, rather than separate them?

Is it fair to read, into what I said there, that we were also clear on what the issues were in phase two?

MR. TURK: I understand your decision to address what are the structural issues that need to be addressed. I understood that what you were going to do was to decide what is the probability of an impact that could have significant structural consequences that could result in doses to the public.

Now, you may have intended something else, but I read your statement that way, Your Honor.

JUDGE ABRAMSON: Doses from radiation release.

MR. TURK: Well, that is the issue that had been framed, and that is what was then focused upon.

JUDGE LAM: The radiation release, we are not talking about radioactive material release. I see all of our --

MR. TURK: When I use the word release I'm talking about radiation materials, an increase in radiation is not a release of radiation, it is just an increase in the amount of radiation.

JUDGE LAM: Right. But the transcript you provided Ms. Chancellor had always talked about penetration and radiation release. She has not talked about radioactive material release.

MR. TURK: She was referring to her expert studies that are premised on a hole in the MPC. She had no studies, ever, that would say there is increased radiation consequences where you don't have breach of the MPC, that is the only issue raised.

CHAIRMAN FARRAR: Is the nature of the State's offer of proof help us here? Ms. Chancellor argued that the offer of proof only is, I could paraphrase and say only partial. But are you arguing that we should look at the offer of proof and say that's why you get an offer of proof, and that does not go to increased radiation dose from loss of shielding?

And then we could rely on the limitations

of the offer of proof as part of your case against them?

MR. TURK: The offer of proof actually makes the case against Ms. Chancellor. And I say that for two reasons. In the offer of proof itself the State indicated that the Board had given the State, quote, the opportunity to make an offer of proof on the substance of the evidence it would have presented on consequences. Should the Board have ruled in its favor by having a combined trial on the probability of cask breach, and the resulting consequences.

Instead the Board limited the current trial to the probability of cask breach. When she used the term cask breach, she is talking about MPC breach, that was their issue.

In their proposed findings they refer to the offer of proof and they state there, and this is at page 4 of their proposed findings they refer to the offer of proof, and they state there, and this is at page four of their proposed findings, quote, the State presented an offer of proof in which it described how it would have integrated the results of the cask breach probability phase to show there is greater than a one in a million probability that there would be a breach of the barriers between the spent fuel and the

environment and excessive dose of radiation and a potential for criticality.

That offer of proof, again, refers to cask breach, a loss of barriers between the spent fuel and the environment, and the case that they made to you, in that offer of proof, is a hole in the MPC, it is not a loss of shielding.

That is the case they wanted you to consider that they claimed they were precluded from presenting.

JUDGE LAM: Could they argue, Mr. Turk, could they argue a loss of barrier can be loosely interpreted as two, the two barrier, one is physical confinement of fissile material, or fission product material, which is the MPC.

There is another barrier against radiation, which is shielding. I mean, could somebody in our business would interpret it loosely that way?

MR. TURK: If the State had raised the issue they could have, possibly, described the concrete steel overpack as a barrier for radiation protection, rather than just a barrier between the spent fuel and its being released to the public.

But in their proposed findings the only regulation that they cited, with respect to barriers,

was the confinement barrier. They used the definition in 10CFR72.3 for confinement barrier, and that is a barrier against release of radioactive material. It is not a barrier against radiation dose. So they don't raise the issue.

I will hand my prepared remarks and I may just respond to a few questions that were raised before, and I will try to make this very brief.

I'm going to make it very brief because I think I have addressed most of the points already. The one point, I guess, that I would like to make is in response to Mr. Gaukler.

I don't believe that the tornado missile analysis that he points to, in Staff exhibit FF, resolves the question for you. It does suggest an outcome, just as the seismic testimony suggests an outcome of breach, if you are going to touch on the issue of radiation doses.

But, in our view, it is not what you should now be looking at. You should not be basing a decision on the State's motion on that kind of information.

And I would conclude only by stating that I believe Your Honors got it right. The State raised the issue for the first time too late. And it would

be a gross procedural error to now take it up and try to address it at this late date.

CHAIRMAN FARRAR: All right, thank you Mr. Turk. Ms. Chancellor, go ahead.

MS. CHANCELLOR: Thank you, Your Honor. I would just like to make the point that an F-16 ordnance accident is not a design basis event, it is not within the design basis of the cask.

We get into this splitting the baby of release versus exposure. I might note that Mr. Turk and I think the NRC Staff, in their response to Utah's Motion for Reconsideration, at page 4, state: While the Board, talking about the standard that the Board used in the earlier decision, and saying that the final PID is consistent with the standard.

While the Board described the standard in the context of radiation "release" rather than "exposure" this short-hand description of the standard was appropriate in light of the focus on canister breach that was shared by all parties.

So what the Staff is saying in their response is that the standard is exposure to radiation. And what the parties do cannot change that standard.

I feel like that the State has had to try

probability over and over, and over again. And that was the point that we were making in that March 31 conference call. There was something that I think you said in the Decision, that I think is important to note.

You've got the probability of a crash into the site leading to a cask breach, leading to radiation consequences. And that there are really two ways of looking at this. Probability of a cask breach calculation, so you are still in the probability stage, for the consequences of a site impact calculation and you are on the consequences side.

What this argument on March 30th was doing, is we were talking about we should be on the consequences side. And I think that PFS took this upon itself. They talk about justice delayed.

But PFS adamantly refused to deal with radiation dose consequences. They insisted that even though we brought forward our case, at that time, back in 2003, what we would have put on, on consequences, but as you can see, by the testimony that evolved, up through the hearing, those things changed.

We don't know what the State's case would have been at the end of the hearing. We did raise penetration of the cask. There is nothing, in the

record, to suggest that we were referring, solely, to the MPC.

Our findings, and I think it is important to note that findings are based on the parties' view of what evidence is in the record. And our conclusion, based on the evidence in the record, was that the Licensing Board finds there is no evidence, in the record, to demonstrate that an F-16 crash, into a HI-STORM 100 cask system will not result in breach of the overpack shell and not result in an increase in radiation dose.

That is a finding that we asked you to make, that is a finding that you did not make. And I think that you can say that the overpack, I think you can treat that as synonymous with shielding, that is its function.

CHAIRMAN FARRAR: But findings may be too late. In other words, there is a lot that goes into the case before findings. Everybody pre-files their testimony, we have 16 days of hearing, we cross examine, we ask a lot of questions.

And I would feel better about the strength of your case of having raised this, if you were pointing to somewhere before the trial, or during the trial, rather than after the trial.

MS. CHANCELLOR: We have a table showing where testimony was presented as to rupture of the overpack. It is not as if we wrote these findings knowing what your decision was going to be.

CHAIRMAN FARRAR: Correct.

MS. CHANCELLOR: We had really considered that your decision would come out differently.

CHAIRMAN FARRAR: Okay. So your argument is, your best argument is you had evidence about rupture of the overpack and because the Applicant and the Staff had convinced us not to do consequences, of course you didn't have evidence about increased radiation dose because that was off the table?

MS. CHANCELLOR: That is right.

JUDGE ABRAMSON: Ms. Chancellor, I agree there are numerous references to rupture of the overpack, or rupture of the cask. But I'm troubled by the lack, anywhere in the record, of a single mention of shielding.

Can you point me to anywhere, you failed, so far, although we requested it explicitly, failed so far to show us anywhere in the record where there is a mention of the word shielding. Is there any such, to your recollection?

MS. CHANCELLOR: No, Your Honor, because

we didn't believe that was within the scope of what we were to present to you. And what we did show was rupture of the overpack which, to us, is synonymous with loss of shielding.

JUDGE ABRAMSON: I see. So we were to assume that because you talked about rupture of the overpack, and even though the 16 days of hearing, and all of the testimony in evidence, and expert information in front of us focused on the possibility of puncturing the MPC and actually physically releasing radiation, we were to assume that your references to rupture of the overpack should be interpreted to mean reduction in shielding?

MS. CHANCELLOR: Two things. I mean, all the parties did take the time to compute the strains in the overpack. With respect to what you should draw from our findings, you have to look at the legal standard that we presented in our findings, as well as the factual findings.

And on page 13 of our findings we have the regulatory standard in these proceedings. And we went through and we got a couple pages of analysis of the various regulations and we talk about each barrier of the cask between the spent fuel and the environment and maintaining its integrity as a barrier in the

event of a credible accident or ordnance impact.

That is man-induced design basis event. And that SSC is needed to prevent spent fuel and cask structures SSCs needed for fuel retrieval, also need to be designed to perform their functions in the event of a credible accident.

And the regulations we cite to, both here and in our Motion for Reconsideration, those regulations require that SSCs perform their functions under normal and accident conditions. And our point is that if the overpack is ruptured it is not performing its function, and its function is to provide shielding.

I mean, I think that the --

JUDGE ABRAMSON: Yes, I understand that you're asking us to interpret the references to failure to perform a function to imply, to us, that because one of the functions of the overpack is shielding, that because it may fail to provide its shielding function, and you made reference to failure, requirements that they continue to satisfy their functions, that we should have seen, or that it was meant by you that at issue here was reduction in shielding.

MS. CHANCELLOR: I believe we made the

same type of finding for the MPC, and we didn't talk about the inventory of fissile material required for a dose at the boundary for rupture or breach of the MPC.

I think we are being consistent.

JUDGE LAM: So, Ms. Chancellor, am I to understand you this way? The critical part of your argument is that you did not talk about dose at the site boundary because the Board has ruled that we are not dealing with consequences?

MS. CHANCELLOR: That is correct, Judge Lam.

CHAIRMAN FARRAR: Ms. Chancellor, what do you think of our expert affidavit suggestion?

MS. CHANCELLOR: I think if that is the way the Board wishes to proceed we would go ahead and provide you with affidavits. I think it would be similar to a Motion for Summary Disposition, and that the burden would be on PFS, because if you want expert affidavits then it is because there may be loss of shielding, which leads to an increased dose, something that PFS in its counting bin didn't include.

CHAIRMAN FARRAR: If I want expert affidavits it is because I want to know should I worry about this issue or not worry about it.

MS. CHANCELLOR: Well, you definitely should worry about it.

JUDGE ABRAMSON: We don't know that yet because there is no demonstration, no information in the record, that tells us whether this either has safety significance, or if it was error, whether it is an outcome determinative error, there is no way for us to determine that.

MS. CHANCELLOR: This is not a motion to reopen the record, this is a motion for reconsideration. And we are asking you to overturn your decision and go to phase 3, provided that PFS and the Staff have not waived their ability to do that. That is what we are asking you to do.

And you cannot expect us, after you have eliminated dose, the consequences of an accident, you have chopped us off from presenting that issue, even though we wanted to, now you are saying, where have you presented evidence of consequences?

I feel like we are in a little bit of a catch-22 situation here.

JUDGE ABRAMSON: We have never said to you where have you presented evidence of consequences. We are merely seeking to understand if, in fact, you raised the issue of shielding reduction anywhere in

the course of this hearing.

MS. CHANCELLOR: And shielding gets to consequences.

JUDGE ABRAMSON: No, ma'am, no, ma'am.

CHAIRMAN FARRAR: It gets to consequences but before we get to a phase three it would seem to be a wise course to have some inkling about whether phase three is important at all.

I'm not saying the three of you will agree, but somebody suggested that three legitimate experts, all starting with the same base case would come up with kind of a same analysis.

MS. CHANCELLOR: I'm not sure what that base case is, if we go by the PID, there is no references to --

CHAIRMAN FARRAR: The base case would be the damage to the shielding associated with what we found to be the bounding --

MS. CHANCELLOR: Okay, I understand.

JUDGE ABRAMSON: And we would expect that the parties would start from identical physical situations.

CHAIRMAN FARRAR: And if it would take you a --

JUDGE ABRAMSON: And you may differ in how

you get the result, and I would expect there to be, perhaps, some minor differences in the result. But this should be like what we did during the aircraft consequences case, where we asked you to go back and do something, all starting from the same point and see what you got.

If we were to do this we would certainly insist that you all do the same thing. We are not interested in reopening and having a whole bunch of new theories here.

CHAIRMAN FARRAR: And another twist on that might be, I know you were concerned, before, about your ability to keep consultants on the payroll, and so forth, for a long time.

We could leave it to your option, let the Applicant and the Staff do it first, and your person take a crack at it, take a crack at reviewing it, that is a possibility.

MS. CHANCELLOR: That is a more appealing possibility because over the course of time many of our experts have moved on to other things, retired, one has even died.

So I just don't know how quickly we could retain an expert.

CHAIRMAN FARRAR: The gentleman from

Perdue?

MS. CHANCELLOR: Pardon?

CHAIRMAN FARRAR: Not the gentleman --

MS. CHANCELLOR: No, this is somebody, it may have even been before your time, Judge Farrar.

CHAIRMAN FARRAR: Okay. How is he doing, from Perdue?

MR. SOPER: He is doing well.

CHAIRMAN FARRAR: Marvelous. Ms. Chancellor, do we have your argument?

MS. CHANCELLOR: I'm sure there will be something else when the other parties respond, but that is all I have for now, Your Honor.

CHAIRMAN FARRAR: Very well. Mr. Gaukler, have you put to good use your opportunity to think, again?

MR. GAUKLER: Going back to the March time frame, March/April of 2004, I would note that basically we had our expert report prepared at that point in time, and we are thinking in terms of going to hearing, the State asked to revise those expert reports, take into account changes we had made in our expert report with respect to the addition to the cask design.

But that was the timing of the case, they

had done their expert reports already, and they were coming in, they were going to make changes based upon changes that we had made in our generated expert reports.

CHAIRMAN FARRAR: And were those expert reports substantially the same as what became the later offer of proof?

MR. GAUKLER: Well, they never did more expert reports in terms of dose consequences, but that was overtaken by the Board. But the point is that it was after that point in time, I think, mid April they notified the Board that they felt they needed to file new expert reports with respect to structural issues based upon the structural changes we had made in our design.

And so that is an issue they raised, in mid-April in terms of new expert reports. But back at this point in time they were already talking about their case, and planning to introduce at hearing.

And in terms of, they talk about criticality in the March transcript. Well, you cannot have criticality without breach of the MPC.

CHAIRMAN FARRAR: And that came, that was clearly stated in one of --

MR. GAUKLER: One of those points that Mr.

Turk --

CHAIRMAN FARRAR: In one of the pre-hearing transcripts.

MR. GAUKLER: I want to make a couple of other real quick points. She refers to this issue of having raised the breach of the outer shell of the cask, and other design basis requirements.

Basically she is arguing legal damage as far as, that is based upon her interpretation of the regulations. And we addressed that, extensively, in our reply findings at page 11-16 in our reply findings.

We addressed, extensively, why their claim about you can't have breach of the fuel cladding, can't have breach of the outer cask. In other words, she was talking about breach of the cask's outer shell, and breach of the fuel cladding in the same breath, and having the same import.

And, obviously, breach of the fuel cladding you are still going to have it contained by the MPC if you don't have any breach of the MPC. So she was making a legal argument based upon your understanding of their reading and saying that this is what the regulations require.

And we responded that at pages 11-16 of

our reply brief, and the Board essentially will not favor at PID B-2. One other thing, before I get to the last issue, she refers to the findings of fact 86 and 87 in their proposed findings.

I would ask the Board to turn to tab 8 in the book I gave you. Those are the two findings of fact that the State refers to. And if you look at the last sentence of finding 86 -- well, look at 86.

It says, therefore this Licensing Board finds none of the scenarios analyzed by any party show the outer pack, outer shell, or inner shell, is safe from rupture. Accordingly the Licensing Board finds that the evidence regarding assessment of the HI-STORM 100 REV Zero overpack fails to, and I emphasize, prove containment of the radioactive material.

She is not talking about loss of radiological shielding, she is trying to make this into an argument that it doesn't contain the radioactive material inside the MPC.

And finding 87 is just, accordingly the Licensing Board currently finds, it is just a conclusory sentence based upon 86. So I don't think even those two findings does the State raise the issue.

CHAIRMAN FARRAR: So you are saying in 87

the reference to increase in radiation dose is not an independent finding, but a conclusory finding based on what went before, which you find inadequate to raise the issue?

MR. GAUKLER: Yes, you look at 86, there is the radioactive material, 87 starts out saying accordingly. In that light we believe that the record is overwhelming that the State is changing the scope of the issue at this -- it is not even the 11th hour, it is after midnight.

CHAIRMAN FARRAR: And let me guess, now you are willing to bank everything on that, and you don't want to give us the affidavit?

MR. GAUKLER: Well, we believe the Staff has identified, I think the Staff has identified the appropriate approach in terms of resolution of this issue. They believe it is some type of concern to look at, and that is the proper role of the Staff.

CHAIRMAN FARRAR: But that assumes you and the Staff are right, that the State didn't raise it. I'm saying if we were to conclude that the State did raise it sufficiently to put it in front of us, you don't want to help us, perhaps help your cause with an affidavit?

MR. GAUKLER: If you ask us to give an

affidavit we will give it, Your Honor, but we are just concerned about the slippery slope. You heard it from the State saying how we can't do it now, we want to respond to what you do.

CHAIRMAN FARRAR: So you caution me against any vain hope that I get an affidavit, we get an affidavit from all three of you that says the same thing?

MR. GAUKLER: I'm pretty sure, I can't speak for the other parties, I don't want to presume for the Staff. I know what I would say.

CHAIRMAN FARRAR: Is that it, Mr. Gaukler?

MR. GAUKLER: I believe so, yes.

CHAIRMAN FARRAR: Mr. Turk, do you want to, very quickly --

MR. GAUKLER: I did want to mention one other point. The State talks about loss of radiological shielding, that it wasn't appropriate to get into because it goes to dose issues. But you could quantify the loss of shielding, just like you quantify the standard of the MPC, as to whether or not you are going to get a failure.

There is never, if you look at their September 2003 report, let's just focus on the MPC, stay on the MPC, their May 2004 structural report,

again focused on the MPC, they make no assessment of damage, no quantitative assessment of shielding, loss of shielding of the cask overpack.

And there is no quantitative assessment at any point that loss of shielding has a physical effect, just like straining the MPC has a physical effect, and you can qualify it, but they made no attempt, in any of their expert reports to do so.

CHAIRMAN FARRAR: But you didn't either, but you will tell me the reason you didn't is because you were showing us the overpack in those computer runs just as part of what happened to the MPC. And so nobody quantified --

MR. GAUKLER: Right.

CHAIRMAN FARRAR: -- you showed us strains on the overpack but nobody said and, therefore, here is what physically results, because all we are focusing on is the MPC, not the loss of shielding?

MR. GAUKLER: Right. And if you recall, Your Honor, I think I made the point that I believe that everybody started focusing on the overpack, really focusing on the overpack after Judge Lam raised this question about the overpack, I believe, the second week, at the end of the first week, or second week of the hearing, that is when you really began to

see the parties begin to focus on the overpack at that point in time.

But it wasn't in terms of loss of shielding it was in terms of damage and the potential effect on the MPC.

JUDGE LAM: But, Mr. Gaukler, I'm well aware of your concern about procedural matters here that, you know, this is a slippery slope, quote unquote, as you just said.

But based on the science here, isn't it true that site boundary dose has two basic components? One is from radioactive material releases by failure of the confinement, which a majority opinion has concluded is not something to be worried about.

But the second component are radiation increases due to loss of shielding has not been addressed. Right now this Board is sitting here without knowing which way, how material that impact is.

So how would you recommend that that issue be resolved, besides what you said earlier, let the Staff take care of it?

MR. GAUKLER: Your Honor, the issue is outside the scope that the contention has, as it developed by the Board. At least from our

perspective. There is a good reason why it is outside the scope, but I don't want to get into that, because I don't think it is appropriate.

But we have a function, as an Applicant, to make sure that what we do is safe. And the Staff has a function too, from its duty. We would not provide something to this board that we did not think was technically justified, that made the point, that we met the requirements of the regulation, unless we believed that to be the case.

JUDGE ABRAMSON: May I, Mr. Gaukler, just follow this up for one brief moment? Did I understand this correctly, outside the scope means it is improper for us to consider it?

MR. GAUKLER: Yes.

JUDGE ABRAMSON: That it is not something we may consider?

MR. GAUKLER: That is correct.

JUDGE ABRAMSON: Thank you.

CHAIRMAN FARRAR: Mr. Turk?

MR. TURK: Your Honor, it is late, I will make it very quick. Two points, and I'm going to ask Ms. Zaccari, once again, to distribute the transcript. This is the transcript of the very next telephone conference after the one that I distributed

previously.

This is the telephone conference of April 8th, 2004. It was in this conference that the Board adopted the issues for hearing. And two points that I want to make, that appear in this transcript.

First of all, Judge Abramson, at pages 14663 to 664, stated that "by addressing the probability of the series of events that will be discussed in this hearing, the State will have an opportunity to demonstrate that the events that it wants to consider are probable enough that they would reach the threshold of probability."

And this is the perfectly appropriate approach for addressing the issues that need to be addressed. If the State had identified loss of shielding in response to that comment, that this is an issue that they want to have addressed, all parties would have addressed it.

There is no reason why PFS and the Staff could not have introduced testimony on the amount of loss of shielding that would result. It was not raised, it was not framed as an issue, they didn't address it. That is unfair.

The second point I would make on this transcript, Mr. Soper entered the fray. It was in this

telephone conference that he identified the possibility that the State might introduce additional reports beyond what they had filed previously.

At that point, again, Judge Abramson and Judge Lam discussed with Mr. Soper what those reports might entail. Judge Abramson expressed the view that the --

CHAIRMAN FARRAR: What page are you on?

MR. TURK: I'm going to give you that.

CHAIRMAN FARRAR: Okay. Is it 14716?

MR. TURK: I believe it starts there, where you talk about modifications to design, starting at 716, going to 717. Judge Abramson indicated he assumed that whatever new reports the State would come up with would address those modifications.

But the State was not limited to that. I'm looking for this precise page, page 14721, Judge Abramson states that "my guess, from a technical perspective, is that the revision should only reflect the structural changes that were subject to TT, and should not reflect methodology changes, but the State can tell me what they were going to do."

