NUCLEAR REGULATORY COMMISSION

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PUBLIC WORKSHOP

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SPENT NUCLEAR FUEL TRANSPORTATION STUDIES

Nuclear Regulatory Commission
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P R O C E E D I N G S

[9:40 a.m.]

MR. CAMERON: Good morning, everybody. Welcome to the NRC's roundtable discussion and public meeting on spent fuel package research.

My name is Chip Cameron. I'm the Special Counsel for Public Liaison here at the Commission, and I'm going to serve as the facilitator for today's meeting.

Before we get started with the substance of the program, I just want to cover three issues briefly with you, and one is the objectives for the meeting today. The second is format and ground rules, and the third is the agenda for the meeting.

I just want to go over that briefly with you, so you'll understand where we're going to be going today.

In terms of objectives, the first is that we want to provide all of you with information on the Sandia Lab report on spent fuel package research, and we also want to talk about the draft brochure that the NRC is developing on transportation risk.

Most importantly, we want to listen to your views on the proposed Sandia research program and also on the draft brochure, and not only to individual views but also to get an idea about how you react to your colleagues around

the table, to their views on this, and hopefully the value of this roundtable discussion will be to get a dialogue going on these particular issues.

And the NRC is going to consider your views and the collective discussion in moving forward on the proposals in the Sandia report, and we do have NRC staff with us around the table this morning and in the audience, and they're here to listen and to provide any clarifying information that you might need and also to ask you questions about any recommendations or concerns that you might have, to make sure that we understand that before we move on to the evaluation stage.

In terms of format for the meeting, the focus is going to be on the roundtable, and we will be going to the audience after each discussion area, so we can answer any questions, get any views from those of you out there in the audience.

All of you around the table have what we call name tents in front of you, and if you do want to say something, if you could just stand that name tent up on its end, and that way you won't have to keep raising your hand, and I'll be able to keep track of who wants to talk, and I may not take the name tents in the order they are raised, so that we can follow some discussion threads on some of the issues

that come up today.

When we go out to the audience, if you could just give us your name and your affiliation, if appropriate. You can either go up to one of the standing mikes or I'll bring you this talking stick out, and we are taking a transcript today, and at the beginning of the roundtable, if you could just give your name before you talk, that will help Tamara, our stenographer over there, to make sure that we identify you correctly, but she has a chart of where you're sitting, so I think we can dispense with that after a little while this morning.

I usually ask people, and I'll ask again, to try to be to the point in your comments today, so that we can make sure that we can hear from everybody.

We don't have a lot of people around the table, so I think that will give us more time for discussion. There will be a couple people that are coming in late today and will be joining us.

Even though we don't have an expansive time for discussion, I would just note that the NRC is taking written comments on these issues, so if you do have detailed comments that you can't get in today, please submit those in writing to us, and another value of having this roundtable discussion is you may hear things that will better prepare

you for submitting your written comments, and I would ask that only one person speak at a time, so that we can get a clean transcript of the meeting.

In terms of the agenda, we want to focus on package performance -- in other words, on the Sandia report that has some research recommendations in it.

We will be talking about the NRC's document called a NUREG on spent fuel transportation risk later on today and also about the draft brochure that the NRC is preparing for the public on this, but we want to make sure that we get all of your comments on the important issues associated with the proposed Sandia research project. So, we're going to be starting off with that, and most of the time will be spent on that today.

In a few moments, we'll turn to Dr. Susan Shankman, who is the Deputy Director of the Spent Fuel Project Office at the NRC, to give us a welcome and an overview of NRC responsibilities.

We'll then begin with the package performance research program that Sandia Labs is doing for the Commission, and we're going to have Rob Lewis, who's the Project Manager for that research project, give us an overview on the project, and then we're going to go to Ken Sorenson from Sandia Labs, who's going to give us a summary

of the project, and then we're going to go through the issues in the report, and the way we've divided that up for discussion purposes is to start off with all of the testing issues that are in the report, because we find that that is probably a major area, definitely a major area of concern for everyone around the table.

We'll talk about the testing issues, and that may take us all the way up to -- we're going to have an early lunch break today. So, we'll just go from now until we get to lunch.

Then we're going to go -- after we're done with testing, we thought we would go through the topics as they're presented in the Sandia report, but we're going to focus on the so-called A and B issues, and Ken Sorenson will be explaining what that -- how we got to those -- or they got to those conclusions on A and B issues. But we want to focus on those.

We'll move through all the topical areas and then save time at the end for discussion of the C and D issues. People may feel that there's a C or a D issue that should be bumped up to an A and B area.

On your agenda, we have two o'clock as a starting time for the discussion of the NUREG, "Reexamination of Spent Fuel Shipment Risk Estimates."

If we need to devote more time to package performance, we'll cut into that time period, but right now, it's scheduled for two. We'll see how we're moving along with that.

I would just thank all of you around the table and in the audience for taking the time to join us today.

And I thought that before we go to Susan, we should start out with some introductions around the table, and if you could give us your name and affiliation and one or two sentences on what your interest or concern is with this particular subject.

Why don't I start with Susan? We'll go that way.

DR. SHANKMAN: I'm Susan Shankman. I'm the Deputy Director for Licensing and Inspection in the Spent Fuel Project Office at the NRC.

MR. LEWIS: I'm Robert Lewis. I work for Susan. I'm the Project Manager for the package performance study.

MR. FRONCZAK: I'm Bob Fronczak. I'm a AVP, Environment and Haz-Mat, for the Association of American Railroads, and we're going to be hauling a lot of the commercial spent fuel.

MR. BLACKWELL: Kevin Blackwell, with the Federal Railroad Administration, the Haz-Mat Division. I'm the primary point of contact on materials issues in the

headquarters level for FRA.

MR. SORENSON: Good morning. Ken Sorenson, Sandia National Laboratories. I'm the Manager of the Transportation Group that conducted the studies for the NRC.

MR. VINCENT: John Vincent. I'm here representing Private Fuel Storage and the Nuclear Energy Institute today. Private Fuel Storage will be transporting all of our spent fuel to the facility once it's licensed and constructed via rail.

MS. GUE: Lisa Gue with Public Citizen. Our area of concern is with the public interest. I'm the advocate for sensible and sustainable energy policy.

MR. HOLT: Mark Holt with the Congressional Research Service. I'm an energy policy analyst, and one of my areas is spent fuel legislation. The transportation has always been a big part of that debate.

MR. KAMPS: Kevin Kamps with Nuclear Information and Resource Service. We have members in transport corridor states, as well as in the targeted facilities for storage and deposition of the waste out west.

MR. KRAFT: I'm Dave Kraft with Nuclear Energy Information Service of Evanston, Illinois. We're particularly concerned, since DOE announced in February there will be 36,000-plus shipments coming through our

state.

MR. EDLOW: My name is Jack Edlow. I'm the President of Edlow International Company. We are a traffic management company specializing in shipment of radioactive materials. We handle many, many hundreds of shipments per year, including shipments of spent fuel.

MS. MUSTIN: Good morning. I'm Tracy Mustin from the Department of Energy.

MR. LAKE: Good morning. I'm Bill Lake from the Department of Energy, also. I'm with the Office of Civilian Radioactive Waste Management. We anticipate having large shipping campaigns in the near future.

DR. BAUGHMAN: I'm Mike Baughman with Lincoln County, Nevada, a consultant to the county. Lincoln County is on the mainline of Union Pacific Railroad and has been identified by DOE as a prospective inter-modal facility for the transfer of rail shipments to truck that would ultimately go into the Nevada test site.

MR. CAMERON: Great. Well, thank you all. I think you can see that we have a outstanding group of people around the table representing all of the interests that might be affected by this program, and I am going to turn to Susan now, but before I do, I just wanted to introduce the Director of the Spent Fuel Project Office at NRC.

This is Bill Brach, who is in the audience with us today.

MR. BRACH: Good morning. I, too, want to welcome all of you all to the NRC.

I want to stress the importance that we at the NRC management staff all put on our plans and activities that you're a part of today in our planning for the package performance study.