Judge Lam agreed. Judge Lam stated, in the following discussion, that "even if the State comes up with new methodology, I think the State's

obligation is only to disclose it. Now, if that delays the proceedings, so be it." And Judge Abramson agreed.

The point is if the State had come to you with something we could have all adjusted then and argued whether it is appropriate or not.

CHAIRMAN FARRAR: Okay. We will read that and see whether that has any bearing, what extent it has bearing on the question before us, as opposed to other questions.

MR. TURK: And the only other point is one sentence in their proposed findings at pages 19, 21, 22, 95, and 96, the State identified the issue as a breach of confinement and a release of radioactive materials.

CHAIRMAN FARRAR: All right. Ms. Chancellor, we have long exceeded our time, we will give you a minute if there is anything you really need to tell us.

MS. CHANCELLOR: Just one thing, Your Honor. From the State's perspective, referring us to the Staff is not always a satisfactory result for us. We find that unless we bring the issue forward, that it doesn't get the full airing it deserves.

CHAIRMAN FARRAR: All right, thank you.

Let me consult with my colleagues, here, on how long a break we will need.

(Pause.)

CHAIRMAN FARRAR: All right. We think a short break will suffice. I have 3:21, let's be back at 3:35.

(Whereupon, the above-entitled matter went off the record at 3:21 p.m. and went back on the record at 3:35 p.m.)

CHAIRMAN FARRAR: We are back on the record now. And having spent half the oral argument time on an issue the State says we neglected to consider, we will now turn to some issues where they say we considered them but got them wrong.

And, Mr. Soper, as we said, we would like you to start on the seven crashes.

MR. SOPER: Thank you, Your Honor. Good afternoon to the Bench. At this point in the State's motion, concerns the data base used to calculate the probability or, excuse me, the impact speed and angle and thus the probability of the ultimate release of radiation that we are concerned with in this matter.

Of the data base of 57 crashes that were used by PFS, and of course none of these 57 crashes actually happened in Skull Valley, those are crashes

that happened elsewhere, and they are selected, should be selected on the basis of whether or not they could occur in Skull Valley, so that we might consider them as being representative of the crashes that we might expect at the PFS site.

The State's point is this, that whether or not these planes could crash, these particular crashes could occur in Skull Valley, is the subject of expert testimony from two F-16 pilots who actually fly in Skull Valley, or have had experience flying F-16s in Skull Valley, one for the State, and one for PFS.

Seven of the 57 crashes, used by PFS to predict the impact speeds were crashes from take-offs, or landings, that could not in fact occur in Skull Valley, which has no landing field.

And both experts from PFS and the State agree to that. And if you remove those seven from the data base, from the calculation, --

CHAIRMAN FARRAR: Before we get to what happens if you remove them, let's track what happened. The Applicant came in with 57, and then as the hearing progressed there was other testimony, and homework assignments, and so forth.

Are you saying there was, essentially, agreement of the parties that we didn't take note of,

there was, essentially agreement of the parties that those seven didn't count?

MR. SOPER: Yes, Judge Farrar. And that is a very good question. Let me answer it this way. Here is how this came about. The State's F-16 pilot testified that 13 of the crashes used by PFS could not, in fact, occur in Skull Valley.

Nine were from take-off and landings, according to him, and four for other reasons.

JUDGE ABRAMSON: Mr. Soper, was that 13 of 61, or 13 of 57?

MR. SOPER: It was 13 of 57. The Board then asked each party to disregard labels, because as you know there was a tendency to use Skull Valley type events, which is not a label for crashes that could occur in Skull Valley. It has to do with what caused the crash, which means that it could occur anywhere.

So the Board said disregard those labels and reassess whether or not the 57 crashes could, in fact, focus on whether or not it could, in fact, occur in Skull Valley. And whether the crash should, therefore, be removed from the data base.

I'm asking to be passed out, just for the Board's assistance, PFS exhibit 319. This is, in fact, the reassessment of those 13 crashes, this is

PFS' reassessment of those 13 crashes.

And if you would call your attention to the highlighted portion, here, which is not part of the exhibit, that I have added, the Board also suggested that the parties disregard any labels previously used to identify, or categorize, the accidents, and focus on the specifics of each crash, and whether it could occur in Skull Valley.

For the purpose of further sensitivity analysis we have undertaken such a reassessment here. It is focused on the nine so-called take-off and landing accidents, plus the four accidents that LTC Horstman asserted should be excluded.

Jumping to the very last paragraph, the table below identifies each accident, states the reason the State claims it should be excluded, gives the aircraft altitude at which the mishap initiating event occurred, the pilot's ejection altitude, the ejection speed, if known, and the impact speed, if known.

This is the important sentence. It then states whether the accident should be included or excluded from the crash impact speed and angle frequency determination, and why, relying on the information in the F-16 mishap report.

CHAIRMAN FARRAR: Dr. Cornell says exclude seven of them. Did the Applicant adopt that view in its proposed findings?

MR. SOPER: Yes, sort of. First of all, it wasn't just, although Dr. Cornell's name appears here, he refers to assessment with the pilots. And this is a reassessment jointly with them.

Now, if you will note that the table --

CHAIRMAN FARRAR: Yes, I follow -- this report says, okay, seven are out. And the Applicant, as a party litigant, adopt that, or was there some other evidence that they relied on, and what was the Staff's position?

MR. SOPER: I'm just about to get to that, Your Honor.

CHAIRMAN FARRAR: Okay.

MR. SOPER: Let me mention one last important thing about this table. Not only did they say they should be included, or excluded from the data base, but they actually gave PFS' reason why it should be included or excluded.

CHAIRMAN FARRAR: We will get back to that in a minute. Help me, I want to know what the parties' position -- we will come back to that. But I want to know what the parties' positions were.

MR. SOPER: All right.

CHAIRMAN FARRAR: Because you said PFS, the Applicant did it, sort of.

MR. SOPER: Well, they conceded these could not happen in Skull Valley but then, rather than concede that it affected their analysis, they did this. They said, well, we have performed a sensitivity analysis which, in fact, appears on page 8 of this same document.

And rather than saying well, if we took these out of our analysis, the UEP would increase, they said this. Well, if we did a sensitivity analysis, which we did, and we assumed that had we done our original analysis, not by giving equal weight to all of them, but by weighting each crash according to whether or not it occurred in sevier B, or sevier D, then under that type of analysis, if we took out the seven, it wouldn't increase, in fact it would go down.

So they said, apparently to avoid the issue that their analysis is adversely affected by this, they say, well if we do a different type of analysis it would go down.

CHAIRMAN FARRAR: So you are going to say if we stuck with the original analysis we should have

just thrown these seven out?

MR. SOPER: Well, clearly, it corrupts the data base because now we are predicting the frequency that we are going to expect a certain crash to happen.

CHAIRMAN FARRAR: No, don't get ahead, let's take these one at a time. If we stuck with the original analysis it would have been very simple, just throw these seven out, everyone agrees -- now, they are going to try to backfill a little bit with the sensitivity analysis, but you are saying the basic position, before we get to page 8, is these seven are out?

MR. SOPER: Yes, these seven are out.

CHAIRMAN FARRAR: Did the Staff agree with that?

MR. SOPER: I'm trying to remember if I know anything specific about that. But the Staff, generally, supports anything PFS does. So my guess would be yes.

CHAIRMAN FARRAR: Now, Mr. Soper, you know when you say that Mr. Turk is going to filibuster and sound off.

MR. SOPER: Then I apologize for the way I put it.

MR. TURK: I'm just laughing quietly.

MR. SOPER: However, I think the facts will bear that out.

(Laughter.)

MR. SOPER: So, in other words, having concluded that these seven accidents could not, in fact, occur in Skull Valley, they resurrect the issue by saying we will do the analysis entirely different and then we still come out lower.

CHAIRMAN FARRAR: Before you go on to the rest of your argument let's talk about these seven.

MR. SOPER: All right.

CHAIRMAN FARRAR: I remember two things from both sets of hearings. One I asked, did you ever try to -- because we were wondering whether landings could ever take place near the casks.

And I asked, did you ever try to crash land this thing, you know, like in the highway or the desert? And they said, no, the plane -- there is clear evidence the planes are too fragile, you would never try to land it in the desert.

But there was also testimony that sometimes when you are in trouble, coming down Skull Valley, you head for Michael Army Air Field, which is 15 to 20 miles south of the site, if I'm not mistaken.

I could look at at least four of these and

there two of these seven where it was so soon, right after take-off, that I'm going to ask the Applicant why they were ever included in the first place, because the plane just took off and never got anywhere.

That obviously couldn't happen, and it is an engine failure on take-off, when there is a lot of stress, and I don't know how those ever got included. But the other four, can't you posit a scenario, and the reason I don't mention seven, we can't find, we are missing one report.

There is four of them where can't you posit a scenario where the pilot is trying to get to Michael Army Air Field and doesn't make it, and a similar event happens, like in those four?

MR. SOPER: Well, first of all, what scenario might be posited by those of us that don't fly F-16s and might assume that, maybe -- Mr. Turk suggested one time the F-16 could turn upside down and try to view where the site was.

Those of us that don't fly F-16s may suggest a lot of scenarios. The two people that fly F-16s through Skull Valley told us it can't happen there. Now, why would we want to put them in the data base?

CHAIRMAN FARRAR: So unless we asked them questions at that time to probe that understanding, we are stuck with that?

MR. SOPER: Well, yes, I --

CHAIRMAN FARRAR: That is what the record shows?

MR. SOPER: PFS could have very well said we disagree, we have reassessed these and we think the State is wrong on all 13. Now, for purpose of a sensitivity analysis, even though we don't agree that seven of these, we believe that all of them could happen in Skull Valley, we will, nevertheless, consider seven could not, and do a sensitivity analysis.

They did not do that. They went through a very detailed table, and they gave the exact reasons why they couldn't happen. Having done that, they do their sensitivity analysis. Now, that is the evidence from the experts.

So the other thing about positing what might happen, I suppose you just about come up with anything, including a 747 might land on the interstate. But what we are trying to do here is come up with a relative frequency of these events, and if we introduce a bunch of slow crashes, then the idea,

the analysis will show, well the likelihood of a slow crash is very common.

That is because we put in data that is not likely to occur in Skull Valley. Now, I just don't see anything that would justify it. And there is even a more important point.

JUDGE LAM: Before you go any further, Mr. Soper, are you maintaining, by including these slower speed crashes, you contaminate the data in the direction which would give the Applicant a more favorable outcome?

MR. SOPER: Absolutely. All of those seven crashes were below the bounding speed.

JUDGE ABRAMSON: Let me pick this up, Mr. Soper. I'm sitting here looking at the exhibit you gave us, and I'm looking in detail at the seven of these incidents that are in question.

I think all of them tell me there were engine failure, or engine problems. I'm not sure what an engine problem is. But I think I understand what engine failure is, it stops running. Is that the way you see these?

MR. SOPER: Well, six of them were engine failures, one is a stuck throttle, actually.

JUDGE ABRAMSON: Well, actually one of

them is engine problems. I don't know what that means. The first one on the table says engine problem. I mean, I can't tell from that what that is.

But with the exception of two of these which really occurred, essentially, on or near the runway, these loss of engine failures occurred in flight.

What would be the reason, in your mind, that we should speculate that those kinds of engine failures should be removed from the data set? I've got a data set of X events, where engine failure occurred Y percent of the time in flight.

Why should I, why would I not be contaminating a data set if I remove some of those, if I believe that statistics tell me that X percent of the time accidents are caused by engine failure?

MR. SOPER: If we are trying to come up with a probability of what accidents happen by engine failure, then you would want to use a data base of engine failures. Sorry?

JUDGE ABRAMSON: Sorry. And if I'm trying to come up with a probability of crash at certain speeds, and there has to be an initiating event that causes those crashes, why would you eliminate certain percentage of certain events that occurred from that

initiating event?

MR. SOPER: That is a very good question, and this is the answer. An engine failure can happen in a bombing run, it can happen in combat, it can happen in refueling, it can happen while you are in the runway, it can happen in limitless, it is a random event.

It bears no relationship to what happens in Skull Valley. It is just random. In fact, Dr. Cornell said what we are trying to do here is model, as closely as possible, the flight that takes place in Skull Valley, not the engine failures that take place anywhere, the flight that takes place in Skull Valley. It just not a relevant data set.

JUDGE ABRAMSON: If I've got a set of events that we have narrowed down to possibly occurring in Skull Valley, that is, they represent the kinds of speeds and flight paths, and non-bombing runs, not take-off and landing events, and some of those events you want to question because of what happened near the ground, which I think is what is going on here.

Would those events, the way I look at this, looking at this, five of the seven, the initial engine failure was well above the ground, or at least

it was well above the speeds and conditions at which we looked at, we discussed during the hearing, occur with engine failure.

If I discard those, from the set, as opposed to perhaps making some modification to the impact speed, because the pilot did something near the ground, am I not distorting the set by eliminating ten percent, fifteen percent of events of crashes which occurred from events which we know happened a certain statistical portion of the time?

MR. SOPER: Well, the events you are talking about is how often do engine failures happen. And, again, it is just not relevant to how often do crashes happen in Skull Valley at a given speed.

The two experts that looked at this said these accidents cannot happen in Skull Valley. Now, it turns out that take-off and landings, because they are close to the ground, and because by the nature of take-off and landings they happen to be slow.

Now, if we are going to make a mistake on this, we certainly don't want to underestimate the speed of an impact, the slower the impact, the less damage. We have just fooled ourselves into thinking that an aircraft crash won't do anything.

Excuse me, Judge Lam, go ahead.

CHAIRMAN FARRAR: Go ahead and finish, Mr. Soper.

JUDGE LAM: I thought you were done, go ahead.

MR. SOPER: I was actually going to move to a related point, Judge Lam, so if --

JUDGE LAM: Well, if you are done, may I ask you a question?

MR. SOPER: Certainly.

JUDGE LAM: If I may reframe Judge Abramson's question, connected to your earlier statements. If one is assembling a data set of engine failure, then these seven events should have been included.

Conversely, if one is assembling a data set of impact speed, then these seven events should be excluded because they contaminate the data by tilting towards the impact speed being too low.

MR. SOPER: That is exactly right, correct.

JUDGE LAM: Excuse me, is that what you are trying to say?

MR. SOPER: Yes, that is exactly right, Judge Lam.

CHAIRMAN FARRAR: If I understand Judge

Lam's question correctly, if you are assembling a data set of what crash speeds are likely to be in Skull Valley, it is not what -- you would include these if you are looking at what are crash speeds, impact speeds, generally.

But I take it your argument is, if you are looking at crash, what are likely crash speeds in Skull Valley, where people wouldn't be doing maneuvers like these, trying to get to the field, trying to do this and that, then you are saying you need to exclude them to get a proper data set?

MR. SOPER: Well, that is right. And I left out a fact that I just assumed that everybody is aware of. Of course there are no take-off and landing fields in Skull Valley. And we do know a lot about the flights through Skull Valley from the first hearing.

They fly through it from Hill to the training bombing range, they fly over the PFS site, they do not land, they do not take off, they just fly straight over it. And that is true of all 7,000 flights annually. They just fly over it.

CHAIRMAN FARRAR: Except if you lost your engine just as you crossed over interstate 80. Wouldn't you do some of the things that these pilots,

in at least five of these reports, did? In other words, you start doing various maneuvers to try to get to somewhere, and to save yourself, and to save your plane?

In other words, each of these five ended up -- now, granted, they were trying to get back, most of them were trying to get back to a field. But if you lose your engine over interstate 80, isn't the rest of your flight going to partake somewhat of these?

Or your answer might be you don't know, and you don't care. Dr. Cornell said exclude them.

MR. SOPER: Well, again, the State's expert said there is 13 that should be excluded, because they couldn't happen there. Now, Col. Fly, the F-16 pilot for PFS, went through these, again, and sort of reasoned like you did, on five of them.

On seven of them he said our reassessment is these can't occur in Skull Valley.

CHAIRMAN FARRAR: So no matter what I might think, that is PFS', that is the Applicant's evidence, and I shouldn't be thinking about them independent of what -- in other words, if they are willing to exclude them, they should be excluded?

MR. SOPER: Those are the only two F-16

pilots that gave testimony. And you asked about whether the Staff agreed. I would suggest the Staff doesn't have an F-16 pilot, so I'm not sure their evidence weighs on this point.

But let me just point, if I may move on? Or is there more questions on this? We have calculated the increase, and it is set forth in our motion, it is -- well, it is set forth in our motion. Maybe that is sufficient for this matter.

CHAIRMAN FARRAR: Yes.

MR. SOPER: Now, there is one big problem I haven't touched on, and it is this. The data base is now down to 39 data points. We had 57, we took out 7 that were agreed to be excluded.

And in doing this weighting in sevier B and sevier D, there are eleven crashes that occurred in neither. So weighting the analysis, the sensitivity analysis, assumes this weighting, but take out eleven and --

CHAIRMAN FARRAR: Wait, stop with the 50. So you are saying to the extent we should just do the original crash impact and angle we have 50. But now if you are going to let the Applicant move to a sensitivity analysis we are down to 39, is that what you are saying?

MR. SOPER: Yes. And I was explaining how we got there.

CHAIRMAN FARRAR: But your motion didn't say go beyond minus seven to 50 on the classic analysis.

MR. SOPER: No, I'm just telling you what the data base, how low it is now that they are doing the sensitivity analysis. This is PFS' data base. They started with 57, that is the study they presented to you and you adopted.

Now, we take out 7, we are down to 50. Also, by the process of weighting, for this sensitivity analysis, you take out an additional 11 that neither fit into sevier B, and sevier D.

CHAIRMAN FARRAR: Don't fit in just because of altitude?

MR. SOPER: They are too high.

CHAIRMAN FARRAR: Right.

MR. SOPER: And you can see that is confirmed on the Cornell/Fly testimony at question 7. They said we could have done it another way, then we would add those 11 back in. But this is done taking them out.

So now we are down to 39. More importantly ten of those are still sevier B, or D, as

in Delta. Sevier D gets a weighting of four percent, because the Board found there is only four percent of the flights in sevier D.

So this is a weighted sensitivity analysis now. So 10 of those flights get only four percent weighting which is, essentially, excluding them. We are now down to 29 significant data points.

Now, when we had 57, the Board said, in its PID, this. In the final analysis we recognize that we have, before us, sparse data that may be of questionable utility in predicting any particular incident. That was with 57.

We now have 29 significant points. So it seems to me, that this data is so frail, and in fact the sensitivity analysis demonstrates that. You can take out seven and increase it. You can just change this data around to show whatever you want to show.

I think it is now we are to the point that it means nothing.

CHAIRMAN FARRAR: Mr. Soper, we were trying to keep this argument short. If we have heard all your points why don't you reserve, unless you have something you need to bring to our attention, I would rather you --

MR. SOPER: I think that is the substance

of it, Your Honor.

CHAIRMAN FARRAR: -- save some time for rebuttal, because I want to hear what the Applicant's and the Staff's position is. Mr. Barnett, you are going to do this one?

MR. BARNETT: Yes, Your Honor.

CHAIRMAN FARRAR: All right. Let me ask you a question before you even get started. As I read your brief on this question you said, well, the State says you made a mistake, and here is four reasons not to worry about it.

But I looked in vain for you saying we didn't make a mistake. Did we miss, were we wrong on these seven?

MR. BARNETT: No, Your Honor, I don't think you were wrong on the seven. Col. Fly discussed the set of what were nine, at the time, take-off and landing accidents, on the stand in his testimony.

And he said that it was possible that if you had a mishap in Skull Valley you could have a low speed, low altitude ejection like the ones you have in these accidents. He said all of the accident initiating events could occur because they were all engine failures.

And he said it was possible that you could

have an ejection, in Skull Valley, that was consistent with what happened in these accidents.

CHAIRMAN FARRAR: Yes, but not with the two. Okay, that is your answer on the seven, generally. But two of those seven were engine blow-outs immediately on take-off, and there is no way that happens in Skull Valley.

MR. BARNETT: Your Honor, I think Col. Fly would, I don't recall him testifying specifically on those accidents. But I think he would agree that it is unlikely that you would get to that kind of a situation in Skull Valley.

But if you are looking at the ejection altitude and the ejection speed, it is possible to get to low speed and low altitude before the pilot actually ejects.

CHAIRMAN FARRAR: So even if those accidents couldn't, that accident scenario couldn't happen in Skull Valley, the position the pilot ended up in is something that could happen in Skull Valley, and if we know when he ejected, we can figure out the regression analysis --

MR. BARNETT: That is what controls the impact speed. And that is what he was saying. And PFS exhibit 319 speaks for itself. And it says that

we did that as a further sensitivity analysis, and Mr. Soper described it.

We walked through the analysis that he --

CHAIRMAN FARRAR: But the classic analysis, it looks to me like your people are saying seven are out? If we want to rewrite our -- help me with this.

If we want to rewrite our opinion and say we are enamored of this sensitivity analysis, that is one thing. But if we go back to the classic one and say how many of these were Skull Valley accidents, your people have told us 50, not 57?

MR. BARNETT: Well, Your Honor, we stand behind our original analysis that was in our findings. And, in fact, Dr. Cornell discussed this issue of the low speed/low altitude ejections. And this is even in his pre-filed testimony.

He said that he recognized that having these accidents in there could be seen as giving too much weight to the low speed impacts. But then he said, at the same time, that the data base has accidents that occurred at higher altitudes, and then gave weight to higher altitude accidents resulted in higher speed impacts.

And he said that in his view, looking at

the data as a whole, that these two over-weightings, if you will, balanced out.

CHAIRMAN FARRAR: That was his pre-filed testimony?

MR. BARNETT: That is correct.

CHAIRMAN FARRAR: The State is pointing to something that happened during the course of the trial, which I think they are arguing superseded the pre-filed.

JUDGE ABRAMSON: So let me ask my question. Does the Applicant agree with the State's posit that the Applicant, that all the parties have agreed that these seven accidents should be excluded?

MR. BARNETT: We do not agree that they could not happen in Skull Valley, that they were impossible. Col Fly testified, he testified that they were not impossible.

We did, PFS exhibit 319 is a further sensitivity analysis. But Dr. Cornell said, even in 319, that he supports his original approach of looking at all the data. That is on page 8 of PFS exhibit 319.

So even at that point in the hearing he said, yes, we see what is being said about these accidents, these seven accidents, and you could take

one approach of just throwing them out, and then re-weighting everything by altitude, and doing a sensitivity analysis study, as he did in 319.

But then he said, considering this he would still stand behind his original approach of using all the data because of the fact that you have both the higher altitude and the lower altitude accidents in there. And all of the accidents convey information that could be useful in assessing what could happen in Skull Valley.

It may not be perfect information, and he discussed that, as well. You are trying to take real world information and use it to represent what could happen in Skull Valley in the future, but he thinks that that is a reasonable thing to do.

JUDGE LAM: Now, Mr. Barnett, I don't think Dr. Cornell is here?

MR. BARNETT: No, Your Honor, he is not.

JUDGE LAM: Right. Now, forgiving my expression, aren't you trying to have it both ways? Professor Cornell, in the table, is saying 7 events should be excluded, and gave the rationale for exclusion.

On page 8, now we suddenly see them included. It seems to me either way, if Dr. Cornell

were here, I would ask him this question. It seems to me, just based on 319, either way would be adequate.

MR. BARNETT: Yes, I think he would agree that there are two alternative approaches to looking at the problem.

JUDGE LAM: Now, if either way is adequate to the Applicant, then perhaps the exclusion should be done. But that is the State's position here.

MR. BARNETT: I don't think Dr. Cornell would say that it is necessary to do that. I think he said that one could do that, and if you also went through the additional step of the re-weighting, according to altitude, that it would be a reasonable thing to do.

JUDGE ABRAMSON: Counselor, can I ask a question here? It seems, help me refresh my recollection here. When we were, when the Board suggested that there be some sensitivity studies done, I think I recall a great deal of protestation on the part of, at least, the Applicant.

And I don't remember whether the State protested it or not. But I remember, I think correctly, that there was a great deal of protestation to the effect that we will do these, but they don't change our view of what should be in front of the

Board as a record, we are doing these because the Board asked us to do it.

Is that an accurate recollection?

MR. BARNETT: Your Honor, I think that was mostly with respect to the exclusion of anything other than the documented impact speeds, where we resulted with a very small data set. Here the Board asked all the parties to go back and take another look at the issue, and so we did that.

I think that our protestation was, really, the case where we got down to the very small data set. So, Your Honor, I would submit that, as Dr. Cornell set forth in PFS exhibit 319, he stands behind his original approach, but one could take this alternative approach as he did and he got the results that he did.

JUDGE ABRAMSON: So let me make sure I understand how you are summarizing Dr. Cornell's view of this. You are saying that Dr. Cornell feels that it, felt and testified that it was more appropriate to use the original analysis with all 57 data points.

But that if one wanted to exclude some of those 57 data points because they had questionable applicability to things that could happen in Skull Valley, one should comb all 57 and determine which should come out, and that would result in eliminating

some low speed, and some other events. Is that accurate?

MR. BARNETT: He would say that it would be, in the case of the low speed, yes. In the case of the high speed accidents what he would do is he would re-weight them according to the altitude at which they were initiated.

And that is the weighting factor he --

JUDGE ABRAMSON: So he was saying, we don't have time to really do a thorough reanalysis of this. If we were to try to eliminate some of the low speed ones, we would have to do some, we would feel it appropriate to do some other modifications to our analysis?

MR. BARNETT: With respect to the high speed accidents as well, yes.

CHAIRMAN FARRAR: I'm still having trouble with this. Why isn't it fair to state it that he said, all right on the classic analysis the 57 I agree, 7 of them are out, do 50. But now I'm going to say there is another way to look at this, where you include them all and do the sensitivity analysis and the reweighting?

MR. BARNETT: Your Honor, I don't think he would agree to just take the classic analysis and

throw out the 7 and do another analysis.

CHAIRMAN FARRAR: But he said that, the column says he is going to exclude them.

MR. BARNETT: But that is only in the context of this sensitivity analysis in 319. On page 8 he said that he would stand behind his original assessment. He thinks that is the way that we ought to go.

CHAIRMAN FARRAR: Then tell me how the two accidents, the blown engine on take-off, where the plane barely got off the ground, tell me why those were not excluded automatically, at the beginning, when you went from 61 to 57, how come you didn't go from 61 to 55, and get rid of those two?

MR. BARNETT: When we went from 61 to 57 we excluded the accidents that occurred, literally, on the runway.

CHAIRMAN FARRAR: On the runway.

MR. BARNETT: All of the others we left in. And we recognized, at the time, that we had some accidents that were very low, but we also had some that were high, and that was the approach that we took.

JUDGE LAM: Now, Mr. Barnett, doesn't your argument somehow, disconnected from what Mr. Soper was

saying, Mr. Soper is making the statement that these data are basically frail, that you don't have enough data.

Now, by reading PFS exhibit 319, the first part of 319 confirmed what he was saying. You don't really have 57, you only have 50. Now, on page 8 of 319 all of a sudden that seven event is re-added to it. Is the addition of something that should have been excluded consistent with what Mr. Soper is saying, you don't have enough data, therefore you do things that may or may not be valid?

MR. BARNETT: Your Honor, I think that is Dr. Cornell's, that is part of Dr. Cornell's reason for wanting to stay with the original data set of 57. Because in his view all of those accidents convey information regarding what could happen in Skull Valley.

Now, we do have the weighting issue with the low altitude accidents and the high altitude accidents, but he had always been opposed to throwing away data. His testimony was very consistent in that regard. And he is sensitive to the issue of getting down to very small data sets.

And that was part of his objection to doing the other sensitivity analysis where we are only

looking at the documented cases. So I think that is part of his reasoning. And so I think he would say that that is why we are better off staying with the original analysis where there is a recognition that there are weighting issues with the low and the high altitude accidents.

But that they counterbalance each other, and in the end you have a better approach, looking at the whole thing, rather than -- although he did the sensitivity analysis, and he believes that they are legitimate, he thinks that his original approach is the way to go.

JUDGE LAM: So your statement, basically, is the opposite of what Mr. Soper is saying. Mr. Soper is saying you don't have enough data, so you expand it, at the risk of contaminating it.

What you are saying is, yes, we do have enlarged data, we are not willing to throw things away, because some of them had stuff that you can use?

MR. BARNETT: That is right, that is right.

CHAIRMAN FARRAR: So what should we do in -- go ahead.

JUDGE ABRAMSON: As I recall, in our PID, we acknowledged the fact that the data is sparse. We

also recognized that there is information contained in some of these other incidents and that the regression analysis approach, which was done in stages, was done to try to incorporate whatever information was available in an effort to get all the information in.

Is that an accurate summary of Dr. Cornell's approach?

MR. BARNETT: Yes, I think that is right, I think that is right.

CHAIRMAN FARRAR: So what should we do in response to the State's motion on this point?

MR. BARNETT: Well, Your Honor, I think if I might add one thing, as I did in response to the State, at the outset, and as you identified. We said that their argument was not material to the result.

So I think that is an important thing to consider. That even if you take the State's numbers, as they calculated them, the accident probability remains below the threshold.

I would also add that the Board found --

CHAIRMAN FARRAR: If we don't agree with them on their other argument?

MR. BARNETT: That is correct, that is correct. I would also add that the Board found that there was a lot of conservatism in the calculated

accident probability, and that the real probability of a canister rupture is well below that, by a factor of five or more.

And that is on page B-43 of the Board's opinion.

CHAIRMAN FARRAR: It is one thing for us to say you are below one in a million, and we are reassured that there is a lot of other factors there. You want us to say the same thing, well you are a little below one in a million, but it is okay because there are some other factors?

Is that a difference in kind, or difference in degree?

MR. BARNETT: Your Honor, I think that is appropriate because the Board said, also, that given significant conservatisms the threshold probability for credible accident might even be further increased.

That is that the higher number could be tolerated. And that is also on page B-43.

JUDGE ABRAMSON: Counselor, let me pick this up for a second when you are done consulting.

(Pause.)

JUDGE LAM: Mr. Barnett, when you say the Board you meant the majority?

MR. BARNETT: Yes, Your Honor.

JUDGE LAM: Thank you.

JUDGE ABRAMSON: Did I, I heard my learned colleague state your position as if the probability were greater than ten to the minus six, we still have these conservatisms.

Did I hear you suggest that the probability, even including these seven incidents, might rise to above ten to the minus six?

MR. BARNETT: No, Your Honor. Even by the State's calculations, if you simply took out these seven incidents and left the original calculation as is, without any weighting, the final probability would be on the order of 8.4 times ten to the minus seven.

CHAIRMAN FARRAR: But it is a totally independent part of their motion that adds another something in there?

MR. BARNETT: Yes.

CHAIRMAN FARRAR: If we don't buy that other part of their motion, this doesn't get them to the --

MR. BARNETT: Right.

JUDGE ABRAMSON: Let me ask another question, because I'm focused on these seven incidents, and I'm sorry to drag out this piece of the discussion.

But when I look at the description of those seven incidents contained in PFS 319, I only see two of the seven that clearly took place very low to the ground at very low speeds. I see five that initiated at other conditions.

Is it your view that Dr. Cornell's position was that all seven should be eliminated, or that they could be eliminated? I'm trying to understand what the nature of this sensitivity study was.

Was the seven that if you looked for the worst situation these would be the seven you might eliminate? What was going on here?

MR. BARNETT: Your Honor, Dr. Cornell, with input from Col Fly said that if you are going to do a sensitivity analysis and take a closer look at these accidents for where they occurred, and what was going on at the time, that you could exclude these seven accidents and then perform the further analysis the way he described it in 319.

But Col Fly testified that all of these accidents were, or I should say, the ejections that you had, the ejection speed and altitude were possible in Skull Valley, although they may or may not be likely in Skull Valley. **

JUDGE ABRAMSON: And it seems to me that when I look closely at these seven incidents, or at least at the descriptions in PFS 319, what is happening here is not a challenge to whether such an accident would have been possible in Skull Valley because it was initiated by a loss of engine failure, by engine failure, loss of engine power, but rather a challenge to the impact speed, because a pilot did something near the ground.

Is that the way you see these?

MR. BARNETT: Your Honor, the fact that they were all engine failures means that from that perspective they could all occur in Skull Valley. But the question turned, I think turns on the, what was happening at the time of the ejection.

And it relates, primarily, to ejection speed and ejection altitude.

JUDGE ABRAMSON: And the conclusion that seems to me would be logical, for scientists, to draw from that would be, perhaps we've got the wrong crash impact speed because the pilot did something near the ground. But the event initiator is still an event initiator that is statistically real for these data that we are looking at.

Now, I know you are not a scientist, but

is that what you think Dr. Cornell might have put into this?

MR. BARNETT: Your Honor, I think --

JUDGE ABRAMSON: Or am I asking you to go beyond --

MR. BARNETT: -- the initiator is something that would say that the accident could occur in Skull Valley. The circumstances of the ejection may make it more likely, or less likely, to occur in Skull Valley.

And I think Col Fly testified that some of these accidents were unlikely to have an ejection at low speed and low altitude in Skull Valley. But that gets into how much weight do you apply to these accidents when you are looking at the data base as a whole.

Do you have too many low altitude events, do you have too many high altitude events, what do you do? And I think Dr. Cornell said that taken as a whole you look at the data set and say, yes, we probably have too many low altitude events, but we also have too many high altitude events, so you look at the whole data base.

And he thinks that that is appropriate, in his judgement, as to what to do if you are performing

a statistical analysis trying to use this real world data trying to estimate what is going to happen in Skull Valley.

JUDGE ABRAMSON: So you either do the whole thing, or you redo the whole thing? Either take it as it was, or redo the whole thing, is what he is saying --

MR. BARNETT: I think he would say either take the whole thing, or if you are going to redo it, then throw out the seven, but also do the reweighting that he did in the sensitivity analysis.

JUDGE ABRAMSON: All right, let me ask another question. This is probably a question for an expert, so if you don't feel comfortable with this, please tell me.

It seems to me that what has happened in five of these seven incidents is the pilot did something that caused the crash speed to be off. Didn't do something that would have eliminated the fact that this was an event whose initiator could have occurred in Skull Valley.

And so, therefore, what has happened is we may have, if we were going to properly analyze this, what we might better have done is not use that crash speed from those, the crash speeds from those five

events, speeds and angles from those five events, in stage one of the regression analysis, but rather use them in a different stage.

They are still initiators of engine failure and we know something about what happens in engine failure crashes. We know that they are, generally, relatively low speed crashes. So it wouldn't throw them out from being low speed, it would merely shift the distribution a little bit on the low end.

And I realize I'm talking tech, and I probably shouldn't to lawyers. This is a --

MR. BARNETT: Your Honor, I agree with you. I think that is right, I think that is something that we could have done, we could have said these are all engine failures, we know generally what engine failures look like. There is something that happened in these few accidents that maybe affected the impact speed so that rather than just taking them purely as they were, we could have said they are engine failures, we are going to say that they are more like some average engine failure, impact speed, or something like that.

I don't know how, exactly, we might have done it. But I think, yes, that we could have done

that as an alternative to get a better handle on what these events really would represent.

Because they are initiated by engine failures, and they are going to look like engine failures, even if they might not have the exact impact speeds that they actually had, if they had happened in Skull Valley.

JUDGE LAM: I think that would have been a better approach. Because these events, clearly, should be included in the engine failure data, but excluded for low speed distribution analysis. That would have been a better approach.

CHAIRMAN FARRAR: Mr. Barnett, have we mined this for all we can? This is supposed to be a short issue.

MR. BARNETT: Yes, Your Honor. Just one last thing, is that I would reiterate that Col Fly testified that these seven accidents were possible in Skull Valley, although the likelihood may be, you know, they may not have been as likely as others in the data base.

CHAIRMAN FARRAR: All right, thank you. Mr. Turk, Mr. Soper said you didn't have a pilot, so he would like me not to let you talk. But I bet you won't take that opportunity.

MR. TURK: No, it is tempting, but --

CHAIRMAN FARRAR: Go ahead, Mr. Turk.

MR. TURK: I will try to make this brief. First, there is no dispute, by any of the parties, as to what these events were. The record is very clear what these crashes involved.

That was the subject of part one of your hearings. We all know which were landing or take-off events as classified in the accident reports. Where there is a fundamental dispute that was made clear today, is the State's insistence that Dr. Cornell conceded that these aircraft landing or take-off events should be excluded from the data set.

That is a very improper, incorrect reading of the evidence. The very exhibit that the State showed you, PFS exhibit 319, contains words by Dr. Cornell stating I don't want to. Well, not in these words, but he is stating, it is not proper to exclude these. I conclude the best approach is to include these events in the 57 point data set.

That occurs not only page 8 of PFS exhibit 319, but also on the very first page, page one, which Mr. Soper highlighted, but failed to address.

What Dr. Cornell indicates, at the bottom of page one, of PFS exhibit 319 is, for the purpose

of, quote, for the purpose of further sensitivity analysis we have undertaken such a reassessment here. It has focused on the nine so-called take-off and landing accidents, plus the four accidents that Lt Col Horstman asserted should be excluded, in his rebuttal testimony."

The whole point of the table that is presented in this document, is that it is a sensitivity analysis. In the final column of the table, where Dr. Cornell includes the words exclude or include, he is talking about the sensitivity analysis.

And that is made clear by page 8 of the same document, where in the final paragraph he states, "we maintain that our original approach, which included all Skull Valley type event accidents without need for selecting or weighting accidents by altitude, is appropriate for calculating the UEP for the PFSF."

He further goes on to talk about how different events tend to cancel out their effects. And in his last sentence he states: "Thus in the end the original straightforward inclusive approach provides a reasonable estimate of the crash impact speed and angle frequency distribution for potential F-16 crashes in Skull Valley and thus a reasonable basis for calculating the UEP for the PFSF."

In the cross examination testimony, actually this is in direct testimony by Dr. Cornell, on the day that PFS exhibit 319 was introduced, this was on Sunday. If you recall we had an extraordinary session on Sunday, September 12th.

Mr. Gaukler was introducing a set of PFS exhibits, numbers 318, 319 and 320. And that begins at page 18676. Mr. Gaukler introduces PFS exhibit 319 by stating that that exhibit, "is the treatment of F-16 accidents sought to be excluded from use in crash impact speed and angle frequency distribution determination by the State of Utah."

At page 18688 to 18689 Dr. Cornell states, in response to direct examination by Mr. Gaukler, "I conclude that what we originally did was perfectly appropriate. We used all of the events and 57, rather, and recognized that there were some events which were probably too low, and some which were probably too high, and used the transparent approach to bring all that data together in a frequency distribution. The sensitivity studies show that other ways of reading the data lead to virtually the same conclusion."

He did not retract his original set of 57 as being the proper basis for your decision.

JUDGE ABRAMSON: Mr. Turk, would you then -- how would you then, what would be your view, then, of the State's posit in its motion for reconsideration that we erred by failing to accept the agreement of the parties that these seven should be excluded?

MR. TURK: Well, it is a false premise to state that the parties agreed. It is a false premise to state that the parties agreed that seven should be excluded.

That was done for sensitivity studies only. And that was true of the Staff. The Staff performed a sensitivity study. And I'm going to ask Dr. Kamp, who is sitting next to me at counsel table to distribute a copy of Staff exhibit 119.

And I just hand wrote, on top of it, that it may contain safeguards information because, frankly, I'm not sure if it does or it doesn't. But out of abundance of caution I have marked it that way.

Staff exhibit 119 that I'm distributing was a document entitled NRC Staff's response to the Atomic Safety and Licensing Board's questions concerning the probability of an accidental F-16 crash into the PFS facility.

And I'm giving you the cover page plus pages 10 and 16. It is a total of three pages out of

that document that I'm presenting you with. Dr. Camp and Dr. Ghosh did a sensitivity study in which they excluded nine landing and take-off events, which were then the focus of the State's concern.

Those nine included the seven that the State introduces in its motion for reconsideration. So am I clear on that? These nine are a bounding set that includes the seven raised by the State, as well as two other low speed crashes involved in landing and take-off.

The effect of excluding those nine from the data set is shown on page 16. And you can see that the effect is very insignificant. So that if you reach Mr. Soper's question today and say, oops we goofed, we should have excluded those from the data set, the effect is insignificant. You still come out with a decision which finds that the number is below, substantially below, depending on how you characterize it, the one times ten to the minus six.

I would ask you, also, to take a look at figure 2 on page 10 of this document. That figure, I'm sorry, figure 3. Figure 3, on page 10, shows two fitted curves. The solid line is the original set of 57 events, the dashed line is the set of the 57 events minus the nine landing and take-off events.

And you can see that for any particular speed that the difference between those two fitted curves is very insignificant. So that even if you conclude that you should have excluded those data sets from the 57 it has very little effect.

And may I point out that the nine events that the Staff excluded in its analysis bounded the seven. So that the effect that you see here is greater than the effect that would have existed if you only excluded seven rather than nine.

Why does the State come up with a different number? If you recall the State used a statistical method which the Board had, the Board majority had trouble with. And that was they used a step approach, and the Board's decision pointed out that that was an incorrect approach.

And, in fact, it tended to exaggerate the consequences of, or the probability of an event occurring at any particular speed.

CHAIRMAN FARRAR: Mr. Turk anything else we need to hear on this?

MR. TURK: Can I have just one moment, Your Honor?

(Pause.)

JUDGE LAM: Mr. Turk, before you go

further, may I ask you a question?

MR. TURK: Yes.

JUDGE LAM: I look at page 16 I see with or without denying take-off and landing events I see a roughly ten percent increase in the total UEP. Am I correct, using the NRC data?

MR. TURK: I'm not sure how to do the percentage calculation. I would state it in terms of the actual numbers shown there.

JUDGE LAM: Right, right. So if I were to extrapolate the Applicant's data by excluding the nine events I would expect a similar magnitude of increases.

MR. TURK: You would have a slightly different result because Dr. Cornell was doing a weighting according to altitudes.

JUDGE LAM: Yes, indeed.

MR. TURK: This data that I'm presenting to you, these charts, do not reflect a weighting by altitude. It is a look at the data sets and reducing the 57 by 9.

JUDGE LAM: Yes, indeed. My point is this. If just simply excluding nine events I see a rough differential incremental increase of roughly ten percent, whatever that number is. If I increase the

Applicant's number by ten percent I may, indeed, see a big problem.

MR. TURK: I think -- may I have just a moment, Your Honor?

(Pause.)

MR. TURK: Are you looking at the table on page 16? I leave it to you to do the mathematical computation. I come up with a different number, but I'm not going to argue that point.

I would make only one additional point, and it is one of procedural fairness. You have heard Mr. Soper, today, argue to you that you should reduce the data set not down to 50, which his motion for reconsideration asked you to do, but to go all the way down to some lower number.

And, Judge Farrar, I think you picked up on that very well. That is not the issue raised in the motion for reconsideration, it is not before you today.

I would also point out that in the State's proposed findings they didn't argue to you that you should exclude seven events. They argued you should exclude either 13 or nine. So they are focusing in, now, on seven out of the nine that they had talked about in the proposed findings.

We did not address those seven, specifically, in our proposed findings because the issue was not raised there. So I would rely on the reference to the nine that is presented in this exhibit.

CHAIRMAN FARRAR: Thank you very much, Mr. Turk. Mr. Soper do you want some rebuttal?

MR. SOPER: Yes, and I will try to be brief, Your Honor.

CHAIRMAN FARRAR: All right.

MR. SOPER: I'm not sure I understand the idea about the sensitivity analysis shown in exhibit 319. That is Dr. Cornell's sensitivity analysis. It takes out the seven crashes. It also excludes the 11 that are not in sevier B or D.

Those are not adjustments that the State made. Those are Dr. Cornell's assumptions, and the weighting of the ten that existed in sevier D to four percent and coming up with, effectively, only 29 points.

That is how Dr. Cornell did it. We are not assuming had he done it that way, that is how he did it. And you might see there is a reference in his analysis to his testimony, at question and answer 69, that, and the following question also, 70, that

confirms that the 11 were taken out.