We clearly value and look forward to your comments, your suggestions, your recommendations that we can then incorporate into our planning for package performance.

Spent fuel transportation, as noted by some of the comments around the table, is clearly an area of a lot of focus and attention, both within the NRC, as well as within the public across the country.

So, it's a topic that clearly has much attention, and I look forward to your comments, suggestions on how we can best, in our planning, prepare for and structure the package performance study.

I will mention, as well, that earlier this week the National Academy of Science had a meeting -- the Board of Radioactive Waste Management had a meeting where the focus was on spent fuel transportation.

A number of the folks in the room this morning

were there, as well, on Monday, providing information with regard to respective agency or respective organization views and activities with regard to spent fuel transportation.

Our plans for the package performance study was one of the topics that we in NRC, as well as a number of the other presenters at the meeting, discussed and presented views, as well.

So, I, again, look forward to a good dialogue this morning and look for your views, your comments, and suggestions for our consideration as we are planning the package performance study.

Thank you.

MR. CAMERON: Thank you, Bill.

We're now going to go to Dr. Susan Shankman, who's the Deputy Director of the Spent Fuel Project Office, and Dr. Shankman's been with the NRC since 1982 in a variety of positions, including reactor regulation and materials regulation, and she has her doctorate from the University of Southern California, but she is a New Yorker by birth, upbringing, and I guess choice.

Is that right, Susan?

And I'll turn it over to her right now.

DR. SHANKMAN: Thank you, Chip.

I always ask Chip to mention that I come from New

York, because the minute I open my mouth, as I told somebody on a plane the other day -- someone said in a very serious voice, have you ever or are you now a resident of New York? So, I 'fess up right away.

I want to welcome you today. This is the last in a series of meetings that we've held.

This summer, we were out in -- last month, we were in Las Vegas and in Pahrump. Last November and December, we were here and also in Nevada, and we have also been having other meetings related to changes to the transportation regulations of the NRC, and so, this summer, we had lots of meetings on transportation.

And I'd like to focus us today on what we want to talk about and spend our time on today but recognize that the NRC is very much engaged now in assessing the regulations related to transportation and being sure that those regulations protect public health and safety.

I have some slides. I'll go through them rapidly, because I think most of the people in this room already know most of the things that these slides focus on, but just to remind everybody that NRC is an independent regulatory agency, we make our decisions on merit, on scientific and technical bases, and our judgements are designed to protect public health safety and that we have experience over many

years doing this in many arenas related to nuclear activities.

And today is important because it's part of our process in which we set standards, and those are our regulations.

We issue approvals against those standards.

We develop and publish guidance meant to amplify how to meet those standards.

We perform inspections against those standards, and we enforce compliance with those standards, but the standards are developed with information that comes out of research, either research that we initiate, studies we do, or other sources of information, as well as a public process by which we develop the regulations.

So, this study is designed to be part of informing our regulations, and since the regulations are the standard against which our other activities are conducted, at the same time there is a parallel effort -- and I want to call your attention to the fact that Part 71, which is our transportation regulations, are under review right now, and there was a meeting here in Washington in August, and there are two more next week and the week after in Oakland, California, and in Atlanta, Georgia.

So, just -- those who are interested in

transportation are probably interested in the whole realm of what we're doing in transportation.

So, also to remind everybody -- Mr. Edlow made sure to inform us that he was one of the shippers, but -- one of the carriers, I'm sorry, but a shipper can be either a nuclear utility or an entity licensed by the NRC or the DOE. Then there are carriers; regulators, which include the Department of Transportation, the NRC, and states.

So, this is not singularly regulated by the NRC, and the emergency response to transportation -- and since we're going to talk about package performance and severe accidents, it's important to understand that emergency responders are at the local level, they are trained under regulations by the Department of Transportation, and that there is Federal assistance to train those emergency responders, and in all cases where transportation of radioactive material occurs that's under NRC or DOT, there is an advance notification to the governor's designee, and right now, NRC has rulemaking underway related to notifying tribal governments.

So, that's just the background, and I think everybody already knew most of that, but we're all on the same page.

Let me talk a little bit about the goals for

today.

We're coming to closure on the design for the package performance study.

Let me just say package is the container, the entire -- and the contents of what's transported. People use cask. In Europe, they use flask. We use confinement, containment. We use a lot of terms, but the package is what's on the train or the truck, and it includes everything, including the contents, and what we're talking about today is what will we do to look at and how will we gain more information about package performance in severe accidents.

We're going to talk this afternoon about a study that we looked at the risks of package to routine transport and some accident conditions.

That study was to update our environmental impact statement that's the basis for our regulations, and we'll talk about that this afternoon.

That study looked at the risk of both routine and some accident transportation.

The study that we're looking at today and designing will be looking at updating the study we did in 1987.

Now, I'm talking about four different studies:

the original study that we used as an environment impact statement, which is called NUREG-0170; the modal study, as it's called, which was redone in the 1980s; then we updated the spent fuel parts of the environmental impact statement, and that's NUREG-6672, which we'll talk about this afternoon; and now we're talking about doing a fourth study.

This is all part of the NRC's continuing effort to inform us, and you, about the ability of our regulations to protect public health and safety.

The package performance study has arisen out of a lot of comments that we've gotten from the public in November and December, and we synthesized them in our issues report, which I know you've read from cover to cover, but that's what Ken and Rob are going to discuss, is what's in the issues report.

Out of that, out of the discussions that we've had, and comments that we've gotten from groups, as well as individuals, we've distilled several issues that people want us to spend our time and money on, and we're going to make sure, before we do that, that these are the issues that are of concern, and we will, out of today's transcript and the one from the one in -- the meetings in Nevada, distill a research proposal or a study proposal, and what we'll do then is make that public, and if you're on our mailing list,

you'll get a copy of it, and we'll ask for comments then again before we actually do the study.

So, we're at a point of closure, where we hope to come to a study design and focus on what we're going to study, and then we will go forward with it, after we get public comments on the study design.

Any questions?

[No response.]

DR. SHANKMAN: I'm glad you're all here. We've had a lot of dialogue on this, and the reason I spent the time to talk about the different studies and the rulemaking effort is sometimes it's confusing, because there seems to be so many things that the NRC is talking about transportation, but they are discrete entities, and each one has a piece of the puzzle in looking at making sure that our transportation regulations protect public health and safety.

MR. CAMERON: Okay. Thanks, Susan.

Rob Lewis from the NRC staff is now going to talk to us about a project overview, and then we're going to get to the issues report.

Rob is a nuclear engineer in the spent fuel project office.

He's been the project manager for the Sandia study since the study was initiated in 1999, and Rob has a

Master's degree in nuclear engineering from the University of Arizona.

Rob?

MR. LEWIS: Good morning, everyone.

I will kick off our discussions about the issues report.

Before I get there, though, I'd like to talk a little bit about what the package performance study is and why we're doing it and how the issues report fits into the package performance study.

The issues report, if you don't know what I'm referring to, is Attachment 1 to this June 30th letter. I hope that everyone in here is on our mailing list and received it in the mail, and if you didn't, the copies are out on the table.

The package performance study -- Susan mentioned these four studies.

The package performance study is follow-on work to three previous -- what I call the significant risk studies that NRC has performed related to transportation of radioactive materials.

The last three on the list only relate to spent fuel. The first one involves all radioactive materials.

You'll hear more about all of these studies this

afternoon, when we talk about NUREG-6672 specifically.

I'd just like to talk about what the package performance study is trying to do and what it's not trying to do.

The package performance study -- we are building upon the previous work that we've done. Specifically, we're building upon the results we got in the 1987 modal study and we're building upon the results we got in NUREG-6672, which was just published.

We're not redoing that work. We still believe in the results that we got in that work.

The package performance study is only concerned with spent fuel transportation. It's only concerned with commercial spent fuel transportation, I should say.

It involves both truck and rail shipment. We haven't considered barge shipment, other modes, air shipment. And we're looking at severe accidents.

We're not looking at things like the potential for sabotage or what happens after an accident, trying to put the cask back on the truck so it can continue on its journey or something else.