So this is, effectively, a 29 data point set that he uses. Now, I'm not sure if there is confusion on that, or not. But if that is the case, I'm just saying this is not what the State is suggesting, this is how it was done.

Also, if I understand Mr. Turk's argument, it is that Dr. Cornell and the pilots for PFS did this reassessment only for a sensitivity analysis. Now, my question is, what sense does that make? Why would they concede that seven of these flights, for purposes of a sensitivity analysis should be excluded?

I mean, what difference does it make what kind of analysis you do on the data base? They could simply have said, well, we don't agree but for sensitivity let's say seven are out, and let's calculate it.

They first went through the reassessment, which was the Board's instruction, and they gave specific reasons why they ought to be excluded. Then they did their sensitivity analysis.

And as a result they proposed this finding to the Board. We find that the testimony regarding the nine take-off, there was nine to start with, take-off and landing accidents, and their mishap reports do

not support simply excluding them en masse from the impact speed and angle frequency distribution data set.

They do not agree that en masse all nine ought to be taken out. Then they go on to say, however, some of the accidents, because they involve pilot ejection at very low altitude, and low speed, are unlikely to occur in Skull Valley.

That is their point, that is what we are talking about right there. They continue to say: Thus, including them in the impact speed and angle frequency distribution data set could overestimate the likelihood of a low speed crash impact. Exactly what we are worried about here.

Now, let me say this. I know that we can shoehorn these take-off and landings into the data set and say, well we can think of, it is not likely, but we can think of ways that this possibly could have happened in Skull Valley.

Anybody can do that. The experts didn't do it, but we can sit here and do it. Now, if we had a data set consisting of all points, of take-off and landings that we sat here and said, gee, I bet this could happen, there might be something useful about this, so let's put it in the data set, because I can

think of how it might possibly happen, even though it is unlikely.

Now we have just predicted how an impact will happen from a landing. And it completely distorts and corrupts the data base and it is not representative of anything we are trying to determine in this proceeding.

So if we wouldn't do it for the whole data set, why would we do it for 10 or 15 percent? If we are off, if it is bad data, it is bad data.

CHAIRMAN FARRAR: Let me ask you about this sensitivity analysis. At one point, early on, we asked, I think at a pre-hearing conference, maybe early in the case, why didn't the parties instead of taking the historic accidents, however many are relevant, why didn't the parties conjure up what a typical flight down Skull Valley would be like, or what the 7,000 flights would look like and use that as the starting point and predict a crash from that, not from the accidents that happened to have happened.

And I thought everybody told us that that was not possible to do. But doesn't the sensitivity analysis start to get to, isn't that a back door way of doing the same thing?

MR. SOPER: The first crack at this was

done by PFS. And they used 57 data points, basically, because they were engine failures, is how they started with it. And I'm not sure, when you say why didn't the parties, I'm not sure there was any agreement, or consensus, where we sat down and tried to say let's figure out a way.

We were always responding to data from crash reports.

CHAIRMAN FARRAR: In other words, when we were waiting for the case to come to us we thought that we might see that from you, some computer analysis of here is how the 7,000 flights a year go down the valley, here is the kinds of things that happened to them, therefore the typical crash is likely to look like this.

And I thought, with very little discussion, everybody said, sorry, can't do that, that is too hard to do. That is how I recall it. But now the sensitivity analysis seems to be coming, it strikes me as at least vaguely a back door way of doing the same thing that we were told couldn't be done. Or am I wrong?

MR. SOPER: Well, I don't know. The sensitivity analysis has so few data points now. I mean, again, it is based on 29 data points, none of

which occurred in Skull Valley.

And, remember, the majority of these are estimates to start with. So we have 29 data points, very few have speed and angle information, less than 50 percent, as I recall.

And so we have 29 data sets, most of which are estimates to start with. Now, I don't know that that is getting back to some sort of analysis of the typical flight, which we know is between 3 and 4,000 feet, and we know that there is emergency procedures, and so forth.

And I can't tell you why the experts ended up doing what they do, in reflection, Your Honor. I think there was some discussion about it, and maybe it was rejected by everybody. But I can't trace that for you.

MR. TURK: We may have a bit of recollection on that point, Your Honor.

CHAIRMAN FARRAR: All right, Mr. Soper, were you -- does that finish your rebuttal?

MR. SOPER: Well, I think so. I'm not sure what is coming here.

MR. TURK: Dr. Kamp reminds me that Col Fly had testified that it is possible that you could have flights in Skull Valley that exhibit these

characteristics.

And, as I recall, the issue was not that they might be landing or taking off in Skull Valley, but if you recall the procedure by which pilots attempt to gain time, they zoom to gain altitude, and they lose power, and they glide down.

So you do get this loss of speed which perhaps, and I can't speak for Dr. Cornell, but perhaps in the Applicant's mind that was an appropriate reason to include them.

The Staff looked at each of the events and we decided to include them because we considered that you could have those reduced speeds in Skull Valley.

CHAIRMAN FARRAR: Mr. Barnett, do we have anything to add?

MR. BARNETT: Yes, Your Honor. I would like to address one point. Well, a couple of points. First of all the point of the 11 accidents that were initiated at altitudes above sevier D MOA.

In Dr. Cornell's pre-filed testimony, with Gen Jefferson and Col Fly, he looked at two cases when he was performing his sensitivity studies. One where he excluded them altogether, he said they are above sevier D, so we are simply going to exclude them.

And another where he said, well, we will

treat them the same way we do the ones that are in sevier D and apply a weight to them, the same as we would with a sevier D accidents. And that is in question 69 and 70 in his pre-filed testimony.

And what he found was that the results varied very little, whether you included the 11 or excluded the 11. So I think the State's argument about the 11 accidents is an immaterial point, even with respect to this sensitivity analysis.

JUDGE ABRAMSON: Sorry, Mr. Barnett, when you say included them as though they were in sevier D, does that mean they got a four percent weighting?

MR. BARNETT: That is correct.

JUDGE ABRAMSON: So are you surprised that when you weight something four percent, when others are weighted at 96, it really doesn't make much difference?

MR. BARNETT: Not really. And the only other point I would like to make is that the State is now asking that seven accidents be taken out, and the other accidents just simply be treated as-is.

I would submit that there is no basis in the record for doing that, because nobody testified to that, at the time of the hearing.

CHAIRMAN FARRAR: All right. Does that

conclude the argument on this? Yes, Mr. Turk?

MR. TURK: I just have one point of clarification. When I pointed to the Staff's exhibit with that increase in probability, in the UEP, due to the exclusion of these nine events, if you note the exhibit talks about this being the Staff's data set.

And if you recall, from the hearings, we used data that was slightly different from the data that PFS came in with. So if Judge Lam wanted to apply, or whatever Your Honors wanted to apply whatever is this percent increase, it would only be appropriate to do that with the Staff's data set.

I don't think you can just transfer that immediately to the PFS data set upon which your decision is based.

CHAIRMAN FARRAR: Okay.

JUDGE LAM: That is fair.

CHAIRMAN FARRAR: Thank you everyone. We had one more question that we had moved down on the list about the DOE standard. Is that the one, Mr. Turk, that you wanted a projector for?

MR. TURK: Yes.

CHAIRMAN FARRAR: Okay. Amy is trying to get that. Before we move on to that, we had our introductions at the beginning of counsel and of the

judges. And I think there were a couple of people who were not in the room, at that time, who probably ought to be introduced.

We view this as a legal matter, that we are working very hard to get at. But there are at least two people in the room who, from a very different perspective, have invested a lot in this.

And if I'm not mistaken have Margene Bulcreek in the back, who actually lives on the reservation? And so we are talking about flights down Skull Valley, she actually lives there.

If I'm not mistaken you appeared in front of us on April 8th, 2002, and have been opposed to this facility. And we just want to -- we appreciate you coming to hear the argument, and I hope you can conclude that whatever way we rule we take our job very seriously.

We try not to take ourselves seriously, but take our job seriously. And taking a different position would be Mr. Parker, if I'm not mistaken, the CEO of Private Fuel Storage who has had a different kind of investment in this project for a long time.

And we appreciate that both of you are here, and I hope Mr. Park, that you come away with the same sentiment that whichever way we rule, we are

doing our level best to get it right.

Then let's move on to the argument about the DOE standard. It is much later in the day than we thought it would be, so let's get right to the point. And, Mr. Soper, you are going to do this one?

MR. SOPER: Yes, Your Honor. May I just enquire, on the issue of the top impacts, the State's claim that top impacts have been excluded from any probability, but there is no analysis to support that, is that going to be the subject of argument here?

CHAIRMAN FARRAR: Yes, if you would like.

MR. SOPER: I just wondered about the order, if we have to do that first.

CHAIRMAN FARRAR: I would rather do the ductility --

MR. SOPER: Very well.

CHAIRMAN FARRAR: But we had allotted 60 minutes, let's see if we can't do it in much, much shorter time. Let me start by saying, one of the questions we asked in our Order was about the intended use of the Standard and if the inferences, if any, which should be drawn from the State's failure to call any of the authors as witnesses.

And, of course, what we are getting at there, everyone is arguing about what is meant by

this. But if I'm not mistaken we didn't have any of the authors of it in front of us, to tell us what was meant by it, what its applicability was supposed to be.

And that, I think, put us at a little bit of a disadvantage. So help us with that point, and then you can get right into your argument.

MR. SOPER: Okay, let me take that first. The DOE standard, of course, is this document. The DOE standard 301496, Accident Analysis for Aircraft Crash into Hazardous Facilities, United States Department of Energy, Washington, D.C., October 1996.

Every party relied on this standard throughout the proceeding, including PFS and the NRC Staff, except for the provision that PFS does not meet the ductility ratios. There they claim that the authors have provided an exception for the ordinary spent fuel dry storage cask.

They say it doesn't apply to them in that regard. There is no written exception for the ordinary spent fuel dry storage cask in the DOE standard.

In fact it says the opposite. It says, it defines facilities as follows, if I can find it. I am embarrassed, Your Honor. May I have just a moment?

CHAIRMAN FARRAR: Take your time.

(Pause.)

MR. SOPER: Well, I'm saved because I have just been handed a page from the standard. This standard has 211 pages and five supporting supplements so it is quite thorough.

A facility includes, as used in this standard, an area of interest for the purpose of performing aircraft crash impact analysis involving either individual structures, or buildings, portions of structures, or buildings, such as critical structures, systems and components, or a multi building, or multi structure conglomeration, such as a storage tank farm, or munitions magazine complex.

The facility should be defined as the collection of such structures that could be affected by a single aircraft impact.

At any rate, there is no exception for the dry storage cask in the DOE standard. And the authors have spoken, in this proceeding, in black and white by the text of the standard. It says what it says.

Now, the Board didn't raise any concern when PFS or the Staff tried to rely on the standard. They didn't say you need to call an author. They didn't say, this is a design standard, you can't use

this in this proceeding. It accepted all the citations, the appeal to authority from the DOE standard, in all areas where it was used, except the one they don't meet.

And as to that one, the ductility ratios, they claim there is some sort of unwritten exception. Now, between the State who wants to rely on what the standard says, on its face, and the NRC Staff, and PFS, who claim there is an unwritten exception, who ought to call the authors?

It seems to me that built into this question is an answer that it was the State's failure. But the State doesn't view it that way. It seems to me that if somebody is going to object to the standard it ought to be those who claim that it doesn't apply to them for some unwritten reason.

Now, I think there is an inference, in fact, that can be drawn, from the failure of PFS to call the authors. And I believe that inference is this. That they would have called an author, the author would have said we meant just exactly what we said.

This DOE standard applies to all facilities, we did not omit an exception for the ordinary dry fuel storage cask, and we meant what we

said.

Now, I think we have to assume that if they were called to testify they would have said that, they wouldn't have said no, we forgot something, if we want to draw an inference.

CHAIRMAN FARRAR: I guess the reason we framed the question, this was your exhibit, was it not?

MR. SOPER: Every party introduced chapter 6 as an exhibit. And, in fact, let me tell you what PFS says about this standard. They cite from it extensively.

CHAIRMAN FARRAR: Refresh my recollection. Didn't the other parties initially object to this? Or am I confusing that with something else?

MR. SOPER: You might be confusing it, Your Honor. PFS and the Staff both offered into evidence, and it was accepted, chapter 6, which was the methodology for aircraft crash, the structural evaluations.

PFS and the Staff both relied on it heavily in other phases of the case. In fact PFS structural analysis, which the Staff adopts, begins by stating, the current state of the art for analysis of aircraft crash effects on structures is summarized in

the DOE standard 301496.

CHAIRMAN FARRAR: Then let's -- I think you've given us enough of an answer on this point. Let's not be concerned about any inferences we would draw.

MR. SOPER: Okay. May I just add one sentence to that?

CHAIRMAN FARRAR: Yes.

MR. SOPER: Their analysis, their report on this goes on to say, the analysis herein draw upon the information provided in the previously cited references, particularly the DOE standard and its supporting documents. That is PFS exhibit 257, pages 2 to 6.

And so that is why the PFS standard is such a big deal in this case, excuse me, DOE standard, pardon me. And that is because if you apply it to the PFS cask it indicates the cask will not pass the criteria.

The DOE standard was authored by eight organizations that includes four federal agencies, one of which, of course, was the DOE. The NRC was one of the agencies involved, as an observer status.

In addition there were seven other experts that were authors, including experts from Lawrence

Livermore National Laboratory.

CHAIRMAN FARRAR: Wait, Mr. Soper, we know all that. I mean, what is the point of that?

MR. SOPER: The point is, in the publicly available decision, Your Honor, the majority referred to the DOE standard as a report, simply a report. It is the official public standard of the Department of Energy for aircraft crash analysis. It has a supporting panel of 33 experts that authored it.

I don't mean to belabor it, Your Honor, but the State views this as an important part of its argument. The experts that authored it were from Lawrence Livermore National Laboratory.

CHAIRMAN FARRAR: We know, I mean, I know they were experts, but the question is, what they put forward we needed to know how it applied, or didn't, to this case. And I guess, lurking underneath our question was, it would have been helpful to have some, when we are arguing about what the meaning of this was, and how it applies, to have had them here.

But we are willing to pass by it. Let's get to the merits of what it says in there, and why it indicates our decision was wrong, and we asked you to touch, to some extent, on the ductility ratio concept, because that is what we had a lot of problem with.

MR. SOPER: Okay. Well, the authoritative nature of this is somewhat important to my argument. But if you are instructing me to pass over that I will do that.

CHAIRMAN FARRAR: No, I mean, we know who is behind it, we have that table that appears early, that lists the agencies, lists the authors. And, in fact, I think we had testimony that different witnesses knew different ones of the authors.

So we are not questioning that this isn't an authoritative document. The question is does what it say apply to the situation in front of us.

MR. SOPER: All right.

CHAIRMAN FARRAR: And that is what we need your help on, rather than who is behind this.

MR. SOPER: I will do that, Your Honor. Some back drop is necessary, however, as I move through this. The purpose of this standard is stated in one sentence, in the standard.

And it says, this standard establishes an approach for performing a conservative analysis of the risk posed by a release of hazardous radioactive or chemical material resulting from an aircraft crash into a facility containing significant quantities of such material.

Now, let me say that there is no other standard that has been brought before the Board, from the United States government that deals with the aircraft crash into a nuclear facility.

This Board, nor any other Board of the NRC, has previously considered this issue, to my knowledge. So there is no guidance, other than the DOE standard, that I'm aware of.

JUDGE ABRAMSON: Mr. Soper, this is repetitive of what we heard days and days on. Do you intend to continue to repeat, or are you going to give us something new that we can think about?

MR. SOPER: Well, Your Honor, this is a motion for reconsideration, so you have heard it before. And the significance of this document, like I say, is central to our argument. But I will try to be brief and move on.

A facility, again, I read the definition of that. But it essentially states, includes all structures, or portions of structures, including components. In fact it says, for example, tanks, and bunkers, and no exceptions are noted.

Now, the purpose of the DOE standard is given on page 6. This is an analytical standard intended to provide sound technically justifiable, and

consistent approach to analyzing the risks posed by an aircraft crash into a facility containing radioactive or hazardous chemical materials.

The focus is on analyzing the risk posed to the health and safety of the public, and on-site workers, from a release of hazardous material following an aircraft crash.

MR. SOPER: Now, more specifically, let's get to ductility ratios. I thought that to be necessary because I'll refer back to it, Your Honor. I didn't mean to belabor it.

(Pause.)

MR. SOPER: For the Board's convenience, I'm handing out page 76 of the DOE standard.

(Pause.)

MR. SOPER: Calling your attention to 6.3.3.3, structural evaluation criteria. Deformation, strain, responses computed for various target structural components by either the energy balance method, or the time history analysis method all right then used to compute the ductility ratio, paren, the ratio of computed displacement to elastic displacement or the yield strain.

Computed ductility ratios are then compared to the permissible ductility ratios specified

below to determine if the component would deform excessively or collapse under impact loads.

And I direct your attention to small b below that. The first sentence says, for steel structural components, the permissible ductility ratios shall be as specified.

It gives a section of the AISC nuclear specifications. The second sentence says, for plate structures, the permissible ductility ratio of ten is recommended.

This is for plate structures. It is set forth in the standard. It doesn't refer you to the AISC nuclear specifications. It's right in the standard.

CHAIRMAN FARRAR: But the thing you read at the beginning, the introductory paragraph says this will help us determine if it will deform excessively or collapse.

And that's not -- tell me why that's the issue in front of us as opposed to what I thought the issue in front of us was, a rupture of a containment boundary that's not serving in a structural mode, if I can use that.

MR. SOPER: That's a very good question. Let me address that next.

CHAIRMAN FARRAR: And, while you're addressing that -- well, no, that's all right.

(Pause.)

MR. SOPER: Well --

CHAIRMAN FARRAR: I guess you could also address in B there for plate structures the permissible ductility ratio of ten is recommended.

MR. SOPER: Correct.

CHAIRMAN FARRAR: Recommended by whom for what purpose and why is that -- in other words, they just say that. What are we supposed to do with that?

MR. SOPER: Well, the first part I read, the instructions are you take the -- you compute a ductility ratio from the strains that you calculate. And then you compare it to the -- let me see.

The words they use are ductility ratio specified below of which ten would be one of them. If you don't meet that, then you have failed the structural evaluation criteria.

JUDGE ABRAMSON: Mr. Soper, if one took a ductility ratio of ten and backed it out into the actual percentage deformation, what kind of numbers would you get for the two types of steels we've been looking at?

MR. SOPER: You're referring to the idea

that we come up with strains in the two or three percent range, something like that.

JUDGE ABRAMSON: Well, that's what I'm asking. If the ductility ratio is as this document suggests, a ratio of a computed displacement to the elastic displacement, elastic displacement then is the amount of stretch at the point it begins to go plastic --

MR. SOPER: Right.

JUDGE ABRAMSON: -- with the amount of stretch to get to the yield point.

MR. SOPER: Correct.

JUDGE ABRAMSON: And, if we're talking about ten times that number, which would be a ductility ratio of ten, the amount of stretch to go to begin to go plastic is on the order of what for these two steels?

MR. SOPER: Well --

JUDGE ABRAMSON: I think we heard a lot of testimony.

MR. SOPER: Well, let's say it's two or three percent. I do not recall. But I think it's quite low as I remember.

JUDGE LAM: Perhaps one percent.

MR. SOPER: On percent. The point on that

is this, Your Honor.

JUDGE ABRAMSON: Which is one percent, the point that begins to go elastic, or the point that the amount of stretch that would correspond to a ductility ratio of ten?

MR. SOPER: Oh, the yield strain I think was -- the evidence was it's .0012.

JUDGE ABRAMSON: Very tiny.

MR. SOPER: If you're looking for the yield strain.

JUDGE ABRAMSON: Very tiny. So we're looking at a ductility ratio of ten corresponds to a physical percentage stretch of the material something like one or two percent. Is that correct?

MR. SOPER: Yes.

JUDGE ABRAMSON: Okay.

MR. SOPER: And the reason -- I mean, maybe that seems low, particularly for those of us who don't deal in the small field of expertise of sudden impact loading such as explosions, earthquakes, bomb blasts, aircraft crashes.

But you had an engineer from the National Academy of Engineers that appeared before you that testified on this matter. That of course is Dr. Sozen*.

As you recall, he was one of the five engineers that was invited to the scene of the Pentagon after the terrorist attack of 9/11. He and his team wrote the building performance report for that aircraft crash into that building. Dr. Sozen, on behalf of FEMA --

CHAIRMAN FARRAR: Here is my problem with the building, I can understand that you don't want the building structural members to start getting into a plastic range, because now you have some structural members that you can't count on over the long term, because they've gone plastic.

But here, in a sense, do the regulations care if the canister goes plastic, as long as it doesn't puncture and leak? It's still serving its purpose.

And now, the applicant may have to get it out of there and take it back to the canister transfer building and do something. But, it doesn't have to perform any more function than it's just performed, unlike a structural member of a building.

And that's the problem I had listening to the evidence. That is a problem we had in writing the opinion, that we do not know how this ductility ratio, no matter how many people stand behind it, how it

applies to the situation that we are dealing with. That's the problem we have.

MR. SOPER: Well, Your Honor, there's a couple lines of my argument that are very important to our case. And both of them sort of have been -- now we're heading two different ways.

And I do not know which one to continue. But, let me say this, that Dr. Sozen*'s credentials are such that he specializes in this blast aircraft crash earthquake field, chairs committees for the National Academy of Sciences, is a distinguished professor of structural engineering, holds a distinguish chair at Perdue* University.

He has credentials on and on. He has consulted with the NRC, Sandia, Los Alamos, Brookhaven* National Laboratory, Department of State, Corps of Engineers, Stanford Research.

CHAIRMAN FARRAR: Yes, but when I ask him a question -- when I ask him, tell me how your theory applies to what's in front of me, it's not his credentials that help me, it's his explanation. And that's what I --

MR. SOPER: And I --

JUDGE ABRAMSON: and we're familiar with his credentials.