We're not looking at those types of things. We're just looking at what happens to the package, the cask and the contents, when an accident occurs.

Testing -- I think I need to spend a moment talking about testing.

You will notice that the issues report does recommend testing in several places. It recommends testing associated with structural performance, thermal performance, and performance of the fuel.

We know that there is a very high interest level associated with the testing. So, what we have done is we have put testing first in the agenda today, talk specifically about what we're trying to do with the testing.

Very shortly, with a very short summary of what we're trying to do, is that our testing is confirmatory in nature, and the goal of what we're trying to do has a technical reason.

It's not a publicity stunt. It's not to make a dramatic video.

We do have technical reasons for doing the tests. We hope -- if nothing else today, we hope that we're able to convey what those technical reasons are, as stated in the issues report.

The testing that we do recommend in the issues report isn't specific about whether it should be full-scale or scale model or component testing.

It is specific, though, about that the testing

we're going to try to do, if we do it, if we try to do any, would be beyond the regulatory tests.

That's because the focus of our testing is to look at how NUREG-6672 assessed accidents that exceeded our regulations, what kind of releases resulted in those accidents.

That's the testing goals that appear in the issues report.

And I have a whole slide on public participation which I'll get to in a moment.

Why are we doing package performance study? Why are we doing it now?

Here's the reasons that we were able to come up with.

We have an increased modeling capability compared to what we've had in the past studies, probably with the exception of NUREG-6672, which was just done, of course had recent techniques, but prior to that, it's been '87, '77 since we've done this. There's better computer power now, more ability to have finer finite element meshes in your calculations.

We also have, for the first time, the capability to possible do some tests to support those risk analyses that were done, which I've already mentioned, testing.

For the first time, we know the designs -- for example, the dual-purpose casks that we've been certified -- we know the designs that we expect would be used for a large shipment campaign -- for example, if Yucca Mountain were to open. I think it's scheduled for 2010.

We expect the designs that we're certifying right now would be used in transportation campaign to Yucca Mountain.

In the past, that really wasn't the situation, when we had single-purpose transport casks.

The age of the data used on the previous efforts was a factor in our decision to start the package performance study.

It's been -- for example, in the -- the model study was published in 1987. It used accident statistics collected by the Federal Railroad Administration which were from the early '80s.

Of course, there's newer information available. The FRA, I believe, is sponsoring an effort at the Volpe Research Center in Massachusetts, and they do have some newer information. They've indicated their willingness to share that with us, and we would certainly want to take advantage of that.

And last, we have instituted within NRC some

performance goals. I have a slide on what they are. I don't want to spend any time, really, on them, but these have just been introduced into all agency activities within the last couple of years.

Everything we do is trying to meet these four goals in some way. It's not very difficult to see how the package performance study could support these four goals individually and as a group.

I mentioned public involvement earlier. We have been trying to do a informal public involvement process. This is not a rulemaking where we're officially soliciting public comment, but we are trying to do the best we can to keep people in touch, so they can help us design the project and not only comment on the results we get.

We have -- the best way to stay in touch with the project is probably the web-site. We update it frequently. Everything we produce, we put on there, as far as I know.

We have been holding workshops. Last year, we went out and asked what should we be looking at? This year, we're back. We're trying to present what we thought we heard in this issues report and how that could help us.

And of course, we have a mailing list that I mentioned. If you're not on the mailing list, you can leave your name front, and address, and I'll make sure that I add

you to that.

You should know if you're on the mailing list. We don't mail things too frequently, but the best way to know is, if you got this June 30th report in the mail, you're on it.

So, where we are today:

Sandia Labs has just -- and NRC -- has just published the issues report. The issues report represents the results of the scoping study.

This report would be used by NRC to decide in the next couple of months what will be done in the package performance study for the next several years.

What we would like to know about the scoping study is your opinions as to whether the comments that you made last year are captured in the issues report. That's the first thing we'd like to know.

In addition, not only the comments you made at the public meetings last year, but we had a significant -- we've had a number of written comments submitted.

The American Association of Railroads submitted some comments in February, I believe, and the Nuclear Energy Institute submitted some comments in March -- April, I'm sorry -- and we want to make sure that those written comments are reflected in our report, as well.

And the second major thing we would like to know is, in the report, the recommendations that are provided -- I would be very interested to know if you believe that recommendations that we have will provide a solution to the comment that was made, and the report's structure is very logically presented.

There's comments, Sandia's assessments of comments, and recommendations, by subject.

The third major thing we would like to know today is, now that you have seen NUREG-6672 for a couple months, NUREG-6672 did have quite a bit of accident assessments, which wasn't available to you in November, when we had the last meeting.

If there is anything in NUREG-6672 that relates to package performance during accidents that could be part of the package performance study, we would certainly be interested in your thoughts on that.

The last thing I would like to do is introduce the authors of the issues report, and I would note that we have had quite a bit of favorable feedback on the contents of the issues report, and NRC is very happy with the work that Sandia has done to date.

The manager of the group that produced this report is Ken Sorenson. He's the next speaker. But I'd also like

to point out in the crowd as some of the principle authors of the report Dr. Jerry Sprung, who is our expert in the accident data; Dr. Doug Ammerman -- he's our expert in the structural response; and Dr. Joe Koski, who is our expert at the thermal response.

So, they're here. They're at our disposal for the day. Hopefully we can take advantage of their expertise today.

Thank you.

MR. CAMERON: Okay. Thank you, Rob.

We are going to go next for a in-depth discussion of the issues report, but before we get to that, does anybody have any questions for Rob on some of the over-arching issues that he talked about?

Yeah, Bob?

This is Bob Fronczak.

MR. FRONCZAK: This is Bob Fronczak.

When do you expect to have -- I guess what you're saying is, in essence, a request for proposal for the project ready for review by the public in general?

MR. LEWIS: I would hope by the end of the year. That would be a rough guess. By the end of the calendar year.

Let me just say one more thing.

We realize it's a lot to discuss today. We don't expect all of your feedback today.

We are taking written comments. We'd asked for comments by September 29th in the report. I think it's on page 3 or something you'll see that.

If you can't give us comments by September 29th, we understand. Like I said, it's not a formal public comment process.

If you just let me know that you have an intent to give us comments, so we can plan our next step accordingly, by September 29th, that would be good.

MR. CAMERON: Okay.

Thanks, Rob.

Right now, we're going to have Ken Sorenson from Sandia Labs start us off on the issues report, and he'll be providing some overview information, and then we're going to get into a discussion on testing, and Ken is the manager of the Transportation Safety and Security Analysis Department at Sandia National Laboratories.

He has 14 years of experience addressing technical issues associated with the transport of nuclear materials, including fracture mode analysis, systems analysis, the development of standards and risk assessment, and he is the manager for transportation, Sandia's transportation project

for the NRC, and I'm going to let him give us the overview now.

MR. SORENSON: Thank you, Chip.

Good morning, everybody.

Just one point of clarification: Although I am the manager of the group, I am not one of the authors of the study, and so, we do have the experts in the room in case we do have to talk about some specific technical issues that we discussed this morning.

Let me say, first of all, it's a pleasure to be here to give you an overview of the issues report that Sandia conducted for the NRC, and we hope that we can get some good dialogue from you in terms of this report, because really it's an assimilation of all the public comments that we've received to date on the package performance study.

To let you know where I'm going here, first I'll talk about what are the objectives for the presentation this morning, a little bit of background on the issues report itself, and then an overview of the findings, and at that point, what we'd like to do is open this up for a discussion and make it interactive as much as possible to get your feedback.

In terms of the objectives, we want to review public comments that the NRC and Sandia has received to date

over the past about year-and-a-half on this project, present with you Sandia interpretations of these public comments, discuss proposals for the package performance study based on the comments that we've received.

So, we take the public comments, kind of interpret the aggregate comment that we got, and then give a proposal that we think would address that concern, and then again this morning obtain some feedback on this discussion as much as possible.

One thing I do want to mention, we do have hand-outs in the back of this presentation, and if you don't have one, I'd encourage you to get one, because we do have some additional text in these view-graphs that will help explain in a little bit more detail than what I cover verbally here, so it might be helpful for you if you have not read the report.

Rob and Susan, I think, gave a good background of the packaging performance study. The issues report really is -- I can't stress enough, this is a scoping phase of the packaging performance study that's based on public input that the NRC and Sandia has received over the past year-and-a-half, and I encourage you to keep that in mind as we have the discussions this morning.

This is, again, comments from the public that

we've assimilated and made proposals on how we can best address those comments to satisfy the issue.

I'll give a little bit more detail on how we got the public input. I know Rob talked about this a little bit, but we've had seven previous public meetings in Nevada and here in Rockville. We've distributed the issues report for comment back last June. Again, we have the interactive web-site, and then today's meeting.

And just rough orders of magnitude of numbers of comments that we got, I think public comments, probably in the low hundreds, written comments in the tens, so not a lot of written comments, but we've gotten a pretty good bit of public comments just through meetings like this.

So, having received those comments, then we had to assimilate them into some sort of way to address them, categorize them, and so, they really fell into five broad topic areas that we've defined:

What is the cask performance during collisions?

What's the cask performance during thermal environments?

What is the behavior of the spent fuel during severe accident scenarios?

What are the highway and railway accident conditions and probabilities?

And finally, sensitivity uncertainty studies.

In the issues report, the last bullet there is listed as other transportation topics, we've chosen to specify here as sensitivity and uncertainty studies.

So, we've assimilated the comments, put them in five broad topic areas, and then we assigned -- again, this is just Sandia's assessment -- we've assigned ratings, qualitative ratings to these comments, A through D, and the criteria is shown here.

If it's an A comment, basically what we've said is we address that comment or issue through the proposal that we have. That will resolve a very important technical shortcoming or it will confirm the adequacy of a very important analysis method.

For B, we said that we resolve an important technical shortcoming or confirm the adequacy of an important analysis method.

C, resolve a secondary technical shortcoming or address the adequacy of a secondary analysis method, and finally, D is termed, on a relative basis, not significant in terms of advancing the technical knowledge of transportation risk.

In many cases, some of the comments that were received, the answer is already there, the data was there,

and address it immediately.

It's not to say that the C or D ratings are not important. Again, it's Sandia's qualitative rating that the A's and B's would have more impact in terms of addressing specific technical issues that we felt were more important on a relative basis than C or D.

What I'm going to show after this view-graph is three tables, and basically what we've done in the issues report -- there's an executive summary where we have a table, and all the comments have been assimilated into the five broad topic areas and have an associated proposal for those comments that would address the comments that we've assimilated, and we have come up with basically 40 different proposals that would address these comments in these five different topic areas.

In the next view-graph, I'll show the three tables, list these 40 proposals in sequence.

The ones in red are the proposals that are associated with the testing, and we'll discuss those first, and then after we discuss the testing issues, we will go sequentially through the report and discuss the other issues as they appear in the issues report.

And as Rob mentioned, what we'd like to get out of this discussion this morning is your reflection on if public

comments that we've received to date are properly formulated, is the rating that Sandia has assigned to this particular issue the correct rating in your opinion, or should it be a different rating, and as Chip mentioned earlier, I think we'll try to minimize the amount of discussion for the C- and D-rated proposals, because with 40 proposals, there's a lot of material to cover.

I think we'll have a short amount of time towards the end where we can specifically address any C or D ratings that you think should be rated differently.

The next view-graph just shows sequential listing of the proposals that are in the issues report. This is for the topic area of cask performance during collisions. We won't go through all these. We'll talk about these specifically later on.

The next view-graph shows the categories of cask performance during fires and also spent fuel performance during collisions.

And third are the proposals for the topic areas of highway and railway accident conditions and probabilities, and the fifth topic area that we have, other transportation issues or sensitivity and uncertainty studies.

So, that really concludes the opening part of my discussion.

Now what I'd like to do is specifically start talking about the proposals that we have in the issues report that are based on the public comments and begin with a discussion of the testing issues as shown here, and again, this is a good time in the hand-outs to go to the first one past background materials for discussion.

I think that is view-graph 14, section 2.9 in the report, and Rob talked about this, but let me just give another brief overview of what the main issue here that we've received from public comment.

The NRC feels very comfortable, I think, with the way analysis and testing is done for Part 71 certification tests and analyses. The analyses have been well benchmarked to tests, and it has been confirmed that the analysis codes do capture well the cask response with these types of loading conditions.

In 6672, we looked at severe loading conditions on casks.

We looked at, for example, velocity impacts on annealing surfaces up to 120 miles an hour for these casks, a very severe, extra-regulatory type of a scenario, and what happens with the cask is you have a lot of non-linear behavior and you have dissimilar metals with different stiffnesses, and while we feel confident that the analysis

code and the analysts that have done these analyses have done good work in terms of confirming the response to these casks or analyzing the response to the casks, there has really never been an actual full-scale test that confirms these types of analyses with these very severe accidents to actual test conditions.

Now, a lot of the public comment that we've received is, well, you've done the analysis, why not just do the test, just show us, and so, that's the basis of this proposal, is that -- the first one in section 2.9 is full-scale rail cask tests at a high speed.

We give that an A rating, and again, this would be under the category of where it confirms a very important analysis method, the finite element analyses that we have used.

I think, Chip, at that point, I'd like to open it up for any comments or discussions that we might have.

MR. CAMERON: Okay. Great. Thank you very much, Ken.

As Ken mentioned, the first testing issue here is the full-scale, one-third-scale rail cask testing, and I would open it up for discussion around the table at this point. Does anyone want to make a initial comment?

Bill Lake?

MR. LAKE: Thank you, Chip.

Bill Lake.

Ken, you did mention that you felt that the testing was essential to these higher severity tests, but I assume that the codes you use have some verification already. Can you speak a little bit about that?

MR. SORENSON: Yes. In fact, we have done quite a bit of testing of components at high speeds to confirm the codes we use, the analysis we use.

We did use a computer code called PRONTO 3-D, which is a shock-wave propagation code, and feel very comfortable with the analyses that were done in 6672, but the comments that we've gotten back from the public are, well, that's not a transportation cask, it's not full-scale, and we would like to see a full-scale cask of the type that would be used to ship spent fuel, and that's why this proposal is in the report.

MR. CAMERON: Bill, do you want to expand a little bit on the implications of your question at all in terms of this whole issue of code verification?

And then I would ask others around the table if they had any comment on Bill's question and Ken's response.

MR. LAKE: Yeah. I understand your desire to do the tests because of comments, but if you're being driven by

technical concerns, I would suspect that it may be more you've got high confidence in the code's ability to analyze these cask activities for the component tests.

However, I would suspect, when you put the cask together, there may be some interaction that you have a little less confidence in.

Otherwise, I would question why you're going to do it, unless you have those technical reasons.

MR. CAMERON: So, are you questioning or trying to ascertain what's the specific technical reason for conducting the test?

MR. LAKE: Yes.

MR. CAMERON: All right.

And I would open it up to everybody around the table.

Ken, do you have anything else you want to say on that point?

MR. SORENSON: I think you did hit it partially, and I mentioned it a little bit earlier, as well.

When you have a full cask design, as opposed to component testing, you have lots of dissimilar materials or different similar materials that behave differently under these very high loading rates, and that has not been ever confirmed by analyses, and so -- excuse me -- by testing,

and so, that's kind of the basis of the proposal, is to make sure that, when we get into these extreme loading environments, that the analysis that we have done properly captures the response of this full type of package to those types of loadings.

MR. CAMERON: John.

MR. VINCENT: Ken, I assume the reason for that, wanting to do the full-scale, is that you don't believe that there is any scaleable capability here in terms of doing quarter- or third-scale testing?

MR. SORENSON: Well, there is, and in fact, that second sub-bullet at the end is if a scale model cask is used, and certainly, we have done a lot of scale model testing throughout the industry for cask tests to analyze the behavior of components and cask designs to different types of loadings, and the physics of the scaling laws are quite well-known and are used routinely.