CHAIRMAN FARRAR: And he knows a lot.

MR. SOPER: Well --

CHAIRMAN FARRAR: He knows infinitely than we'll ever know about -- I'll ever know about this subject. But, he's got to be able to explain it. And no less a person than Dixie Lee Ray used to say, when a scientist tells you they can't explain it to you, it's because they don't understand it.

MR. SOPER: Well, I'm not sure that that's what his testimony was. He told you that -- here's what he said. First of all, his credentials are important because I note again, the majority refer to Dr. Sozen as a Civil Engineer in its opinion.

Now, Dr. Sozen said, in all of his work in earthquake engineering, ductility ratios are used exclusively for design and to predict failure, design and failure.

He said for explosions, blast effects. And he was at the side of the Mura* Building in Oklahoma City for FEMA. It's all done on ductility ratios. Strain limits of metal are not even mentioned.

And, for the aircraft crashes he said, I'm not surprised to see that the DOE standard used it for aircraft crashes. And he advocated the same, specifically for the canister and for the overpack.

He said they are both structures and they are plate structures. I mean, that seems too obvious to argue. They are structures made from pieces of plate that are welded together. I do not know what else they could be.

CHAIRMAN FARRAR: But they're not weight-bearing structures that have to stay there after the accident and continue to perform their function. Tell me where I'm wrong here.

But, in this accident they need to do one thing. They need to keep something from penetrating the -- they need to not be penetrated. And once they've done that they've served their function.

I understand about the buildings, that once they're hit and they go a little bit plastic, now we've got a long-term problem.

MR. SOPER: Well, Dr. Sozen's testimony --

CHAIRMAN FARRAR: And there's continued weight on them. But, once the plane falls away from the scene, what more does the canister have to do? That's the problem I had with --

MR. SOPER: All right.

CHAIRMAN FARRAR: -- taking the standard and his testimony and trying to apply it to our situation.

MR. SOPER: All right. Of course, that assumes that this standard that was written for the containment of nuclear material, it assumes that the 33 experts and the authors overlooked the fact that that's where nuclear material is kept, in stainless steel canisters.

If you would look at Appendix D that I handed out, Your Honor, this is from the DOE standard. I've highlighted. The highlighting is mine.

And it says, let us assume that an airplane has crashed into a vessel containing acetone at ambient temperature, a vessel. Then, continuing highlighting, it says figure D1, the acetone may be under high pressure.

For example, if the vessel is padded with an inert gas, in this case the analyst should proceed through the lower portion of page D9, and so forth.

CHAIRMAN FARRAR: Okay. But those things you're going to point us to now, aren't they exposure analyses assuming that the vessel has been breeched, not an analysis of how to determine whether the vessel will be breeched?

MR. SOPER: That's exactly right.

CHAIRMAN FARRAR: And I hate to sound argumentative, and I told you at the beginning, don't

feel bad telling us that we got it wrong. That's not what this is about.

I'm trying to get your help to tell me where I got it wrong.

MR. SOPER: I'll tell you right now, Your Honor. I understand the question. As we know, the DOE standard provides methodology for all areas of aircraft crash, because it's been used in here for many things in our proceeding.

It begins with the methodology for determining the impact frequency, the probability for crash. It has a methodology for determining the loading of the aircraft impact, the riera* curves.

It was used exclusively by PFS for that. It also has the methodology for evaluation called global evaluation, the section we just read, for evaluating the calculated strains.

And, finally, it has the methodology for evaluating dose exposure, which is the section I just handed, which shows the free-standing tank that's been ruptured by an aircraft crash, not a building, not part of a building, a tank.

And, I'll have to say that I would think the authors of the DOE standard -- it specifically says it is under pressure, so it's a pressure vessel.

So I can't imagine that they would contemplate that hazardous chemicals and nuclear waste wouldn't be kept in a stainless steel vessel. But, the methodology goes in successive steps.

The standard states the implementation guidance provides a framework of step-wise increases in analytical sophistication aimed at eliciting only that amount of analysis needed.

Evaluation guidelines are provided to aid in determining the need to conduct each subsequent analytical step. This standard allows the analysis to proceed along a series of increasingly complex steps.

The results of each step are used to determine whether it is necessary to proceed to the next step, or whether sufficient information has been provided and the analysis can be stopped and documented. It's page five to seven.

MR. GAUKLER: What page is that?

MR. SOPER: Five to seven. In other words, you start with the probability that the plane will crash. Then you go to the loading material and you figure that out, and the evaluation criteria.

If you fail the crash part, you don't go to the structural evaluation. If you fail that, you go to the dose exposure evaluation. Now, that's just

logical.

We've done the same thing in this proceeding. The standard further says, when applied as a complete approach, the methodologies in the standard will result in a technically justified conservative analysis of the risks posed by releases resulting from aircraft crash.

So, the exposure evaluation that we've just seen with the pressure vessel, with the example aircraft crash into a pressure vessel, that would only be used to evaluate that scenario if it failed the preceding steps, those of crash probability and the structural criteria.

In fact, it wouldn't even be reasonable to think the authors chose an example for exposure that would never be used because the preceding sections don't apply to tanks, to vessels, to pressure vessels, to stainless steel.

I mean, there's a specific example of this in there. And the methodology is you have to get through it by working through the other steps.

JUDGE LAM: Now, before you go any further, Mr. Soper, do you mean, by showing us Appendix D to the DOE Standard, in which it clearly talks about a pressure vessel of some sort, that the

ductility ratio should be applied to pressure vessel as opposed to the Applicant and the Staff's claim that pressure vessel is exempted specifically from the DOE ductility ratio?

MR. SOPER: Yes. And, that's exactly right. And let me tell you why.

(Pause.)

MR. SOPER: For the Board's convenience, I've handed out Table Q1.5.8.1. This is from the document referred to in the DOE Standard under the page I handed out before on structural evaluation criteria.

In fact, if you read the structural evaluation criteria, the ductility ratios under small b, it says, for structural steel components, the permissible ductility ratios shall be as specified in -- and then it refers you to this table I just handed out.

Now, this is in evidence. I'm not sure what the exhibit number is. This is the ANSI standards. And, both the NRC Staff and PFS, have pointed out that the ANSI, A-N-S-I, standards -- or actually, A-N-S-I/AISC Standard does not apply to pressure vessels, which is this document.

That's their argument. This document

excludes pressure vessels. However, it's the next section of the DOE Standard for plate structures the permissible ductility ratio of ten is recommended that applies to a free-standing tank, which is simply a structure made of welded plates.

So, the whole argument, the same is true for the argument about buckling. If you look at Dr. Bjorkman's testimony, he says there is a study noted in the back of this standard, which he goes to.

And he says, well that's Howell and -- excuse me, Dr. Bjorkman, what's the name of the team?

(Off mike)*

MR. SOPER: Howell & Nemark*, that did that study. And it relates to buckling. On further examination, it turns out that Dr. Bjorkman testifies that number two and three relate to buckling and number one is just what it says, structural steel tension numbers.

Nevertheless, the whole testimony with regard to buckling, like I beams that you're referring to, Your Honor, is based on this document. The same with pressure vessels.

Forget about this document, because we don't go to it for plate structures. It's right in the code. And the code has the specific example of a

tank fracturing by rupture, a pressure vessel, as a matter of fact.

And that's what we're dealing with here. Now, probably more important, is the absence of any other standard. There isn't any other competing standard here.

So we've looked at coupon tests. Coupon tests, of course, are the slow stretching of a small sample of material until it breaks. That, no doubt, tells us --

JUDGE ABRAMSON: Actually, Mr. Soper, did we not hear testimony on rapid stretching of samples?

(No verbal response.)

JUDGE ABRAMSON: They're small samples, I agree. But, did we not hear testimony on rapid stretching?

MR. SOPER: I --

JUDGE ABRAMSON: In fact, stretching which was, as I recall, at a rate greater than is predicted by all the analyses we heard?

MR. SOPER: Not that I recall. Not by a coupon test.

JUDGE ABRAMSON: Oh, well --

MR. SOPER: We might have had drop tests or something on that order.

MR. GAUKLER: That is not correct Mr. Soper.

JUDGE ABRAMSON: Well, we'll let Counsel --

MR. SOPER: I stand corrected. The majority of the strains referred to are taken from texts. And coupon tests generally are slow tests of pulling only in one direction.

Maybe they're fast pulling, but they're still only in one direction. Whereas an aircraft crash, of course, happens in milliseconds, thousands of times faster.

Maybe you have a fast test in mind. But, that is not the bulk of the evidence in the case that came from the coupon test. Now, why would we think that the strains from slowly pulling in one direction only would approximate what an aircraft crash or an explosion, or an earthquake would generate?

In fact, Dr. Sozen says they do not. It's not a relevant standard for evaluating instantaneous impacts. He said what the experts used, the experts that deal in this field use ductility ratios.

In fact, we have -- that's why I say, there's many, many experts in National laboratories that contributed to the DOE Standard. A strain

failure is not mentioned in here anywhere, not a word of it in any place, only ductility ratios.

JUDGE ABRAMSON: Ductility ratio is a measure. It's a measure that computed strain divided by the strain at the beginning of plasticity, isn't it?

MR. SOPER: It has to do with criteria that evaluates your computed strains but is not based on the failure strain of the material. It is based on the yield strain of the material.

JUDGE ABRAMSON: Well, let's pursue this for a moment, Mr. Soper. The ductility ratio is generally defined -- at least, if I believe what you've presented to us here from the DOE Standard on page 76 b-- as the ratio of computed displacement to elastic displacement.

Ductility ratio itself is simply a measurement, it's a measure of how far something is computed to have stretched, divided by the amount of stretch it takes to go plastic. Is that --

MR. SOPER: Yes.

JUDGE ABRAMSON: Okay. Now, what -- as we understood it, and correct me if I've got this wrong -- what the DOE standard says is, if the ductility ratio gets greater than X, one should presume this

material has failed, is that correct?

MR. SOPER: Yes.

JUDGE ABRAMSON: Okay. And, there are various X's depending on what the component is and what the material properties are of that. What I have great difficulty in and what I think you will see from the PID, is that we don't see any reason to accept any prescriptive formula.

We think it's more important and more relevant to look at the material properties, particularly when, even at slow stretches -- although, as I say, we were presented with evidence.

And I think if you look at the PID you'll see a reference to that, that shows that the strain rate, at least in the rates which were occurring in these millisecond aircraft crash impacts that you're talking about, rate has no effect on the amount of strain to rupture.

We were presented with evidence that shows that that degree of stretch, or the ductility ratio one would compute, is many orders -- several orders of magnitude greater than the number -- or at least one or two orders of magnitude than a number that this prescriptive formulation would suggest.

And that's what I have difficulty with

accepting a prescriptive formulation.

MR. SOPER: I think that the issue -- this is a subject of expert domain. And it may be hard for those of us that don't deal in instantaneous loading as our specialty in life to reconcile what we think would happen because we know that a pulling, a simple pulling of the material in one direction will result in a large strain.

How do we reconcile that with the ductility ratio philosophy that has large strains? Well, I do not know if we can do that on reasoning from a non-expert standpoint.

But, Dr. Sozen says -- is the experts that are in this field use it exclusively, that they don't use the strain because it does not approximate the instantaneous loading effects.

Now, the stretching is not in one direction in an explosion or an aircraft crash. Maybe not two, maybe not four. It's a complex strain.

And it's not of just the material. It's of the welds and the bends, and imperfections. It's whatever the artifact is when it's finished. And I think there's quite a bit of testimony on that.

And I would point out that Reg Guide 7.6, which is how the NRC licenses its transportation

casks, referred to by Dr. Bjorkman, it states at the top, design criteria for evaluation of stainless steel storage casks.

So, number one is design criteria. That's how they get their transportation casks, excuse me. And, for the analysis of a 30 foot drop, not an aircraft crash, but a droop test, they require the same philosophy, an elastic analysis, the same philosophy as a ductility ratio.

When you get into the plastic reason it's unknown, they don't allow it for analyzing the licensing of a transportation cask. Now, it seems to me that it's consistent --

CHAIRMAN FARRAR: Do they use a ductility ratio there?

MR. SOPER: They use -- they require an elastic analysis. And a ductility ratio, of course, is based on the yield strain. The yield strain is when the metal leaves the elastic range.

That's where when it's stretched it will pull back.

CHAIRMAN FARRAR: Right.

MR. SOPER: When it exceeds that strain it gets into the plastic range, which is very uncertain.

CHAIRMAN FARRAR: Right. But, are you

telling me that the Staff uses for the transportation cask a different theory or a theory that they say we can't use here?

MR. SOPER: Yes. It's the theory that you need to stay close to the -- this is what Dr. Sozen says. And I'll get his testimony and cite it, if you want it.

I've prepared to read. But he says this -- I'll capsulize. He said, in matters of impact loading like this, instantaneous loading, where it becomes -- there's a range of uncertainty, you leave the elastic range, it becomes uncertain.

You don't know how the material behaves. And he says, you want to stay very close to the yield point, in other words, where the elastic range stops and the plastic range starts.

It's the same theory as the NRC Staff uses in licensing transportation casks. And Dr. Bjorkman said the reason they do that is they expect it to take a greater strain than the test that they give it, which is a 30 foot drop.

And we would all hope so. Nevertheless, that is the design criteria that they use in licensing. If we were arguing here today whether or not a transportation cask could be licensed, we would

be using design criteria.

And we would be using plastic analysis to see if the cask could be licensed.

JUDGE ABRAMSON: Is that 30 foot drop a credible accident, do you know, in those cases?

MR. SOPER: This is from the testimony of Dr. Bjorkman. I can cite his -- the transcript for you.

JUDGE ABRAMSON: Well, no. What I'm wondering is, is there a distinction between what they do in design? I mean, obviously, for design one designs for credible accidents.

One doesn't design for -- I don't want to say incredible.

MR. SOPER: Yes.

JUDGE ABRAMSON: But, accidents that aren't credible, which is what we are looking at here, accidents that are not credible. So the question is, is this not -- this is not a design criteria.

This is a how do you determine whether this material gets a hole in it, whether it rips? Not whether it's designed to deal with it or whether this would have been a suitable design number.

And that's the -- that's what I'm wondering how --

MR. SOPER: Yes, my point -- excuse me, Your Honor. I didn't mean to talk. My point was, if we're licensing a transportation cask, we would be using that very philosophy that you say we're not interested in here.

In other words, we'd be using the philosophy to evaluate the cask based on if it passed the yield strain, if it went into the elastic range.

That's the philosophy we'd be using, which is a design criteria. Nevertheless, that's the basis for licensing. It aught to be used as a basis for licensing here too.

JUDGE LAM: Now, will we have the opportunity to hear from Dr. Bjorkman since he is here?

MR. TURK: No. You will hear from me, you know. But, I would point out, this is a matter that was raised in proposed findings. I think we're going behind the motion of reconsideration at this point.

It's just a rehash. But I'll address it, Your Honor.

JUDGE LAM: Okay. And I had a question for Mr. Soper. Mr. Soper, why was not Appendix D the DOE Standard provided to the Board during the Hearing?

MR. SOPER: I think it was attached.

JUDGE LAM: Was it attached?

MR. SOPER: Yes. It's in the --

MR. TURK: It's in the document, Your Honor. It's in State Exhibit 254. But it wasn't the subject of testimony or discussion.

JUDGE LAM: Okay, thank you.

MR. TURK: I see Judge Farrar looks puzzled.

CHAIRMAN FARRAR: Yes, say that again.

MR. TURK: State Exhibit 254 is a complete DOE Standard, which includes the Appendix D.

CHAIRMAN FARRAR: Yes.

MR. TURK: But the testimony did not address what's in Appendix D.

CHAIRMAN FARRAR: Oh.

JUDGE LAM: So, it was in the Exhibit, but it was not specifically focused on it.

MR. TURK: Yes.

MR. SOPER: I'll say that there's a part of the record, part of the evidence that has become more of a focus after the Board's discussion, Judge Lam.

JUDGE LAM: Okay, thank you.

MR. SOPER: Now, I have a lot of testimony from Dr. Sozen about what he said. And, one of the

things he said is that the ductility ratio -- in fact, he was addressing Judge Abramson.

And he said, you asked a question, sir, whether or not he was judging whether or not the cask was safe, or whether it fail, it would fail. And he said that's exactly what I mean, that it would fail to contain the spent fuel.

So, he says specifically that the ductility ratio aught to be used to judge failure. Now, he's the expert in this field. Now, we may not understand and reason from our common sense point of view as to why instantaneous impacts aught to be judged by a ductility ratio.

But that's what the experts do. That's the consensus of opinion. And that's what the DOE standard provides exclusively. And I think we have to assume that all the authors and the many supporting experts have some kind of validity here since the standard is the public standard of the Department of Energy.

CHAIRMAN FARRAR: Mr. Soper, let me interrupt you. We -- and you've never let me down before when you said you'd be quick. But, we set this for 30 minutes aside.

And we said at the beginning we were going

to shorten that. And you've been -- it's been 50 minutes and I need you to bring it to a -- you know, hit the high points of what's left. We have to get moving.

MR. SOPER: Your Honor, most of what I have are things that would support what I've already said because there's a lot in the evidence that I believe demonstrates what I've said very carefully. Now, I could summarize those in a --

CHAIRMAN FARRAR: Well, what we'll do is, when we go back to write whatever we're going to write, we will go back again to your proposed findings and make sure we look at all the evidence you've referred to here that bears on this.

MR. SOPER: Very good.

CHAIRMAN FARRAR: So, you don't need to --

MR. SOPER: Those are the major points then, thank you.

CHAIRMAN FARRAR: All right, thank you. Mr. Gaukler, or -- whose going to do --

MR. GAUKLER: Yes.

CHAIRMAN FARRAR: Mr. Gaukler, you've heard the discussion. You've heard the concerns we have about how we approach this. And so, if you can hit the high points of your --

MR. GAUKLER: Okay. I will try to do so, Your Honor. There's been a lot of stuff that's been said in the last 50 minutes, a lot that's been rehashed or what's already been briefed extensively and extensive findings on all part in each one of those issues. Let me make the first point.

CHAIRMAN FARRAR: Let me make a point. Sometimes we go to church and we hear a sermon that's an hour long and we don't get a lot out of it.

And sometimes we get three or four minutes that tells you how to lead your life and you get a lot out of it. If you don't have to talk a long time to make points that you want to make.

MR. GAUKLER: Okay. First of all, we used the DOE Standard to the extent it was appropriate to use it. We did not use it to the extent it was inappropriate to use it.

We used it with respect to determining the force time history of the aircraft impact in the structure for which it was appropriate. We did not use it with respect to evaluating failure, global evaluation of failure because it's not appropriate.

JUDGE ABRAMSON: The force time history, is the DOE report the only source of that, or are there other sources of that?

MR. GAUKLER: There are other sources of that.

JUDGE ABRAMSON: Which would have led you to a similar, a different, the same?

MR. GAUKLER: I believe there's other sources to it, because there is riera* developed force time history. It's the riera* force time history approach that he developed back in 1969, I believe.

JUDGE ABRAMSON: So, when you say you adopted the DOE approach, you really adopted the riera* force time history approach, which was in place long before the DOE standard was in place.

MR. GAUKLER: That is correct.

JUDGE ABRAMSON: Thank you.

MR. GAUKLER: It was developed in 1969 and confirmed by the Sandia full scale F-4 test in subsequent -- about 1990. With respect to the loading, we did not use it for two basic reasons, the ductility ratio.

First of all, the issue with respect to the loading, as Your Honor pointed out, is a local issue. It is not a global issue. Section 6.3.3 of the DOE standard concerns solely global evaluation which concerns solely whether you're going to have collapse or excessive deformation of the structure.

It does not concern whether you're going to have rupture from an object hitting something directly. That is local damage. And that is assessed in 6.3.2.

The strains that you would get from the 6.3.2 allows you to penetrate a good portion of the way through an object without having failure. And the strains, as Dr. Soler testified, that you would get from an application in evaluating local damage under 6.3.2, would be obviously you would exceed the failure strain because you'd be plowing through material.

You'd go up to 60 to 70 percent the way through material. You're going to be exceeding the failure strain. So, obviously, you don't apply ductility ratios with respect to the local evaluation.

Now, this is set forth extensively in our reply findings. I want to give the Board the specific reference to it. That's on page 38.41 of our reply findings where we point out that section 6.3.2 is a local evaluation which is -- and all the damage that we have here is local damage.

The only -- as Dr. Soler testified, the only global damage we have is tip-over, which manifested itself into local damage, which we've analyzed.

So, the global evaluation standard, 6.3.3 is just inapplicable here because, as Your Honors recognize, we're talking about localized stresses, localized damage.

We're not talking about global stresses. In that respect I've included, under Tab 12 of the book some excerpts from the DOE standard. And one of them is a definition of the global response.

It talks about the global strain or the overall strain in the structure. Secondly, we didn't use the DOE standard in this respect because it's not applicable because the structure that you're evaluating is not the type of structure we'd use the ductility ratio in the first place.

As Your Honors pointed out, the ANSI/AISC standard refers to buildings. You're talking about protective beams and columns. And I've included a portion of PFS Exhibit 295 under Tab 13, which really emphasizes that.

It's the page five of PFS Exhibit 295 where it talks about the type of construction to which this ANSI standard slash AISC standard apply. All of them are frame structures, building structures, columns, beams, etcetera.

It's not as Dr. Soler and Dr. McMahon

pointed out in rebuttal testimony. It's not a cylinder like the pressure vessel. Number two, the State refers to a plate structure and kind of designates our having focused on buckling, etcetera.

The State in its testimony relied upon the ductility ratio of 20 from the ANSI/AISC standard. In its oral testimony it has changed to the plate structure.

In any event, you're talking about a structure that obviously is caring load because that's the only way we get down to ductility ratios that low.

Further, Dr. Bjorkman explains why a plate structure is not a cylinder in his testimony. Third, in the same respect, is you have a code -- if you're going to apply a code, as Your Honor pointed out, you decided not to apply a code, a prescribed code which is appropriate, because we're not interested in designing something.