There are some aspects of scaling, though, that are not so easy to capture. Leak rate, for example, does not scale well. Some issues, possibly, with welds and material properties as you go up into these extreme environments need to be studied more carefully.

So, one of the issues with the full-scale test is it is clearly a very expensive test, and an option to do an

alternate is a scale model test, with the anticipation, then, that we would look at the scaling aspects of that test very carefully.

MR. CAMERON: Okay.

Ken just brought up the issue of cost, and I think we've been talking, also, about what's the need for the testing.

Does anybody around the table want to comment on -- make a specific comment on support for the proposal, or is there anybody who thinks that the proposal should be tempered in any way?

Lisa.

MS. GUE: Thanks.

Public Citizen is very happy to have read this recommendation for full-scale collision testing.

Full-scale physical testing of actual casks is, as you know, one of our major underlying concerns, both from the technical side and from the perspective of the ability of the public to have confidence in the results of these studies.

And I heard you refer just a little bit to this in passing, but I wonder if you could state more specifically which cask, a full scale of which cask, and if I might just also take this opportunity to make sort of a general comment

that applies to this specific as well, that we feel it's very important for Sandia and NRC, in considering this study, to acknowledge that, in fact, the use of the results of this study is likely not only to be of a descriptive nature but also of a prescriptive nature in informing both the regulatory structure and licensing specific shipment campaigns.

And we feel it's very necessary, therefore, to be explicit about this and to relate directly this study to the specific large-scale shipping campaigns that are currently being considered to the repository at Yucca Mountain and to the PFS site in Utah, and so, therefore, we would like to see the full-scale physical testing of casks that would be used in those shipment campaigns.

MR. CAMERON: Okay.

If I could just ask everybody to just use your -- turn your name tents up if you want to talk, and there was a specific question about which cask, but I think a broader point that Lisa brought up is how will the testing relate to our regulatory framework?

So, I'm going to go to Susan Shankman on that one.

DR. SHANKMAN: Lisa, two things.

One, you asked what cask, and we haven't selected a cask per se. The only thing that we have said in other

meetings and I'll reiterate here is that any cask that we test would meet current regulations and would be one of this generation's casks.

So, it would not be -- the term was used by others, would we use an obsolete cask, and if obsolete means that it couldn't be shipped today, then we will not use an obsolete cask.

We will use a cask that meets current regulatory requirements and would be one of what we call today's generation of casks and would be one that would meet the design requirements for upcoming campaigns, as well as current shipping.

The second question is how would that fit in with our regulatory requirements?

Any information that we get that would suggest that our current regulations do not protect public health and safety, we would immediately work on that. So, there is no question that any information that comes out of this study would inform our regulations.

Now, I have to be honest and tell you I don't expect that it will call into question our current regulations, but I would never say that it wouldn't inform our regulations; it definitely would.

Any information we get about unsafe conditions

that are related to our regulations, we take immediate action. I'm sure you know that we've done that in the past in other circumstances. We would do it here, too.

MR. CAMERON: Let's see if some of the other comments here relate to the regulatory application or regulatory implications.

Any of you that have your cards up now want to talk about the issue that Lisa raised or Susan's comment?

Let's go to Mike Baughman.

DR. BAUGHMAN: Well, I guess I would just ask Lisa -- and I'm very curious to know how Public Citizen would view this -- do you think that Public Citizen would be willing to extrapolate or accept the results of a cask -- of a full-scale cask test on a single cask, which would be one of perhaps several licensed models, and be willing to accept those results as being applicable to all other casks that are then in use, models of casks, plus, obviously, all other numbers of casks, and I'm just curious as to how you view that.

Is a single test of a single cask going to instill in Public Citizen confidence in all other casks? And this does relate to the regulatory issue, because you're going to be, you know, extrapolating, perhaps, from this test to all other casks.

MR. CAMERON: And I guess, before we go to you, Lisa, I think that we'll also want to get David Kraft and Kevin Kamps' view on that, as well as others around the table, and I guess the point is -- broader point goes to, is this full-scale test on a single cask -- what are the implications of that for public confidence in at least that aspect of the transportation of spent fuel?

Lisa?

MS. GUE: I think your question really underlines the point that I was attempting to make, perhaps not completely successfully, in my earlier comment, which is that -- and I'm happy that, actually, you've acknowledged, Susan, that the timing of this study is directly relevant to -- at least to specific shipment campaigns of unprecedented scale, and our insistence would be for the full-scale testing of the specific casks that are under consideration for those particular campaigns.

And it's that kind of test that would, I think, make possible a greater degree of public confidence in the consideration of those specific campaigns, because again, the descriptive nature of this kind of testing is perhaps abstractly interesting, but much more relevant right now is the implication that it's going to have on the specific proposals under consideration.

MR. CAMERON: Okay.

Let's go to David and then Kevin and get some further discussion on this.

David?

MR. KRAFT: Well, since I raised my banner, a couple other threads have been introduced here, and I'll just throw in some quick comments.

MR. CAMERON: Okay.

MR. KRAFT: I guess the first, in reaction to the last point made, was -- not being an engineer but certainly wanting to consult engineers -- would be to have the question answered, just how representative is the one cask of the others. Of course, that's where the answer lies. So, I can't speak for Public Citizen, but that would certainly be of concern for us.

When I put my tent up, though, the question was back to Ken, and it goes back to a perception from the original Sandia films, and one of the criticisms of those early films was that, of course, the casks contain fresh fuel, as opposed to spent fuel.

So, the question that gets raised for me is, even in this full-scale analysis that you're anticipating doing, how confident are you in being able to extrapolate out the necessary information as to the effects on spent fuel,

because obviously you're not going to use spent fuel in this test.

MR. CAMERON: Okay.

Too, I think both of David's questions go to perhaps this larger issue about public confidence might depend on how representative is the cask to be studied to other casks, how can you extrapolate?

Ken, do you want to address those two questions?

MR. SORENSON: Maybe together, Lisa and David's comments.

For Lisa first, one point I want to make from a technical standpoint -- the proposal really relates to confirming the analysis for these extra-severe accidents so that we can demonstrate that the analyses that are done can properly capture the response of a package under these sorts of extra-regulatory type of loadings.

And so, having confirmed that, then, we would have better confidence that we really do understand some of the scaling parameters and things like that and that we can properly capture cask response with the different materials interacting and the scaling and all that properly, and so, once we do that, then, we'd feel confident in using those analysis techniques and the scaling laws so that we can properly capture through analysis other types of designs and

other loading scenarios and that sort of thing.

MR. CAMERON: Susan, do you have a quick clarification on that?

DR. SHANKMAN: Yeah, just to say that the points that you're bringing up now, I think, speak to the design of the actual study, and I think we need to make sure that we hear what you're saying and that, in any design for a study, that we make explicit how it relates to those concerns.

And that's why we want to put the proposal out for comment before we do any testing, to make sure that there is a -- if not consensus, at least we hear from different parties how they believe we've captured that and whether the nexus between the proposal is close enough or what might be missing, and it may be that we have to have a secondary testing of the behavior of spent fuel at forces that we measure in the accident conditions that we actually test. I mean I'm not sure how we get to this.

The other thing is I did say when we were out in Nevada and I'll reiterate that it would be our intention to have some method -- and we haven't figured out what that would be yet -- that we select people to be witnesses to this, as well as revealing the design and the instrumentation.

So, we want to do this in as public a way -- and

there were some people from Nevada along the transportation route that volunteered to come to Sandia at their own expense, and we'd very much like perhaps some elected officials from some of those communities and we've talked about ways of doing that.

So, I just wanted to emphasize that, yes, it's not an abstract intellectual interesting exercise. We recognize that there are people vitally interested in the results and in understanding them and observing them, and we're going to work on having that be part of this. If we're going to do the testing, we want it to be in public and the proposal to be publicly reviewed.

MR. CAMERON: Thank you, Susan.

Further clarification from Rob, and then let's go back over here to David and Kevin.

MR. LEWIS: Yeah. I would -- I thank Mike for asking this question. It's very important. And I want to agree with Ken and Susan.

An important part of the proposal as it appears in the issues report is that we would pick an individual cask. We'd do an analysis of that cask, very detailed analysis, and share that with the public.

Then we'd perform a test, also witnessed by the public.

That test can be compared to the analysis we did, and if it agrees, then we could extrapolate by saying, well, since we could predict that one cask, there is no reason to believe we can't also do analysis for other casks.

And also, spent fuel was brought up. There is a specific part of the report that talks about how we would represent simulated spent fuel in the cask.

So, I would -- hopefully we can get to that later. I think it is one of the next bullets.

MR. CAMERON: And Ken, did you want to answer that second part of --

MR. SORENSON: Rob took care of it.

MR. CAMERON: Okay.

MR. SORENSON: The testing for the actual spent fuel itself is covered in a different proposal.

MR. CAMERON: Okay.

Go ahead, David, and then we'll go to Kevin.

MR. KRAFT: Actually, it was something Susan was saying that kind of was going to get to my last question here, and that was the notion of how these tests will be used, under what circumstances, for what purposes.

Again going back to the history of the previous films from Sandia, I think it would take a lot to say that, in many instances, the controversy over how those were

interpreted, how they were portrayed, how they were presented were wildly all over the map, and if you're talking about wanting to involve public witnesses, if you're talking about wanting to have credibility enhanced in the process, then I would underscore that it would behoove NRC to clamp down really hard on folks who attempt to either mis-characterize it or go beyond the data, and also, I would urge a very precise description of what is being shown, what was attempted, the goals, and that the public understand what those are.

That's all.

DR. SHANKMAN: I agree, and I think the films you're referring to I've never seen, and I don't think NRC uses them.

MR. CAMERON: Okay.

Kevin?

Kevin has designed his own cask, I guess, that he took across the country this year.

MR. KAMPS: I did have a question about the films again, and they've been used extensively across the nation. It's amazing some of the people I've talked to who have received copies of the film, and that's a big concern of ours, is that there was a real purpose behind the use of those films.

So, a question I have is will there be films made of these tests, and how will they be used, who will they be given to?

MR. CAMERON: Is an implication that the prior films were used in a promotional way?

MR. KAMPS: Absolutely, yes.

MR. CAMERON: All right.

Susan?

DR. SHANKMAN: I was going to say, Kevin, I understand your point. I think, in terms of what's been used with the Sandia films, I can't speak to. I know there are films from Europe, also, that have been used, and you know, I can't speak to that.

We do not use them in our regulatory dialogues, nor do we use them as a basis for our regulations.

So, what will be done with these -- yes, they will be taped or filmed, and I think our public affairs group right now is working on a transportation video about information about our regulations, and they might develop it into something else that's available to the public, but it would be developed with public money; it would be available to anyone.

MR. CAMERON: I think the point is well noted that both of you raised about how those -- how that information

is used and explaining exactly what it means and what it doesn't mean.

Let's give Bill Lake and Mark Holt --

Kevin, go ahead.

MR. KAMPS: Yeah. I did have another question about the collision test itself.

Will this be a simulation of a -- the earlier test was a simulation of a train impacting a truck cask. Is that the same --

MR. SORENSON: It's not decided yet, Kevin. In fact, part of our next step with the NRC is to develop a test plan, and that's something that would go out for public comment before that was finalized, and I think that's one of the big issues, what type of test is it going to be, not only what type of cask, but what type of test is it going to be, what sort of orientation, how you're going to impact, at what speeds, and those sorts of things.

MR. KAMPS: That was where I was heading, was that one critique I've heard about the earlier test at Sandia was that the cask collision actually didn't represent the full force of a train, that the cask cascaded through the sheet metal of the locomotive but missed impact with the sill of the train, that it didn't really represent a full impact that was a real-life situation.

MR. SORENSON: That's a good point. I think, though, that we'd make sure we had full public review of the test plan before we went forward with it so that we could get those sort of comments.

MR. CAMERON: Okay.

I think we all understand that the comments on this past test or film are being brought up in terms of trying to avoid something this time around, rather than focusing on the past, but very good points, and let's go to Bill, and then we'll go over to Mark.

Bill?

MR. LAKE: Thank you, Chip.

Just a point of clarification or to calibrate the discussion, we are talking about extra-regulatory tests here, not regulatory tests, and we're also talking about a validation test to demonstrate the capability of the codes to repeat analyses, to predict and repeat analyses.

So, one thing I think we need to keep in mind, if you do such a test, the result of it is going to look much different than the result of a regulatory test.

So, people should not be surprised if damage is done to a cask that you would not expect to see and would not tolerate in something that's within the regulatory limits.

MR. CAMERON: I want to make sure that we all understand the -- and maybe we do -- all understand the implications of what Bill just pointed out, and I guess I would ask the NRC, is that a -- what do you think, Susan, about what Bill just said?

Do you have any comment on that, so that everybody can understand this distinction, perhaps, between the application of testing to the regulations versus application of the testing to verify or validate, whatever the right word is, the code.

Is that the distinction, the correct distinction that you're making, Bill?

MR. LAKE: Yes.

MR. CAMERON: Could the NRC talk to that, please?

DR. SHANKMAN: Well, we just happen to have a slide, just to remind everybody what the regulatory tests are and that this is what we use as the standard against which we approve a given cask.

It has to demonstrate that it can meet these tests in the way that they are characterized, but I agree, Bill, that this would be extra-regulatory.

However, it is the public's concern, what happens in a severe accident, and one of the things -- we haven't gotten to this yet -- is how will we define an accident.

Is it known forces? Is it something that's been documented? Is it the most probable severe accident? Is it the most extreme severe accident?

Is it something that has never happened but a meteor could land, and are we going to be in that realm, or are we going to be -- take the data that the Volpe Center has on existing accidents and extrapolate from that about what the forces are in severe accidents.

So, it is extra-regulatory, but as Lisa asked, if it were to show that -- we're not going to test it against our regulatory basis.

That has worked for many years. We have an exemplary safety record.

On the other hand, the question on the table is what happens in a severe accident. So, that's what the study is about.

MR. CAMERON: Okay. And as you pointed out before, if there are any implications for the regulations, that would be something of concern to us.

Mark, comment on this, and then perhaps we'll move on to the next testing issue.

Go ahead, Mark.

MR. HOLT: You brought up the cost issue, and I was wondering if there was an estimate of the difference

between the cost of the full-scale test and the half-scale test.

MR. SORENSON: Well, in the issues report, we delineated versus high, very high, and medium and low. Full-scale would be a very high cost, over a million dollars, I think, was the break on that, and the price scale would probably be -- well, that might be very high, as well.

Doug, do you have an estimate for the scale model testing?

MR. AMMERMAN: The actual conduct of the test is much less for a scale model, probably on the order of less than a half-a-million dollars.

The problem with the scale model package is the cost of building the package. It may be possible to get a donated full-scale cask, because there are some in existence, but there is not in existence an exact replica scale model cask of any package.

MR. CAMERON: I believe there were some discussions with the NRC about perhaps getting a donated cask to do that on.

Mark?

MR. HOLT: Does that mean the full-scale test would be cheaper?

MR. SORENSON: Well, I think, depending on if we

could obtain a full-scale cask, donated, possibly, but it's a little early to tell yet, I think.

DR. SHANKMAN: I think it's simple that we need to understand what the benefits would be derived from full-scale testing versus scale model testing, then we look at the costs and decide -- I mean I think that cost is an issue, but first, we want to understand what we're buying with our money.

And actually, at the meeting in Nevada, there was a lot of discussion by representatives from the State of Utah and some local citizens that component testing, well done and well documented, might buy the same public confidence and validity nexus with modeling, depending on the scientific discussion that preceded it, and there were also people who felt that anything short of full-scale testing wouldn't be worth doing.

So, we need to understand what the reasoning is behind each of those positions and then look at the costs, and it may be that it's a combination and it's full-scale testing of the shell and it's component testing of some of the innards.

The point of my comment is we haven't made those decisions, and that's what we need the input on.