We're interested in determining when it would fail and things like that, ANSI standard AISC standard is a design standard. The same thing with the ASME code.

It is a design standard. But, if you were going to apply a code prescribed formula here, it would have to be the ASME standard because that is the

design basis for the HI-STORM cask. That has been -- that's part of the COC.

JUDGE ABRAMSON: And what would we learn from looking at a design standard? If we looked at the ASME standard here and looked at how this cask and components held up and applied the design standard, what would we learn?

Would we learn that it exceeded or didn't exceed the design standard? And how would that help us understand whether it in fact got a leak?

MR. GAUKLER: You would find out that we would exceed the design standard, assuming that --

JUDGE ABRAMSON: Okay. And how would that help us -- I'm sorry. How would that help us understand whether or not it got a leak?

MR. GAUKLER: It would help us because the ASME code -- the purpose of the ASME code is to preserve the confinement, integrity of a pressure vessel.

And that is the reason why the Commission has said you apply the ASME code in the context of storage casks and MPCs. And I quote a statement from the Commission in one of the rulemakings where it states precisely that the reason you apply the ASME code is because you're concerned with the confinement

boundary.

And Appendix F of the ASME code, you're focused on maintaining the confinement boundary regardless of the loading condition. And these, as we have heard testimony, this includes dynamic loading conditions, whether it be tornado missiles, airplane impact, etcetera.

The ASME code makes no distinction. And the testimony of people who are versed in the ASME code, Dr. Soler, Dr. Bjorkman, were very clear on that.

In this respect Dr. Sozen has no experience in working with the ASME code. He was not familiar with Appendix F. He had never designed.

He's not a mechanical engineer. He never designed a pressure vessel. And, particularly, we talked about -- at one point the State quotes, and you ask in one of your statements, in one of your questions, the Board asks, how would you look at the ductility ratio if you wanted to apply it to something like say a pressure vessel or something like that?

And you refer to a footnote in the State's motion, footnote five, where it says that, if you weren't going to apply the DOE ductility standard here, you would actually apply something more rigid,

because that's what -- pressure vessel is supposed to be more -- it's supposed to be subject to a more rigorous standard.

The only source of that testimony is Dr. Sozen's statement that, if you didn't apply the ductility ratios here, from the DOE standard, you would have to obviously do something more rigid, more stringent.

When asked on cross examination wouldn't you presumably find those more stringent standards in the ASME code, he said, I would hope so, presumably you would.

But then, when you point him to the ASME code, he did not know anything about Appendix F. He had never applied appendix F. So, therefore, the State's suggestion that, if you were going to apply something other than the DOE standard ductility ratio, you would do something more stringent has absolutely no basis whatsoever.

It is solely based upon a hypothesis of Dr. Sozen in an area which he has absolutely no experience. As I said before, in our reply findings, the State's case is trusting. And we won't go through all that.

CHAIRMAN FARRAR: But the areas that he

does have experience in, and in a spec, you know, world class. And why would you not have some spill-over knowledge about this?

I mean, he's a recognized expert in a number of things that strike me as coming very close to this area. And so, how do you compartmentalize his expertise and say, well, he may be great here, but he knows nothing over here?

I mean, what strikes me as a fairly related field.

MR. GAUKLER: Well, he's very familiar with civil structural information. That's his background by training, okay. And in the civil structural information he uses the ductility ratio for a global evaluation as you see in the AISC/ANSI standard.

Now, so that's his background, that's where he comes from. He's never -- he's not a materials person. He's not a material expert. You heard from Dr. McMahon, who was head of the Materials Engineering Department at the University of Pennsylvania for many years, a distinguished professor, very knowledgeable in materials, saying that the test data shows that as a practical matter the failure of stainless steel is not affected by the

strain rate.

It's not affected by the dynamic loading. You heard so much talk from Dr. Sozen. Dr. Sozen, this was the first time that Dr. Sozen looked closely at stainless steel.

He's not familiar with it. Professor McMahon testified, based upon the test data, from his area of expertise, this concern that Dr. Sozen expressed is not relevant.

It's not supported by the data. Also, the State made the point that, well, Dr. Sozen always uses ductility ratio. Well, the only other example on the record of an evaluation done by Dr. Sozen other than the one that is in evidence before the Board, is the one that he did with respect to the Pentagon report.

And what did Dr. Sozen use there? He did not use ductility ratio in determining failure. He used the failure strain of the steel. He used the failure strain of 20 percent basically the carbon steel like we have here.

And I would refer you to our findings where we specifically point that out on page 77-79 of our findings. And I asked Dr. Sozen this on cross examination.

Why is it that they're using a failure

strain with respect to the Pentagon when you say we should use ductility ratios here? There's a subtle but strong difference between the way engineers think when they're trying to analyze a problem and when they are designing something.

When you analyze a problem in terms of whether something will fail or not, you look at the failures. When you are designing something and responsible as to the engineer for design, you look to the ductility ratio.

That's what he said. And that's -- I have a quote on page 78 of the findings. Therefore, his testimony that we should only use ductility ratios is not supported by his own past work himself. A couple other quick points.

JUDGE LAM: Before you go any further, Mr. Gaukler, help me in resolving this apparent dilemma. If I apply your argument on local failure on the pressure vessel, on the suitability of ASME code to predict failure, then everything being talked about here in Appendix D of the DOE standard should not be there.

MR. GAUKLER: No.

JUDGE LAM: Here in the standard I see a pressure vessel. I see the assumption an aircraft

crashes into a pressure vessel and, going through the scenario about predicting leakages, and rupture.

If I apply the local failure that you are talking about, apply the exceptional capability as measured by failure strain, not ductility ratio, then it will not be an issue here.

MR. GAUKLER: Well, it would --

JUDGE LAM: It should not be in Appendix D.

MR. GAUKLER: It would be if you exceeded the failure strain. Underneath the DOE standard it would be an issue if you had local damage where you would penetrate that tank.

The failure strain with which you would do so would greatly exceed the ductility ratio. But this section D is solely concerned with the radiation, those consequences once you determine by your structural evaluation that there is in fact a breech.

It doesn't tell you anything in terms of how you go about doing your structural evaluation. You have determined from your structural evaluation by the time you get to Appendix D that there is a breech, there is a rupture.

And this just tells you how to go ahead and do that analysis.

JUDGE LAM: But --

MR. GAUKLER: It doesn't tell you how to go ahead and do the analysis for determining whether there is a breech.

JUDGE LAM: Yes, but if I remember correctly, what Mr. Soper was telling us, within the DOE Standard, there's no other failure criteria.

MR. GAUKLER: No, there isn't.

JUDGE LAM: Only ductility ratios.

MR. GAUKLER: No, there's a local failure criterion. The DOE ductility ratio only applies to global evaluation. And that's the global response. If you look at Tab 12 in my book I handed out, if you look at global response, under definition on page 14, it is the response of the overall target structure as measured by its date of strain or displacement, which may result in global structure failure due to cracks or excessive structural deformation.

You're not talking about something punching through and rupturing a tank. That's covered by 6.3.2 of the DOE Standard, which concerns the issue of local damage when you have an object striking it, a strong object, say a missile, and you're going to punch a hole through something.

That's 6.3.2. And it doesn't concern

ductility ratios at all. It doesn't apply ductility ratios. It just looks at whether you have perforation or penetration.

And, obviously, if you go 80 percent of the way through a structure, that would be allowable under the DOE Standard for local damage. You're obviously going to be exceeding the failure strain for the first 80 percent of the way through the structure because you've failed the material.

If you're having missile -- for 80 percent of the way through the structure, you're going to exceed the failure strain for that, as far as the missile has gone and probably beyond it too.

So, in other words, the DOE Standard has two criteria for failure. And the State continually focuses on the wrong criteria, even if you were to apply the DOE standard here.

Last time I said there's three reasons why we don't do it. One, they look at the wrong failure mechanism. Two, to the extent you're going to look at this issue in terms of a code prescribed formula, the proper code is the ASME code.

We have done calculations assuming that this abounding speed is in fact a design basis accident under the ASME code. We've done those

calculations.

We've done the calculation with respect to bounding speed, plus the calculation with respect to the speed that's above our bounding speed. And both of those calculations show that we would meet the requirements of the ASME code, assuming this were a design basis event.

And, as Dr. Abramson pointed out, that's very important because the whole purpose of the ASME code is to ensure confinement integrity. That's why the NRC applies it here.

And, even assuming this were a design basis accident, we would meet it. And that is set forth at length in our response to the Board's request for clarification of December 16th. The pages are -- excuse me a second.

(Pause.)

MR. GAUKLER: Pages 10-15, and there we summarize the calculations that Dr. Soler did, which are part of the evidentiary record. The State never challenged those calculations that we presented.

They challenged some aspects that Dr. Bjorkman did in terms of ASME code. But they never challenged those calculations ever. We pointed that out in our response.

JUDGE LAM: Now, Mr. Gaukler, your argument here applies specifically to the failure of the MPC. Are you saying the same argument can be applied to how the State is thinking about failure of the overpack?

MR. GAUKLER: Yes, it can. Now, there we've got the ASME code calculation. But you can look at just say 6.3.2 of the DOE standard. With respect to the overpack, as explained by Dr. Soler -- and this is on pages 37-41 of our reply findings, I believe, 38-41 of our reply findings.

That's where we go through and summarize the evidence that's in the record that was presented by Dr. Soler talking about the distinction between section 6.3.3 where you would apply the ductility ratios and why those -- that's not applicable here either for the cask or the MPC in 6.3.2, which is the local damage criterion for the DOE Standard, why if we were to apply the DOE Standard to the cask, why that would be applicable, and why it would show no failure.

Because, it's only local damage. That's what the issue is. And you look at the cask, again, just like with the MPC. You have local damage. And so, what the State is trying to do here, they're trying to take a standard that's a standard for

measuring global response, global evaluation, and trying to apply it in a situation where we have analyzed in explicit detail what happens on a local basis.

And that is just totally inappropriate, both for the MPC and for the cask.

E-V-E-N-I-N-G S-E-S-S-I-O-N

6:00 p.m.

JUDGE LAM: Now, for the cask, I am not sure if this is not appropriate. Consider the scenario that's being analyzed by all the parties. You are talking about -- even Dr. Soler is saying that there will be local damage to the outer pack*.

MR. GAUKLER: Right.

JUDGE LAM: Now, what local -- the definition of locality is in the eyes of the beholder. How much is local damage? And, considering the energenics involved, a crashing F-16 is able to flip a 200 ton cask into the air.

Now, perhaps there may be a loss of material. We talk about the outer shell is penetrated. First of all, our boundary case shows no penetration of the outer shell.

Secondly, we've shown in -- as a matter of fact, none of our cases in terms of the initial impact -- even our case where we have the speed greater than the bounding speed -- shows a penetration of the outer shell with respect to the impacting aircraft, the penetration that we show in our case that, beyond the bounding speed comes from the cask the cask tip-over when one cask hits another.

Secondly, we've done the analysis in terms of showing what happens when this cask that tips over, whatever happens, either it hits another casks or hits the path, assuming it goes directly the path.

We've done the analysis in terms of the damage that we'd get. And you don't have any -- the analysis show you don't have any global failure. You basically end up with local damage to the cask and the MPC.

So, the State is trying to apply the totally wrong evaluation criteria to a situation that's totally inapplicable to where we've looked at trying to apply a global evaluation to something where we've looked at in exquisite detail for local damage. And that is totally inappropriate.

One last thing I would only say is that the ASME -- DOE standard at various points refers you to the ASME code. It's appropriate determined SSC criteria capability.

And I've included a couple of those cites in the pages in that Tab 12.

CHAIRMAN FARRAR: Thank you Mr. Gaukler. Mr. Turk, if this is an area where your remarks are not significantly different from the Applicant's you don't need to repeat them

MR. TURK: That's kind of you. Unfortunately my remarks are different. And I recognize that I usually speak when everyone's had a full meal.

And they really don't want the dessert. It doesn't even appear tasty at that point. But, dessert I have. And I would like to address the issue, Your Honor.

CHAIRMAN FARRAR: Okay. Let's make sure we do this. I sense that we've almost been having the argument we would have had if we had had argument after we got the proposed findings and we wanted to have you argue the whole case.

And so, if you can focus on the elements of the motion for reconsideration.

MR. TURK: I intend to address the questions you raised specifically in your order.

CHAIRMAN FARRAR: Okay.

MR. TURK: As well as to respond to some of the comments here today.

CHAIRMAN FARRAR: Okay.

MR. TURK: I will probably need about 15 to 20 minutes. Could we possibly take a short recess before I start?

CHAIRMAN FARRAR: Yes. It's five after.

Come back at 6:15.

**off 6:05, on 6:18

CHAIRMAN FARRAR: Mr. Turk, are you ready to proceed?

MR. TURK: I believe so, Your Honor.

JUDGE ABRAMSON: Well, before you get started with your slideshow, I have a question for you Mr. Turk. I recall something from early on in our discussion of these -- of the DOE Standard that the Staff said they never accepted the DOE standard.

There was a -- I think -- a discussion about whether we would even admit it. Is my recollection wrong? The Staff didn't follow it, didn't use it?

MR. TURK: We're now going back to the August timeframe.

JUDGE ABRAMSON: Yes.

MR. TURK: My recollection is a little fuzzy.

PARTICIPANT: That was the EPRI study, I think.

JUDGE ABRAMSON: It was the EPRI study, not the DOE Standard?

MR. TURK: Dr. Bjorkman reminds me it was the NEI study. And that had been - NEI had done a

study of aircraft crash. The State wanted to introduce it or discuss it.

And I believe we indicated that they had been submitted to NRC. But it's never been approved or accepted by NRC.

JUDGE ABRAMSON: I see. Yes, that was the --

MR. TURK: Uncertain status at that time.

JUDGE ABRAMSON: That was the EPRI study?

MR. GAUKLER: That was what we referred to in the proceeding as the EPRI study.

JUDGE ABRAMSON: Okay. Not the DOE Standard. So, the NRC did not take a position that it does not endorse the DOE Standard?

MR. TURK: No. But, we did indicate that the way the State would have you apply it is incorrect.

JUDGE ABRAMSON: Okay. I understand that. Thank you.

MR. TURK: With respect to the ductility ratio. And perhaps that's a good point for me to begin on in brief response to Mr. Soper. It is true that the Staff has introduced and relied upon the DOE Standard in certain respects.

We do that with respect to the analysis of

aircraft crash events, what is the methodology that you should use in order to evaluate the impact. It talks about the riera* curve.

We use it for that purpose. But, when it comes to ductility ratio, we say, wait a minute, that's not what the DOE Standard is meant to do. It's inapplicable for the evaluation of whether there would be a breech of the MPC.

JUDGE ABRAMSON: Let me back up, because I want to make sure that I'm perfectly clear on this point. When you say you used the DOE standard, do you mean that you used the methodology that happens to be picked up in the DOE standard?

For example, when you're predicting the probability of a -- when you're going to use the aircraft probability formula, the old number of flights and width, etcetera, is that something that you looked to the DOE standard to get a source?

Or is it something you had an independent source of, which happened to later get used in the DOE Standard? And the same thing with respect to the riera* curve.

I've heard from the Applicant that the riera* curve and approach was around long before the DOE Standard. So, what I want to make sure I

understand is whether the Staff uses the DOE Standard per say or whether the Staff uses methodology that happens to also be suggested in the DOE Standard.

MR. TURK: It's more of the latter. With respect to how do we calculate the number of flights and the effective area and the width and the probability, that's NUREG 0800.

That's in the NRC Staff's standard review plan. The DOE Standard talks about the different methods of assessing aircraft impact, such as the missile target interaction method, or the use of riera* curve.

Those are approaches that we utilize not because they're necessarily in the DOE standard, but because they represent an appropriate way to evaluate aircraft crash events.

When it comes to evaluating the safety of a structure, as to whether or not that structure will be breeched, then we look at what the State presents and we say, no, what the DOE standard talks about with ductility ratio does not apply to the failure by breech of the structure.

JUDGE ABRAMSON: What I'm trying to get a handle on is, there seems to be an underlying theme, maybe not explicitly stated, that the Staff

selectively picks to adopt certain sections of the DOE standard.

And I'm trying to find out whether it just is a coincidence that the DOE Standard has picked up what the methodology that the Staff were to use or whether that was the only logical method to pick up, or whether in fact the Staff selectively uses part and doesn't use part.

MR. TURK: With respect to the MPC, with respect to a stainless steel vessel such as the MPC, we use the ASME code. That evaluates or that presents a means for evaluation of all loads.

The DOE Standard does not apply. If you look specifically at what the state is referring to here, that's section 6.3.3.3, which Mr. Soper presented to you for your consideration, that provision of the DOE Standard refers back to the ANSI standard.

The ANSI standard, which is ANSI N690 as I recall, talks about ductility ratio. And it in turn says this discussion is based upon reference 69. That's the Holand & Nuewmark * study which Dr. Bjorkman addressed at length in his testimony.

Let me do this. Let me first of all pass out for your consideration copies of NRC Staff Exhibit

111. And I will ask Dr. Bjorkman to help me on this.

(Pause.)

MR. TURK: If you recall, Mr. Soper pointed you to page 76 of the DOE Standard, which in section 6.3.3.3 B states, for steel structural components, the permissible ductility ratios shall be as specified in section Q1.5.8 of AISC Nuclear Specifications ANSI N690.

And it goes on to say -- I think it's irrelevant, but I'll give you a complete quote -- for plate structures the permissible ductility ratio of ten is recommended.

Well, what is this document to which the DOE standard refers and tells you to go to to calculate the permissible ductility ratio? That's the document we've just handed out.

It's the ANSI standard Staff Exhibit 111, which in section CQ1.5.8, which are the comments on section Q1.5.8 of the ANSI Standard, in the discussion of flexural members, the ANSI Standard states, quote, a ductility factor of 20 is based on the test results reported in reference 69.

The value of 20 represents a conservative limit, and was allowed for box sections. It goes on to talk about open sessions where the ductility ratio

is reduced to 12.5.

It concludes by stating there, quote, in order to achieve these ductility factors, local and lateral buckling must be prevented by limiting width thickness ratios and unbraced length of flexural members, close quote.

All right. We're on a logic train here. What's this reference 69 that this section talks about upon which the ANSI Standard is based when it talks about ductility ratios?

The next page of this exhibit is page -- well, it's a reference page. And item 69 is the Howland & Newmark * article entitled Static Load Deflection Tests of Beam Columns.

It's out of the University of Illinois, 1953. That is the intended use of the ductility ratio. That is why the State's reliance upon it here is wrong.

As Dr. Bjorkman testified at length before Your Honors, the ductility ratio addresses failure by buckling. If you're evaluating a case that we have at issue here with this failure by rupture, it does not apply.

And, in this regard, I would ask Dr. Bjorkman again to help me. And I would ask him to

distribute some selected copies of his testimony.

(Pause.)

MR. TURK: I'm distributing pages from the transcript of August 16, pages 16834 through 16853, along with Staff Exhibit 108 attached to this document.

And, may I point out this document was originally part of the safeguards information file. We have had it reviewed to make sure we can disclose it.

And we've now been advised by a safeguards information classifier that this information is not safeguards. But, at the same time, I won't bother putting it on the slide.

I'll make reference to some of the passages that appear here. Your Honors, in your order you asked for a good general engineering discussion of the ductility ratio and how does it apply to the issue before you?

And that's what I cam here hoping to address and maybe to clarify, because this piece of testimony that I've passed out to you provides you with a discussion of the general engineering principals that you've been inquiring about.

As you recall, Dr. Bjorkman's testimony indicated that the ductility ratio relates to failure

by buckling. And we've talked briefly just now about the Howland & Nemark * article and how that provides the basis for the ANSI standard, table Q1581, which has been referenced in the DOE Standard.

In Dr. Bjorkman's testimony, at pages 16840 to 41, he indicates that the failure that was studied in Newmark and Howland * occurred due to lateral or local buckling of the compression flange.

Failure by rupture was not involved. The authors of that article, Howland and Newmark*, found an average ductility ratio at buckling of about 27 or 27.5, which the DOE Standard then reduced to an allowable ductility ratio of 20.

And that appears in Dr. Bjorkman's testimony at transcript pages 16842 to 43.

CHAIRMAN FARRAR: So they looked at where it failed for this purpose on the average of the tests and said, okay, we can't go that far, we'll go -- we'll allow you to go less than that.

MR. TURK: In essence they established a safety factor.

CHAIRMAN FARRAR: Based on test of a particular mode of failure?

MR. TURK: Exactly.

CHAIRMAN FARRAR: So, you should have a --

according to this you'd have a ductility ratio for every mode of failure that you're concerned about?

MR. TURK: No, ductility ratio?

CHAIRMAN FARRAR: Yes. According to this, you would have a different ductility ratio for every mode of failure you're worried about.

MR. TURK: Yes, Your Honor.

CHAIRMAN FARRAR: So we should, if that's correct, you should smash something into vessels and see how much -- excuse the word -- smashing it takes to perforate it, figure a ductility ratio based on that, and then say the standard will be something less than that?

MR. TURK: Yes. And Your Honor asked about how the DOE Standard applies a ductility ratio of 20. They did that simply by taking that factor of 27 at which failure in the mode of buckling occurred, and compared that to the 20 ductility ratio.

And then they said, okay, well here's -- we'll apply 20. That gives us a safety factor of about 35 percent. That's a good allowable limit for their purposes.

But that does not relate to failure by rupture.

JUDGE LAM: But, Mr. Turk, if I may follow

Judge Farrar's question, there should always be a ductility ratio of some sort for a specific failure mode.

The concept of ductility ratio is simply the ratio computed strain to the used strain. So, to say -- when here the statement say well, ductility ratio concept don't apply here, it doesn't make sense to me.

MR. TURK: Well --

JUDGE ABRAMSON: Let me pick that up. I think that's exactly the point that I've been striving for here. Ductility ratio is just a measure of something.

And so, what the codes prescribe, what the DOE Standard would prescribe is assume failure at this ductility ratio. And that's what gives me heartburn, rather than looking at material properties.