MR. CAMERON: Thank you.

Let's go to John Vincent, and then we're going to go to the next testing issue.

John?

MR. VINCENT: I just had a couple of additional comments.

I, historically, have always been on the side of scale testing or component testing, as opposed to full-scale testing, simply because full-scale testing probably won't tell us anything we don't already know given our current state of capability analytically in regard to the performance of materials or construction of the cask.

But having said that, I think at the outset, the test criteria that you impose need to be thoroughly understood at the outset.

Otherwise, you end up deciding, well, we intended for it to be able to show something else other than that when it's all over and done, and we have to be careful about that, so that the expectations are well-defined in advance.

Otherwise, you end up doing cask number two, cask number three, and at over $2 million a copy, nobody wants to do that.

Secondarily, an issue that hasn't been raised, but I think it's important -- I shouldn't say it hasn't been raised, it's really been tap-danced around, and that is the

acceptance criteria for the purposes of testing to do certain technical evaluations or verification is probably quite different than the acceptance criteria associated with meeting public acceptance criteria. So, I think you have to be careful about that.

While, one, the technical stuff may very well play into that, there may be the situation where that example wasn't good enough.

So, we have to understand what will accommodate the public acceptance criteria, whatever they might be, as opposed to what you're trying to do technically.

MR. CAMERON: Okay.

Let's clear that up, perhaps, right now.

When you use the term "test criteria," then you use the term "acceptance criteria," first of all, I guess, clarification, are those the same -- are you referring to the same criteria?

MR. VINCENT: No. When you set up the test, you're setting up what you want to -- what parameters you want to review, what things you're attempting to demonstrate. Those are what I'm referring to as the test criteria.

Acceptance criteria is, once you've defined those parameters, what is acceptable performance under those

criteria, and that could be both on the technical side and then on the public acceptance side you'd have another set of criteria that would meet public acceptance requirements.

MR. CAMERON: Okay. And let me ask the NRC and Sandia, at this point, the study design that would be proposed for public comment -- will there be test criteria and acceptance criteria proposed for comment in that study design?

MR. LEWIS: I agree with the comment. I think that, as we mentioned, we want to share the test plan maybe next year sometime, and as part of that test plan, I think it's very important that we set out what the -- what kind of tests we'll be doing, to use the term "test criterion," what our objectives are, and what we will consider acceptable, what our acceptance test is. So, that's a good comment, and I agree with it.

MR. SORENSON: I would just add on to what Rob said. For test criteria, I think -- keep in mind, these are not certification tests, these are confirmatory tests, and really, what we are attempting to do is capture the response of the test article in our analyses, and so, the test criteria would be developed based on that.

MR. CAMERON: And the acceptance criteria that John talked about would be -- if I read your comments in

your introduction correctly, the acceptance criteria are going to be keyed to some technical specifications.

MR. SORENSON: Right.

MR. CAMERON: Okay.

Let's take two final comments here before we move on, since this is an important issue.

Let's go to Jack and then Bob, closing out here on cask collision testing, full-scale, one-third-scale, component.

MR. EDLOW: Jack Edlow.

Ken, is it necessary -- in order to validate what you're attempting to do in your model, is it necessary to use a spent fuel cask?

That is, could you validate your model by using an entirely different component in order to show that your model using, saying, a steam turbine or a helicopter or any other component could validate your model, thus not having to use a cask, not having to use something in an extra-regulatory basis, because I remain very concerned the public be given the impression that somehow it's necessary to test a spent fuel cask beyond regulatory area, that in fact what you're trying to do is validate a model, what you're really attempting to do, and the question is could you validate that model without having to use this

particular component?

MR. CAMERON: After we hear Ken's answer, I want to make sure that we check in with Lisa, then perhaps others, on the comment that she started out with.

Ken, first to you, and then we'll go over to Lisa.

MR. SORENSON: Well, I think the short answer, yes, you can validate any model with analysis that you so choose. I think there's a natural question, then, how does this model and this analysis relate to some other application like a spent fuel cask, and you can have technical questions arise in terms of how do these specific dissimilar materials react with each other in an integrated design, how do specific scaling parameters relate to these specific designs.

So, I think, Ed, you can validate analyses to specific models and you can make technical arguments that those analyses can be transferred to different applications, but I still think there are technical issues that arise around specific applications, that while you may be able to argue from a technical basis that you've got them covered, you still have not confirmed or demonstrated that analysis with that application.

MR. CAMERON: Lisa, let's go to you for a comment now before we go to Bob, on that particular point.

MS. GUE: Thanks. I'll try to be brief.

I think the technical side of that -- my concern for the technical side of that question was summed up by Ken there, but in addition to that, I think that it is clear to acknowledge that we're, in fact, not talking about shipping cotton balls, but we are talking about the transportation of an inherently extremely dangerous substance, and so, I take a bit of offense at the sort of implication that public concern with the models used for testing the shipping containers are based on, you know, an inadequate understanding of modeling or of the technical side of this.

In fact, the public concern with these shipment campaigns are based, you know, on a very substantial and legitimate concern for safety in proposals that result in them being put directly at risk with an unnatural, highly dangerous substance that wouldn't otherwise be in their backyard, and so, I think that that sort of baseline acknowledgement is where we should becoming from.

And with respect to the concern about this being an extra-regulatory test -- and this follows, actually, on an earlier comment that was made, too, in terms of how to curtail the discussion, I guess, here, an acknowledgement that this is extra-regulatory -- in fact, we also do have concerns with the parameters of the regulations that are

currently in place, and so, taken as a whole -- so, we see this study, actually, as part of the bigger picture of how the NRC does govern the shipments of nuclear waste, and it certainly isn't isolated from what the regulations suggest, and so, we're very interested in the practical and the demonstrated results of these tests from that standpoint.

MR. CAMERON: And I would again just reiterate Susan's comment, to tie it to that, that even though there is a separate purpose for doing the tests, it could have implications for -- to test the regulatory framework, and that would be looked at by the NRC.

And I guess, Bob, last comment on this for you, and then I'm going to have Ken tee up the next testing issue.

Bob Fronczak.

MR. FRONCZAK: Thanks, Chip.

By the way, AAR is not convinced that full-scale testing is needed.

One of the issues we're concerned about, though -- and I'm not sure it's reflected anywhere else in the issue paper -- is that there's regulatory tests and then there's accidents, and you know, we've had extra-regulatory tests that, you know, test one scenario. You can do that on and on and on forever.

I guess one of the suggestions that we would have is that, if there was a way to bound the forces that are generated in accidents and then assure us that those forces -- or that the casks can withstand those forces, I think that's the key issue that we're interested in.

I don't know how many of you have been to rail accidents, but there are some severe forces generated. I see steel bent to all kinds of weird forms, and forces that make those shapes are pretty extreme, and we just want to be assured that the cask can withstand those forces.

MR. CAMERON: Okay. A good comment. And I guess I would just ask -- I think there was a reference earlier that -- Ken, you said that we would be looking -- we would be talking later on today about the forces that would be considered.

MR. SORENSON: Types of impacts.

MR. CAMERON: Okay.

When we come out with the study design, will the forces that are going to be used in the tests for the study design -- will they be specified so that people can comment on them, if I read Bob's point correctly?

MR. SORENSON: Yeah. I think, certainly, the type of accident will, by definition, define the types of forces that will be impacted onto that cask.

MR. CAMERON: And any dose of reality that you think that we should have based on your experience, Bob, would be a good comment.

Okay.

Ken, do you want to talk about the next testing issue, please?

MR. SORENSON: The next one we have is section 2.8 of the report, and it's a hard link to what we've just been talking about.

If you use a scale model test, if we're going to do a test, first of all -- secondly, if it's going to be a scale model -- what are the issues associated with scaling these different parameters up to full scale when you do the analyses, and so, this is a proposal to address public comments to technically address scaling issues in the form of a study so that, when we do the scale model testing and we benchmark the testing with the analyses, we can make the technical arguments that we can properly scale the response of the scale model cask up to the response of a full-scale cask. That's the crux of the issue.