MR. TURK: Exactly. If you're going to calculate the correct ratio, Judge Lam, it wouldn't be based upon the point at which you get a deformation of the material, because stainless steel can go into classic deformation without failing for rupture purposes.

You would need to compare the point of failure to the point at which yield stress occurs.

Now, in that regard --

CHAIRMAN FARRAR: Through an experiment design -- like here, I mean, what you're saying here is they did a series of experiments and found the average.

And those experiments were targeted through a particular mode of failure.

MR. TURK: Buckling, exactly.

CHAIRMAN FARRAR: And if you did it -- targeted our mode of failure, then we would have what we said we didn't have. In other words, we had two inconsistent approaches is what we said.

This would give you the consistency because it's related to the performance of the material. And that was the problem in our decision, is we couldn't understand why these two approaches were inconsistent.

And they're inconsistent because the ductility ratio tried to be imposed, didn't relate to the performance, tests of the performance of that material in the mode that we were concerned about.

MR. TURK: That's exactly right. And it's your decision, the majority decision correctly grasps that and answers it.

JUDGE LAM: Now, we don't have --

CHAIRMAN FARRAR: Our problem wasn't with the ductility ratio. It was with being given a random ductility ratio and being said to use it, just pulled out of somewhere.

JUDGE LAM: My argument really is not I'm objecting to the use of ductility ratio. We object to a raw ductility ratio, raw by your definition being applied to the rupture of a stainless steel pressure vessel.

JUDGE ABRAMSON: In local failure.

JUDGE LAM: Right.

MR. TURK: Your Honor, if I may make a correction, ductility in my mind has to do with the stretchability of a material. That's not the issue. True, you would establish a ratio.

But you would not call it a ductility ratio. You might call it a rupture ratio. But, the State is saying no, it's a ductility ratio. We're looking at the yield stress as compared to how much strain was actually experienced.

If I may ask the cameraman to focus on the document on the slide, Staff Exhibit 108. If you recall, it was drawn by Dr. Bjorkman during his testimony.

You have copies of the testimony in front

of you as part of the handout I gave you a moment ago. Dr. Bjorkman drew a curve which shows on its vertical axis a sigma, which is the stress, includes sigma Y, which is the yield stress.

On the horizontal axis is strain. This exhibit shows you that, at approximately 0.0012 or, I guess that translates to --

JUDGE ABRAMSON: A tenth of a percent.

MR. TURK: Okay. That sounds about right to me. You get -- the material goes into yield. That doesn't mean it fails by rupture. That means it's beginning to stretch.

Well, that's not the problem that you have to resolve. That's not the point that you look to see do we have a safe facility or not? The Mu of 20 that's shown on this figure as being the ratio of the DOE Standard, I guess that's the DOE Standard ductility ratio as compared to the yield stress.

But, where does failure occur? As Dr. Bjorkman's testimony explains, and that's the part of the document I put in front of you, you have to take that curve and take it way out into some distant space in order to determine where does failure by rupture occur?

But that's not what's being measured by

the ductility ratio of 20.

JUDGE ABRAMSON: And, in fact, let's leave that up for a second because there's something I wanted to ask. This curve shows that the ductility ratio of 20 occurs in this -- for this material at 2.4 percent strain, correct?

MR. TURK: Yes.

JUDGE ABRAMSON: Now, is that -- do we remember whether that is true strain or engineering strain? Because I get those confused.

MR. TURK: Dr. Bjorkman told me it doesn't matter.

JUDGE ABRAMSON: Okay.

MR. TURK: But there's another graph I'm going to show you that will make his statements --

JUDGE ABRAMSON: Sorry, okay.

MR. TURK: -- now on the table more clear.

JUDGE ABRAMSON: But, where I wanted to go with this is, we heard information a lot of testimony that said that carbon steels can go -- the carbon steels such as the overpack used for their liners, inner and outer shells, can go to true strains of something like 50 percent before they rupture, and that the stainless steels at which the MPC is made can go to something like 90 or more percent before they

rupture.

So, if I were to try to find out where your X is, I would have to expand this scale so that I went something like 25 to 50 times as far away from the left axis to get to the point where it actually ruptured.

JUDGE LAM: Even for carbon steel?

MR. TURK: Even for carbon steel. You would use this sort of a stress strain curve to determine for any material the point at which you would get rupture and the ductility --

JUDGE ABRAMSON: And if one -- let me make sure I understand this. If one did the kind of experiment that Dr. Lam was suggesting, which was to try to determine a ductility ratio which occurred at ruptured, and remember, taking the view that ductility ratio is simply the ratio of how far it stretched divided by how far it stretched when it began to go plastic.

If I took that, one would get from that experiment a proper ductility ratio to use as a failure criteria for this mode of failure.

MR. TURK: For --

JUDGE ABRAMSON: No, for the kind of failure where we're talking about a penetration of --

local penetration of an MPC. It's still the same. The concept of a ductility ratio, right?

JUDGE LAM: Applies.

CHAIRMAN FARRAR: But it wouldn't be 20.

JUDGE ABRAMSON: It wouldn't be 20. It might be 100. It might be whatever.

JUDGE LAM: Yes, whatever it is, right.

JUDGE ABRAMSON: Or 1,000. If we're saying, for example, if we're saying that these materials fail at 90 percent strain and they went plastic at a tenth of a percent strain, then we're talking about a ductility ratio that describes that failure mechanism of 900.

JUDGE LAM: Right.

MR. TURK: Right. I'm sorry. I was confusing -- you used the word ductility ratio. But I think ductility is the wrong word. That ratio you describe is correct.

CHAIRMAN FARRAR: Whatever.

MR. TURK: There is a tremendous margin for the yield stress.

CHAIRMAN FARRAR: And that's the missing piece that caused us to say in our opinion we couldn't reconcile the two approaches. And that ties in actual material properties experimentally determined and the

ratio approach.

It's just 20 under this is the wrong ratio.

MR. TURK: That is correct.

CHAIRMAN FARRAR: The wrong number.

MR. TURK: Now, I have another exhibit that may make it more attractive. But that's not this.

JUDGE LAM: Now, before you go any further, by looking at this curve for carbon steel, the DOE Standard has already spoken where the failure strain is, even though the fracture, the rupture failure, or the buckling, whatever failure mode it is, particular ductility ratio applies to, it's way out there, because we had heard that carbon steel would not rupture until it reaches 50 percent strain.

MR. TURK: I understand it's correct. But you're looking at -- there is failure by buckling. The building begins to sag.

JUDGE LAM: Yes, indeed.

MR. TURK: It no longer supports load.

JUDGE LAM: Yes, indeed. I understand, for a specific failure mode, even though carbon steel at tremendous capacity as measured by its fracture strain or failure strain.

The DOE Standard specifically has spoken, thou shall not go beyond about ten to 20 tons beyond yield, which is very, very close to one or two percent.

MR. TURK: And you have to recall how many times Dr. Bjorkman repeated in his testimony the mode of interest here is rupture. It's not buckling.

JUDGE LAM: Yes, indeed. I'm aware of that..

MR. TURK: And that's the key. And, if it's appeared today, I'm very glad. I wish we had done it a little more clearly. It wasn't clear to everyone during the hearing.

I'd like to ask Dr. Bjorkman to pass out one other Staff Exhibit, which we've modified slightly to insert different points that have been discussed in testimony.

And this is not new information. It is provided transcript citations everything that appears on this piece of paper. I'll ask the camera to zoom out a little bit.

(Pause.)

MR. TURK: What I've put on the overhead projector is a copy of Staff Exhibit 106. And you'll notice that I put a little red star there and at the

bottom I've indicated Staff Exhibit 106 is modified in what you see before you to include the four balloons which explain these different points that have been set on the curves.

They are represented as Staff Exhibit 106. Those four balloons or text boxes give you citations to testimony. I want the State to understand we're not presenting any new information here.

We're simply collating and putting in front of me for graphic purposes a combined demonstration of evidence. The point of fracture, which is what Judge Lam was just asking about, not whether we can do a ratio showing the fracture point as compared to yield stress.

A fracture point on the true stress strain curve is represented by the red star. On an engineering curve it's the blue star down at the bottom.

As you may recall, there were two curves on this Exhibit. The engineering stress strain curve is the lower one that's slightly upside U shaped.

The true stress strain curve is the one that goes all the way out to approximately 1.2. Point of rupture, again, is that red star on true stress strain.

Where is yield stress? Yield stress is way back here at the beginning. In fact, this slide has shown here we have a ductility ratio here, we have the strain of 2.4 percent shown.

The yield stress actually was way back at the fracture --

JUDGE ABRAMSON: A tenth of a percent.

MR. TURK: That's right. So, when Dr. Bjorkman mentioned before that there's relatively no difference between the engineering stress strain curve and the true stress strain curve in terms of where that yield stress occurs that's because way back there at the beginning of the strain, you're really in a miniscule amount of difference between the two curves.

If Judge Lam was going to draw a or determine a fracture between point of fracture which was based on the test data, close to 1.2, he would have to divide that by the yield stress of .0012. You'd have a huge ratio.

JUDGE LAM: That's exactly right.

MR. TURK: As opposed to what the State is arguing you should have done, which was to adopt this 2.4 percent strain. Now, I want to make one other point.

I'm sorry, I don't mean to cut you off

Judge Lam.

JUDGE LAM: Oh no, go ahead.

MR. TURK: There is another set of information presented on this modified chart. Staff Exhibit 106 was based upon actual test data of type 304 stainless steel.

That's the same stainless steel that would be used in the MPC by PFS. The Staff also did a literature search to see, apart from these test data, what does the literature show would be the point of failure by rupture of type 304 stainless steel?

And you'll see there is a point at which we've drawn in there, that's the 92 percent. That was the minimum amount -- the minimum value that was found in the literature for failure of stainless steel.

And that did include strain rates. So, if you had a very high strain rate, that's reflected in that 92 percent. As you know, the Staff came to you with a value that said let's cut that in half.

The Staff didn't tell you that should be the strain limit. We went down to 46 percent for that reason and others. So I think that may help provide you with a clear general engineering principle to help you compare the ductility ratio to the point of rupture.

JUDGE LAM: Now, if I may ask you, Mr. Turk, what is so special about fracture relative to buckling? In fracture what you're saying is one is willing to go to a ductility ratio of 500 for carbon steel before it will fracture.

Abut, if we accept the DOE Standard, you are only willing to go to 10. What is so special about two different failure modes? One is fracture, knowing that carbon steel -- let's talk about carbon steel, because that's what the DOE Standard has been talking about.

For carbon steel, if we are talking about the failure mode being fracture, we're talking of ductility ratio of about 500. We're talking about buckling, as Dr. Bjorkman has been maintaining all the time in our proceeding.

Then, if you accept the ductility ratio concept as defined by the DOE Standard, then the ductility ratio is no more than 10 or 20. Why is two different failure modes for why we view so dramatic differences in ductility failure for the same material?

MR. TURK: Dr. Bjorkman is -- an engineering analysis --

JUDGE ABRAMSON: Let's come at this -- I

think there's a

MR. TURK: -- before you is when do you get a break of the MPC? Not when does the MPC begin to go slightly plastic? When does it begin to deform a little bit?

We don't care. You shouldn't care. Because, as long as a confinement boundary is maintained -- and that was the issue that the State raised repeatedly in this case in their opening remarks a year and a half ago in their proposed findings and at every point between the two.

The issue they raised was, do you get a breech of the confinement boundary? Do you get a release of radioactive material -- rupture? The issue was, does the MPC tend to deform a little bit?

You shouldn't care because it's not the issue.

JUDGE LAM: Yes, indeed.

MR. TURK: That's the ductility ratio that they are representing to you saying, please adopt this low standard because we don't want that kind of deformation on the MPC.

JUDGE LAM: But, in my mind, when a structure is under rapid dynamic loading, I do not know which mode of failure the material is going

through.

Could it be mixture of buckling and rupture and whatever?

MR. TURK: You're asking a question that the test data and the literature answer. As you recall, I said a moment ago that 92 of minimum failure that we found in the literature included strain rate, i.e. includes fast impact events.

JUDGE LAM: But this is a pristine coupon testing according to Dr. Sozen.

MR. TURK: That's the State's argument. But that's how the world reaches decisions on whether material is safe or not.

(Pause.)

JUDGE ABRAMSON: Mr. Turk, that was very helpful. Do you have any other particularly salient points you would like to make?

MR. TURK: I have a lot. But I don't want to take your time. We're all tired. If I may have just a moment I'll see if there's anything that's worth bring out at this moment.

JUDGE ABRAMSON: Okay.

MS. CHANCELLOR: Your Honor, could I ask a procedural question?

CHAIRMAN FARRAR: Yes.

MS. CHANCELLOR: We're being handed a lot of safeguards documents. We don't want to have to haul them back to Salt Lake City. Is there any way we can dispose of them here?

CHAIRMAN FARRAR: Yes, you can give them to Amy.

MS. CHANCELLOR: Thank you.

JUDGE ABRAMSON: And she'll deal with them.

CHAIRMAN FARRAR: She'll do whatever we say because she wants to get out of here in the next whatever.

MR. TURK: I would thank the Licensing Board and the regional assistant for his help in that presentation.

CHAIRMAN FARRAR: Okay.

MR. TURK: I'm just about done, Your Honor. Mr. Soper talked about transportation casks.

CHAIRMAN FARRAR: Yes.

MR. TURK: He addressed that previously. I don't want to go into it at length. The drop test involved drop onto an unyielding surface.

CHAIRMAN FARRAR: Yes. But the short answer is did you apply a different --

MR. TURK: Yes.

CHAIRMAN FARRAR: The short question is, did you have an inconsistent approach to that than what you've done here?

MR. TURK: No, because what's done for the transportation cask, what Mr. Soper referred to was that the type of analysis that the Staff requires an Applicant to do is an elastic analysis only.

But we're not looking there at doing an analysis of what happens in the event to see at what point does the cask or the material fracture? We're looking to set a conservative bounding standard.

JUDGE ABRAMSON: Do I understand correctly it's used for the design of the cask to test to see whether the cask is designed to withstand that?

MR. TURK: Yes.

JUDGE ABRAMSON: Okay.

JUDGE LAM: But, in designing you do not permit the storage cask to go beyond yield, is that correct?

MR. TURK: No. It is allowed to go beyond yield stress. What the elastic analysis reference is is the type of analysis that is done. It doesn't tell you that you must stay within the elastic regime in the outcome.

The material is allowed to go beyond yield

stress.

JUDGE LAM: How much beyond for the storage cask -- no, for the transportation cask?

MR. TURK: I can't give you a precise answer on that. But, again, that's not a way of determining point of failure. That's a method of ensuring that the design is safe enough to withstand the postulated event.

CHAIRMAN FARRAR: What we don't want to find out is that this transportation cask can withstand an airplane crash that the storage cask cannot withstand.

JUDGE ABRAMSON: We'll never know that. But, let me ask --

CHAIRMAN FARRAR: I mean, we don't want to find out later that there's been some different way that these are -- or some inconsistent principal that the Staff has applied to the analysis of one rather than the other. I think that's the point the State was raising.

MR. TURK: There is no inconsistency, Your Honor.

CHAIRMAN FARRAR: Mr. Turk --

MR. TURK: The Staff experts who appeared before you were familiar with both transportation cask

analysis as well as storage cask analysis. And their testimony represents a unified consistent approach where you may see the difference because in one case an elastic analysis is done, whereas here we're doing plastic analysis.

That doesn't mean it's an inconsistent approach. In fact, plastic analysis is allowed for the --

CHAIRMAN FARRAR: Mr. Turk, let me --

MR. TURK: -- for the other cask.

JUDGE ABRAMSON: Let me ask you the same question I asked Mr. Soper on this point. And that's this, when you're looking at the cask drop incident and you're applying a criteria to the design of the cask, does that mean that it must have been a credible event because it's included in the design basis?

MR. TURK: No, it's a postulated event. It's a hypothetical event which establishes as a bounding condition that they want to make sure is appropriately --

JUDGE ABRAMSON: So, even though it's not a, quote, credible event, it is still considered as part of the design basis. And one looks at it to see whether it satisfies that event.

MR. TURK: Yes.

JUDGE ABRAMSON: Okay.

MR. TURK: Yes.

JUDGE LAM: Now, if a transportation cask were to go into the plastic regime as much as what we had observed here on the storage cask, the Staff would have failed at design, is that true?

MR. TURK: You're asking me for a matter that is not in the record. And I'm afraid I don't want to launch into that question because I do not know the answer.

I can't think of where we discussed that in the record.

MR. GAUKLER: Your Honor, if I could just make a point? We discussed it in our reply findings as issued at pages 74-76. And I believe we quote some testimony from Dr. Bjorkman that addresses that issue.

I can summarize what it states if you want me to.

CHAIRMAN FARRAR: No.

MR. GAUKLER: But, it's pages 74-76, we discuss the transportation cask issue raised by the State. I just want to point the Board to that. We do address the issues and concerns that had been raised.

(Pause.)

MR. TURK: There is some discussion of

Appendix D to the DOE Standard. And I mentioned before that this was not a matter that was addressed in testimony.

The State didn't focus on Appendix D until after the hearing had closed. In fact, I believe the first time I saw reference to it was in the motion for reconsideration.

JUDGE ABRAMSON: But Appendix D was in the record.

MR. TURK: Yes, it is.

JUDGE ABRAMSON: We had copies of it.

MR. TURK: It is in the record.

JUDGE ABRAMSON: So --

MR. TURK: But, no one, until motion for reconsideration, asked you to focus upon it and to reach a decision with that in mind. If the State had wanted you to look at it, it should have been in their proposed findings.

It's too late to come in at a motion for consideration and say, Your Honors, you missed something that you should have seen, which I the State never brought to your attention.

That's not proper. However, look at it now. If you look at Appendix D you will see that it does not apply. The State again is wrong in calling

that to your attention because Appendix D at pages D1, the very opening to that Appendix states, nuclear exposure evaluation an underlines.

That's what's at issue here. It's an evaluation of exposures. And it goes on to state, quote, the following guidance is intended to assist the analyst post-structural in modeling aircraft crashes and --

CHAIRMAN FARRAR: You don't have to read it, we've got it.

MR. TURK: -- parameter assumptions and dispersion modeling, etcetera. This is not used to determine structural --

CHAIRMAN FARRAR: We got it.

MR. TURK: -- as much as it it's only used to say, okay, you've reached failure, you've got a structure that's failed, you've got a breech, how do you model the consequences. So the State's reliance upon it is wrong.

JUDGE LAM: But I thought Mr. Soper's point is different. He's talking about Appendix D. If one were to rely on the Applicant's and the Staff's argument, Appendix D would not have been in existence because the pressure vessel would not have failed.

MR. TURK: No. The DOE Standard would

apply to a pressure vessel in so far as you use the right methodology to determine structural failure.

JUDGE LAM: But basically the evidence is before us.

MR. TURK: The DOE Standard refers you back to the ANSI standard. The ANSI standard says it doesn't apply to pressure vessels or piping. So what does apply?

The ASME code, the ASME code. You do your structural evaluation under the ASME code. You come up with consequences. And then you can come back and say, what are the dose consequences of a failure, which has been determined using the correct structural analysis methodology?

And I don't want to tire you anymore. I think that's it.

CHAIRMAN FARRAR: Thank you Mr. Turk. Mr. Soper?

MR. SOPER: Thank you Your Honor. I'll try to march right through these. I know the hour is late. First of all, on the buckling issue, testimony by Dr. Bjorkman, I'm referring to page 17297 of the transcript.

And I asked Dr. Bjorkman the following. So, you have identified two different types of

buckling modes and one failure mode by strain failure.

Did you say? Witness Bjorkman, yes, it would fail in the strain, the DOE Standard and the table for ductility ratio calculations, specifically has a ratio of the ultimate strain of the material to the yield strain times .25.

So, is your understanding that's under tensile strain? Dr. Bjorkman says, that's under tensile structural tension members. And that's an ultimate tensile strain.

I believe it is epsilon sub U or epsilon sub Y times 25. And, if you look at the page from the ANSI standard, the table I handed out, he's referring to the number one, which states right on its face is steel structural tension members.

And he confirms that yes, this one fails in tension, the other two fail in buckling. And, again, this doesn't even address the plate structure that's provided for in the DOE Standard.

Now, switching to another subject, this notion that global evaluation is not what we do here, we just do a local evaluation, well, that is simply untrue.

What impact doesn't have both a global and a local response? In fact, the DOE Standard requires

both. The local evaluation concerns whether a missile would perforate a structure, would punch through it.

And they give two formulas. One is for reinforced concrete, one is for a steel plate. Here's what they say about the steel plate.

(Pause.)

MR. SOPER: This is for local evaluation of steel targets.

MR. GAUKLER: What page are you reading from?

MR. SOPER: Sixty-nine. And it gives what's been used in this case several times, the ballistic research laboratory formula for punching through a steel plate.

And it says, it should be used only to predict local perforation of steel structures by small rigid missiles. So yes, there is a local evaluation under the DOE Standard.

It certainly does not excuse the global evaluation. What is the global evaluation? Look at 6.3 -- well, let me just read from it -- 6.3.2.1.1, global response evaluation.

I'm reading from page 70. Global response evaluation can be performed by either the energy balance method or the time history analysis method.

That's exactly what PFS did, the time history analysis method.

It's the riera* curve of loading. The purpose of it is to compute strains. That is the global evaluation. In fact, not only is it not to be done under the DOE Standard, in fact, that calculation was done by PFS and everyone else in this case.

That's the calculation of strains. That's exactly the definition of global evaluation. And the criteria for that is expressed in ductility ratios.

So, just because you pass the perforation of a steel plate and pass the perforation of a reinforced concrete, doesn't excuse the fact that you go onto global evaluation.

In fact, it doesn't make any sense. Why would you be committed to pass only one, either one of them, and fail the other? I think it is also telling in this case that the industry's own study, the EPRI study that we have referred to before, suggest strain limits much, much lower than what's claimed by PFS or the NRC Staff.

In fact, it's much closer to the ductility ratios if you compared those strains. Again, the EPRI study is specifically for an aircraft crash into a stainless steel containment steel, specifically.

And I do not know whether those have some sort of safeguards component I believe, or at least are not generally available publicly. So I will leave the specifics of that to the Board to look at.

But that, of course, in evidence -- I do not have that exhibit number offhand. But, it's not hard to find. So, let me say this about the DOE Standard just to wrap this up.

Again, contemplating the number of federal agencies, the number of national laboratories, the number of experts that developed this thing, and the fact that it is published as the Department of Energy's formal standard for this very purpose.

Considering that in mind, and the fact that they show an example of a pressure vessel being ruptured by an aircraft crash, here is the question. Which of the ductility ratios apply to this pressure vessel?

Example, pick any one you want. To be generous let's pick the most generous pressure, or ductility ratio, and apply it. The PFS cask will fail. So let's not quibble over which ductility ratio to apply, apply any of them, it won't meet it.

Now, PFS' attempt at a calculation of one of the ductility ratios in accordance with the ANSI,

the number one formula here. However, they didn't quite use the full formula. This is very important.

If I could direct you to this table from the ANSI standard number one. If you look at the structural steel tension member formula, it has the ductility ratio, it should be equal to or less than .25 epsilon sub U, divided by epsilon sub Y, or not to exceed, in any event, must be less than .1 divided by epsilon sub Y.

They left off that, because that is the limiter. They simply performed the .25 part of the calculation, left off the limiter. And if you look in the State's reply, you will find the rest of that calculation. It just arithmetic. And so no secrets about it.

PFS simply doesn't meet any of the ductility ratios. And I think I will submit this issue, Your Honor.

CHAIRMAN FARRAR: Thank you, Mr. Soper. Does anyone have that reference, the exhibit number to the EPRI study handy?

MR. GAUKLER: I have it, Your Honor. It is State exhibit 246 and I tell you, we address it at pages 72-74, our reply findings, and show why it does not support the State's position.

CHAIRMAN FARRAR: All right. Is that all the response you need, Mr. Gaukler?

MR. GAUKLER: A very quick response. The DOE standard defines what the purpose of a global response is. It defines the response of the overall structure as measured by a strain, the strain rate of displacement.

So you are talking about the overall response of the structure, which is different than the local response. In terms of our doing a force time history, we did the same approach with respect, we used the same finite element approach, both in terms of evaluating the detailed localized area and strain and the global response.

So we did a finite element approach that encompassed both aspects of the DOE standard. To say that we only did a global evaluation using the force-time history just is incorrectly characterizing what we are doing.

In terms of referring to the structural steel tension members, and the ductility ratio showing the ANSI standard for that, the State calculates ten percent, for your information, using its approach, which is greater than still anything that the parties find in any of their analysis in terms of tensile

stresses.

Moreover, the limiting factor here, less than equal to 0.1 that he referred to that, again, doesn't take into account material properties. It is just a general statement for all materials, even though you have a stainless steel that is much more ductile than the carbon steel.

So in our response we just said what is the ultimate strain of stainless steel, 92 percent, you take one quarter of that, it would give you what the first part of this statement says, it gives you 23 percent. And that still gives you a factor of safety very large.

So the State's arguments have no merit, and I repeat everything I said before.

CHAIRMAN FARRAR: Mr. Turk?

MR. TURK: One brief point Your Honor. I might have misheard. I heard Mr. Soper refer to the transcript at page 17297. Dr. Bjorkman's testimony is actually in transcript 17279, maybe I heard him wrong.

But that is where the discussion of whether there is tensile strain, I'm sorry, tension member evaluated. If you look at that page and continue down to page 17283 you will see a complete discussion, by Dr. Bjorkman of that issue, as well as

the elastic analysis referred to by Mr. Soper, that is done for transportation casks.

And at page 17281 to 282 Dr. Bjorkman explains that in the transportation cask case, the cask is allowed to go into plastic deformation. It is the analysis that must be done elastically, and that is for reasons of analytical conservatism.

But if you look at the transcript, I don't want to paraphrase, I think if you look at those transcript pages --

CHAIRMAN FARRAR: We will look at them.

MR. TURK: -- you will see it.

CHAIRMAN FARRAR: All right, Mr. Soper, you had mentioned, earlier, the question about the crashes and the top impact. Whatever you say about the top impact, if the speed you are concerned about is greater than the bounding speed, why isn't that just an un-analyzed event that is outside the -- in other words, if it is beyond the bounding event, why do we need to worry about what it does, either to the first cask it hits, or to the one it bounces off and hits?

MR. SOPER: I think I understand your question.

CHAIRMAN FARRAR: We just shifted gears

here. If you want to take a second?

MR. SOPER: Yes.

CHAIRMAN FARRAR: Go ahead, take your time.

(Pause.)

MR. SOPER: The PFS analysis assigns zero probability to a top impact even above the bounding speeds.

CHAIRMAN FARRAR: Right.

MR. SOPER: So maybe I misunderstood your question.

JUDGE ABRAMSON: Let me see if I can rephrase it, Mr. Soper. What we've done here is try to get a handle on what kinds of events are credible. That is have a probability of ten to the minus six or greater, per year. And what events fall outside that category of events.

And the NRC's approach is that if they have a probability of less than ten to the minus six per year, they need not be considered in the design. When looking at the probability distribution for aircraft crashes we found a bounding speed. And the idea was that speeds above that need not be considered, because they are less than one in a million per year likely to happen.

So now the question is, when you are considering these crashes that glance of the top and go hit a second cask, why -- are those crashes that you are worried about at speeds greater than the bounding speed, or are they at lesser speeds?

MR. SOPER: Greater than the bounding speed.

JUDGE ABRAMSON: In which case they need not be considered in the design basis because --

MR. SOPER: Well, all the speeds, all the crashes that went into the PFS analysis, that were assigned some probability of a breach, were crashes above the bounding speed. That is how -- if there were none above the bounding speed there would be a zero probability of any release.

JUDGE ABRAMSON: Sorry, the approach was, the approach that was taken by the Applicant, and which this Board endorsed was that we will look at events, we will look at the probabilities, we will look at crash speeds, and we will develop a probability, we will develop a maximum speed for which a crash can occur that represents where no event below that -- well, all events above that speed have a probability of occurrence of less than one in a million per year.

And, therefore, all those higher speed events, no matter what their consequences are, no matter what their consequences are, need not be considered in the design basis.

So it is not that you are assuming a zero probability, you are saying they need not be considered.

MR. SOPER: I don't know if I understand. Do you mean since the top impacts at high speed don't result in any damage --

JUDGE ABRAMSON: No.

MR. SOPER: -- if it hits the top?

JUDGE ABRAMSON: No, no, we are saying it doesn't matter, it doesn't matter how much damage they have if they occur at a speed greater than the bounding speed, they are so unlikely, that they need not be considered in the design of the system, independent of the consequences.

CHAIRMAN FARRAR: Let me rephrase that. We found a bounding speed. And we said looking at all the crash reports enough of a percentage of the crashes will be less than that speed, that the Applicant wins.

There will be some crashes, there are hypothetical crashes above that speed that we will

assume, for present purposes, could cause a lot of damage. But those are highly unlikely.

So whether it hits the top, or hits the side, those --

JUDGE ABRAMSON: Those need not be considered in the design because they are so unlikely. That is the theory of credible events.

CHAIRMAN FARRAR: Yes, but before you go on, Mr. Barnett, is this your area?

MR. BARNETT: Yes, Your Honor, it is.

CHAIRMAN FARRAR: Did we misstate what we thought you proved?

MR. BARNETT: No, Your Honor. What we did, and this is set forth, in particular in Dr. Cornell's report, pages 26 and 27, and also in page 48, is he took the bounding speed from Dr. Soler's analysis for top impacts.

Dr. Soler looked at the cask top and said this is the bounding speed, slower speeds will not cause breach of the cask. And then Dr. Cornell used that in his calculations and showed that the totality of all the faster potential crashes had a probability of less than ten to the minus six.

CHAIRMAN FARRAR: We spoke of top impacts in two different contexts.

MR. BARNETT: Yes, Your Honor, this would be --

CHAIRMAN FARRAR: Does everyone know the two I'm talking about, so I don't have to clear the room?

JUDGE ABRAMSON: Well, I think it doesn't, if we are talking about an aircraft impact, as opposed to an impact of something else, we are talking about an aircraft impact.

When we looked at the statistics of aircraft impact, as a function of speed and angle, we found a bounding case. Anything above that bounding case, all the events above that bounding case, all the statistics tells us that all the events above that bounding case have an aggregate probability of less than ten to the minus six a year.

MR. BARNETT: Your Honor, yes, that is correct. The one bounding speed that I think you are referring to is for impacts into the side --

JUDGE ABRAMSON: That is correct.

MR. BARNETT: -- of the cask?

We also established a bounding speed for impacts into the top of the cask, and it is different, it depends on the angle on which the plane is hitting the cask.

But Dr. Cornell took that into account when he did his calculation --

JUDGE ABRAMSON: Sorry, when you say he established a bounding speed, that was based on the damage to the cask, not on the statistics --

MR. BARNETT: Based --

JUDGE ABRAMSON: -- of the aircraft crashes?

MR. BARNETT: No, the bounding speed was based on Dr. Cornell's -- I'm sorry, Dr. Soler's physical analysis of --

JUDGE ABRAMSON: Right.

MR. BARNETT: -- what would happen to the cask.

JUDGE ABRAMSON: Right. So I want to come back to the basics here, because the basics are, we are trying to find which events are credible. Which means which events need to be analyzed in making the design of the system.

And the regulations say that if an event has a probability of occurrence of less than ten to the minus six per year, it need not be considered in the design. We then looked at all the possible aircraft crashes. We took all the information we had about aircraft crashes, and we looked at those and we

said, okay, here is the maximum speed which we call an angle, which we say is the bounding impact.

And anything above that has so little probability that it need not be considered in the design. That is just looking at aircraft crashes, not thinking about structural properties.

So we don't consider, in the design of the system, the consequences of anything that hits at a higher speed, or different angle, independent of where it hits. Because the statistical likelihood of that event is less than ten to the minus six.

MR. BARNETT: Your Honor, the way Dr. Cornell did his calculations, he looked at top impacts and side impacts separately, because Dr. Soler had produced --

JUDGE ABRAMSON: Had done structural analysis separately. But that is unrelated to the basic statistics of the aircraft crashes.

MR. BARNETT: It is unrelated to the statistics of the aircraft crashes. Dr. Cornell used the information on the aircraft crashes to calculate the likelihood of a plane hitting the top of a cask at above and below the bounding speed for the top of the cask, so that he could get what he calls a UEP contribution from impacts into the top of the cask.

CHAIRMAN FARRAR: Go ahead, Mr. Soper, pardon that digression, but we were --

MR. SOPER: Okay, let's see if I understand this. Judge Abramson, you are saying that there are not enough crashes over the bounding speed to reach ten to the minus six, is that what I understand you are saying?

JUDGE ABRAMSON: That is what the record shows, and that is where we are focusing. That one only needs considering the design basis crashes that have a probability of greater than ten to the minus six.

MR. SOPER: Well, the combined cumulative effect of all those crashes?

JUDGE ABRAMSON: Right.

MR. SOPER: Now, is that -- you are talking about the Board's common sense, this makes a reason to look at it this way, or are you talking about PFS' analysis? Because the PFS analysis, in fact, comes very close, very close to missing the standard.

Giving them everything that they have done, and all the things we have objected to, they still barely meet it. So it is, in fact, if you are basing your decision on their analysis, their analysis

would be different if you consider that a top impact, every top impact has zero probability according to their analysis.

And the reason, at any speed, and the reason why --

CHAIRMAN FARRAR: Zero probability of --

MR. SOPER: Of a breach, to add to the un-analyzed event probability. Now, we went through this, I thought, in quite some detail at the hearing. And what that is based on is that if an aircraft hits the top of a cask the computation is nothing will happen to that cask because most of the force is horizontal, not vertical.

So they say, well, every one that hits the top, then, even at very, very high speeds, over the speeds that an F-16 can fly, it won't hurt that cask. That is fine, where does it go? Because there is a cask sitting right beside it.

And the evidence is this. Dr. Soler explained it this way, which is just a hunch. He said, well, and the Staff I think -- well, Dr. Soler says, well the bottom of the aircraft would, an air scoop would catch on the cask, and that would cause it to tumble.

If you can imagine a jet aircraft is going

to tumble when it hits an eleven foot cask top, and it is going at hundreds of miles an hour, passes that cask in less than 200ths of a second, boom, like that. It is going to tumble afterwards, he suggests.

This is the cask vendor for PFS offering this opinion, who has never before done an aircraft analysis, has no aviation experience, and he predicts all top impacts will tumble.

CHAIRMAN FARRAR: So you want us to look more carefully at that specific chain of evidentiary presentations, and re-look at --

MR. SOPER: They are un-analyzed, there is no analysis. I mean, what happens -- let me suppose, because I have as much credentials --

CHAIRMAN FARRAR: No, no, you want us to, what we are talking about right here, at 7:20 p.m. --

MR. SOPER: I will be brief.

CHAIRMAN FARRAR: In other words, we are not going to solve this one here. I mean, what you want us, I think what you are suggesting is we go back and take a very careful look at this particular chain of evidence and see if you aren't correct?

MR. SOPER: I want you to understand the problem, and I'm not sure I'm making my point. Because a plane could just as well come in, rip off

the bottom half, it goes right into the adjacent cask.

And anybody else can make that assumption as well as Dr. Soler.

CHAIRMAN FARRAR: That is in your motion. What is your answer to that, Mr. Barnett, if any?

MR. BARNETT: Your Honor, with respect to, first of all, with respect to the UEP contribution, if you will, from potential impacts into the top of the cask, PFS did not assume that it was all zero.

On page 48 of Dr. Cornell's report it can be seen, there, that for angles between 45 degrees and 90 degrees, that is the steeper impacts, there is --

CHAIRMAN FARRAR: Do we want to --

MR. BARNETT: I won't get into numbers, just to say that there is a positive contribution there.

CHAIRMAN FARRAR: So as part of doing what --

MR. BARNETT: It is so minimal to be worth nothing. But there is -- but that doesn't answer the question.

CHAIRMAN FARRAR: But that is something that you want us to look at if we take up Mr. Soper's suggestion that we review the record on this, you want us to look at that?

MR. BARNETT: Yes, Your Honor. And I would also submit that we addressed top impacts in detail in our findings, and reply findings, paragraphs 458 to 470 in our findings, and 174 to 184 in our reply findings.

And that gets to the physical question of what happens when the plane hits the top of a cask.

CHAIRMAN FARRAR: Well, we will take a look at this. Mr. Turk, do you want to add anything we should look at here?

MR. TURK: Yes, the issue raised in the motion is the State's assertion that the only evidence, on this issue, is Dr. Sozen's testimony. And in fact --

CHAIRMAN FARRAR: Soler.

MR. TURK: I'm sorry. No, on page 6 of the State's motion they state, absent such an analysis, this is in quotations, the only evidence is that the F-16 is assumed to continue on after a shallow top impact to damage one or more of the other casks, etcetera.

The testimony actually did address grazing impacts. I would point you to our response to the motion for reconsideration at page 7, where we talked about this issue, we pointed you, really, in very

terse summary fashion, to the Applicant's proposed findings, where the testimony is laid out at length.

And then there is a footnote, footnote 12 of our paper, that talks about the sensitivity studies that were done, both by PFS and by the Staff, that tell you what would be the impact on UEP if you were to consider the issue differently.

And I think the issue is well addressed in the papers, there is nothing more that I need to add.

CHAIRMAN FARRAR: All right. Then we will, if there is nothing further, we will take a closer look at the evidence on this.

MR. BARNETT: Your Honor, if I might? I would just like to point the Board's attention, draw the Board's attention to the part of the transcript where Dr. Soler testified on this, on the stand.

And that was at pages 19562, through 19569. I think that captures everything that we are talking about this issue of an airplane potentially sliding of the top of a cask, or tumbling. I think that that is where he addresses those points.

CHAIRMAN FARRAR: All right. Mr. Soper, has the State had a chance to present everything it wanted to on its motion?

MR. SOPER: Wrapping up with about three

sentences, if I may?

CHAIRMAN FARRAR: Okay, go ahead.

MR. SOPER: Dr. Soler's second analysis was he assumed that, okay, there is a top hit impact. Let's assume that the plane changes direction as soon as it hits the top, and now it travels completely, or perfectly level with the ground.

Why it would is anybody's guess, but that is his assumption, and that it doesn't lose any speed. He then predicts, and does some calculations, which are disphysics, we don't agree with. Now the plane is going at the same speed, at the level of the cask tops.

And, of course, it is going so fast that it won't drop, it will just fly above them. Well, I think that would be nice if that happened. So we have two extremes. One hits the top, doesn't lose any speed, the other one hits the top and it is safe because it loses so much speed.

We are worried about what happens in between. It hits the top, rips apart a little bit, smashes the cask next to it. No analysis, these are just guesses. And that is all the State has.

CHAIRMAN FARRAR: All right.

JUDGE ABRAMSON: For the Applicant I have

a question. When we looked at the statistics of aircraft crash impact speeds and angles, do we have a different set of probabilities for high angles impacts, or for ones that are going to hit the top, than we do for the general impact information?

MR. BARNETT: Yes, Your Honor, and Dr. Cornell talked about that in his report. I think that he goes into that in more detail, in appendix A of his report, that is PFS exhibit 265.

JUDGE ABRAMSON: Okay.

MR. BARNETT: If I could, I would just like to very briefly respond to what Mr. Soper said about the plane sliding off the top of the cask. And that is that Dr. Soler addressed that in page 19566 and 67, and 19569. He did offer an explanation as to why that would happen.

And then just the last point I would like to make in response to something the State said in its reply, it challenged Dr. Cornell's sensitivity analysis, and how he handled top impacts. And it asserted that Dr. Cornell failed to address them, and that is not correct.

What he did is described in PFS exhibit 320, and when he adjusted the UEP, when he was doing his sensitivity analysis, based on his calculations,

he included the entire UEP for all the casks, including top impacts. So that was included in that. But, again, that is in PFS exhibit 320.

JUDGE LAM: Mr. Barnett, if I may ask you a question on Dr. Soler's testimony? Now, the theory advocated by Mr. Soper is a classical goldilocks scenario, the plane hit the top of the cask, not losing too much energy to damage the cask, but losing sufficient energy not to damage its neighbor.

Now, I understand you said Dr. Soler had some explanation provided in the transcript at 19560. I will read the transcript, were these explanation, do you remember, based on engineering principles, or an educated guess, or both?

MR. BARNETT: Your Honor, it was based on his understanding of the structure of the F-16, and the structure of the top of the cask. He talked about the pieces that existed, the metal pieces and concrete pieces on top of the cask, and then the underbody of the F-16, and how they would get caught on each other, and cause damage to the airplane.

And he believed that that would cause the airplane to tumble as a result of that impact.

MR. GAUKLER: Your Honor, if I could add one other brief point? Because I worked with Dr.

Soler in this area, I know there is calculations and analysis in the appendix to his original testimony that address this issue, also, and they are summarized in our findings.

So we did some calculations and analysis in Dr. Soler's appendix to his original testimony, which go in part with the testimony that Mr. Barnett referred to in addressing this issue, and they are all summarized in the findings.

MR. TURK: If I could address your question, also, for a moment? The other leg of the argument presented by Dr. Soler was that in the short distance between casks, the amount of vertical drop that the airplane would experience would be so small that you would not get a direct side impact into a cask.

So I guess the argument that Dr. Soler made was, number one, the plane could tumble, and thereby changing its trajectory into the adjacent casks. But even if it was to continue on in the same line, it wouldn't drop enough to impact the side of the cask.

CHAIRMAN FARRAR: Right, we are repeating ourselves here. By Friday evening, oh no, all of you are going back tomorrow. By Monday evening each of

you fax us a one-page telling us where everything is that we should read on this subject, both testimony, live pre-filed testimony, live testimony, exhibits, and your proposed findings and conclusion, on just this top impact question and we will go read everything that you refer us to.

So let's exchange that by Monday at 5 o'clock. If you need more time let us know. It is not argument, I don't want to see a word in there other than TR and P, NEX. Everything else is to be numbers.

MS. CHANCELLOR: Does this need to be faxed, Your Honor? Can we email it?

CHAIRMAN FARRAR: Yes, I'm sorry, yes. Email it but no argument, no words, all we have is appendix, transcript page, and exhibit.

MR. TURK: And that is just this last point that we have been addressing?

CHAIRMAN FARRAR: Just this very last point. We are all tired, there seems to be more here than we thought. And the best solution is we will just go read everything and consider your arguments. Is that all right, Mr. Soper?

MR. SOPER: Yes, Your Honor.

CHAIRMAN FARRAR: Mr. Barnett?

MR. BARNETT: Yes, Your Honor.

CHAIRMAN FARRAR: Mr. Turk?

MR. TURK: Yes.

CHAIRMAN FARRAR: All right, with that is there anything else, Mr. Soper, that you need to bring to our attention?

MR. SOPER: No, Your Honor, thank you.

CHAIRMAN FARRAR: I think we have covered everything with your motion.

JUDGE ABRAMSON: At 7:30 tomorrow morning, everybody?

(Laughter.)

CHAIRMAN FARRAR: We will take the matter under submission. I guess we do have to reconsider what we said on page C-6 of our opinion, which was for the final time, then, we thank the parties for their professional high quality presentations, blah, blah, blah, blah.

JUDGE ABRAMSON: We will reconsider every word of it.

CHAIRMAN FARRAR: We thought that was the final time, but it was not. But, again, you've all done yourselves proud here today, we appreciate the presentations, appreciate the State bringing these matters to our attention, because we do want to make

sure, when all is said and done, that we have done our level best to get it right.

Maybe it was right. If it wasn't we will say so. So thank you all and to all a good night.

(Whereupon, at 7:30 p.m., the above-entitled matter was concluded.)

CERTIFICATE

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

Name of Proceeding: Private Fuel Storage, LLC

Docket Number: 72-22-ISFSI

Location: Rockville, MD

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

Ed Johns
Official Reporter
Neal R. Gross & Co., Inc.