Clearly, if it's scale-model testing that's going to be performed, we recommend that that's an A issue. If it's a full-scale test, it obviates the need to do a lot of scale-model work, though, with the full-scale cask, and so,

we rate that as a C.

MR. CAMERON: Okay.

I think that that proposal is clear to people in terms of -- the importance of this obviously depends on what your decision is in terms of whether you do full or scale modeling.

Assuming there is some scale testing, does anybody have any comments on the Sandia recognition of previous comments and what they might do in this particular case?

[No response.]

MR. CAMERON: Okay.

I think people, you know, recognize the common sense of that, and perhaps when we do have a study design, some of those issues will be spelled out in more detail for people to comment on.

Is that correct?

MR. SORENSON: Certainly.

MR. CAMERON: All right.

How about the next testing issue?

MR. SORENSON: Okay. The next one -- it's analysis, but it is tied to the testing, and this recommendation is to do very refined 3-D finite element analyses for all components of the cask.

In 6672, we had to make some trade-offs in terms

of how detailed some components of the casks that we analyzed, and this recommendation -- and certainly if we did the testing, we would have to do very rigorous, refined finite element analysis to make sure we capture the testing properly, and so, this is hand in glove with the testing.

If we do the testing, we will have to do commensurate finite element analyses to be able to confirm the analyses to the test.

We wouldn't use the same analyses that we used in 6672, for example, because it would be a different cask design and configuration and probably a different test configuration, as well.

So, we'd have to re-do the analysis anyway. This proposal is to do a much more refined modeling of the cask.

MR. CAMERON: Can you just explain to people what finite element analysis is?

MR. SORENSON: In 20 words or less?

MR. CAMERON: How about 10? Just so everybody understands what finite element analysis is. This is great. I'm ignorant on this, so that I can ask the -- as the facilitator, I can be ignorant.

MR. SORENSON: Thanks a lot, Chip.

It's a numerical analysis method that really was developed with the advent of computers to be able to take

large complex structures and analyze the response to these structures to different boundary conditions that are put on to the structures, and it's very powerful in that it can be used in lots of different engineering disciplines.

It's used in fire environments for casks, for example, as well as mechanical impact loads, and really, what it does, it takes these boundary conditions and steps through -- you divide the design into finite element nodes, what they call bricks, and when these bricks are subjected to a force, whether it's thermal or mechanical, it goes to a minimum energy state, and that just steps through all these different bricks, and you do this in a time-wise sequence, and once all the energy is imparted into that cask, then you have the total response of the cask.

MR. CAMERON: Okay. Thank you.

Anybody have any questions or comments on this particular proposal to do the finite element analysis of one or two casks that models the bolts and fuel assemblies in detail?

[No response.]

MR. CAMERON: Okay.

Let's take a look at the next testing issue, and audience, we will be going out to you before we break for lunch to talk about -- see if there's any comments on any or

all of these testing issues.

Ken?

MR. SORENSON: Okay.

This is section 4.3 of the study, and this relates to David's comment earlier about how do individual fuel pins and the aggregate fuel assembly respond inside of a cask due to these very severe loads, and this is something that has not been well-characterized in the industry.

A lot of the data that we used in 6672 and we used in the modal study comes out of some reports that was done by Lorenz out of Oak Ridge back in the '80s on reactor situations, and so, this proposal is to actually look at fuel pellet response to impacts, fuel pin response to impacts, and then the aggregate fuel assembly response to impacts, and so, when we go to this very refined finite element modeling with these very severe loadings, if we have actual empirical data on how the fuel pellets respond, the pins respond, and the aggregate assembly responds, we can make very good analysis predictions of fuel pin failure and source term that may be released into the cask.

So, that's the crux of that proposal, and we rate that as a A proposal. We got a fair amount of public feedback on that one.

MR. CAMERON: Okay.

Any comments on this one?

Bill Lake?

MR. LAKE: Yes. I agree with your decision to make this is an A factor. This is essential to determining how the cask performs.

What you're looking at is the containment capability, and this has always been a big unknown in many of these studies. It was a big unknown in the modal study, and I think it's a very good thing to consider doing.

MR. CAMERON: Okay. Thanks, Bill.

Kevin?

MR. KAMPS: Yeah. I have a question on the fuel condition. I'm curious, how will you address fuel condition considerations?

MR. SORENSON: In terms of what would be the criteria for --

MR. KAMPS: My question comes out of the fact of the different condition of fuel around the country at this time and how you will address that issue.

MR. SORENSON: Well, I don't envision using spent fuel for these actual tests. I think we'd have to come up with some surrogate centered pellets that would properly capture spent fuel.

For the zircalloy, you could hydrolyze the

zircalloy to capture the spent fuel, the zircalloy spent fuel that's been irradiated, those sorts of things.

So, I think that's part of the package performance study, I think, the test plan, in terms of how you would mock up a spent fuel assembly with the components to properly capture a spent fuel condition when you do the testing.

MR. CAMERON: Okay.

Rob Lewis?

MR. LEWIS: I'd just like to point out two things related to that question, Kevin.

First, if a fuel assembly is damaged, it would have to be canisterized prior to the shipment. So, we would look at that as possibly providing an additional layer of preventing a release.

But also, I just wanted to mention that this issue is broader than the package performance study. This issue is also being looked at in terms of dry fuel storage and in terms of the use of higher burn-up fuels in reactors.

So, we hope that we could -- we can cross-pollenize all these research projects and reduce -- we don't want to repeat work that other people are already doing.

MR. CAMERON: I guess the concern, again, is would

the test be representative of the different types of fuel that might be shipped, which is something that you need to consider. Is that correct?

DR. SHANKMAN: I would just ask Kevin to think about what would be the most important attributes for you in terms of modeling the fuel, and as Rob said, if it falls under the category of damaged fuel, we have different regulatory requirements for how we would approve the shipment cask, as well as the storage cask.

So, then we would need to model that cask differently, and those are all very good points, and I think you're right, we have to make sure that we delineate exactly what we're doing and what it means and how you can extrapolate it to other situations.

MR. CAMERON: All right. Thank you, Susan.

Lisa.

MS. GUE: Actually, I think Susan just addressed the comment that I was going to make, but I was really glad to hear sort of an appreciation of the fact that this issue and this study does have wider implications, and a comment that I was going to make following on was just that it would be important in the interpretation of the results of this study, in that actual fuel wouldn't be used, to be very clear about, then, what kind of fuel is it that you just

tested?

So, it this a test that we can say, therefore, we know this about the reaction of 20-year-old fuel that's been stored only, you know, in pool storage, for example, because given that there are a number of variables that could be considered, that would be very important for us in order for the public to have confidence in what the tests mean for the actual proposal.

MR. CAMERON: Okay. Thank you.

I guess we're going to fire next?

MR. SORENSON: That covers the collisions.

MR. CAMERON: All right.

MR. SORENSON: The next one is the fire testing, section 3.1.4.2., and this proposal is based on a fair amount of public comment we received about durations and intensities of fires that these casks may be subjected to under severe accident types of conditions, and the proposal, then, is to take the cask that's drop-test or mechanically high-speed-impact tested and put that cask into a fire on the ground that would mimic a sequence of events that would have a chemical impact loading followed by a fire for the full-scale cask, and that is rated as a B suggestion.

MR. CAMERON: Any comments on that or, you know, caveats on this testing? Anybody want to offer anything on

that?

Bill?

MR. LAKE: Yes. Thank you.

I guess the one difficulty I would see in doing a sequential test is in trying to calibrate or you're trying to demonstrate the capability of the calculational tools, you get the calculations so complicated that it would be very difficult to make that correlation, and one of the things that you may want to look at in this is not only the cask response but the fire's response to the cask.

Huge fires are affected by the system that's in them or the large system that's in them. A cask is a huge thermal mass. It's going to significantly affect that fire's performance.

Whether it's a laboratory test or it's a huge open pool fire, fires do a lot of strange things, and if you put a big mass into them, that definitely has an interaction, and these are probably the things that you want to look at for the study, for these interactions between the cask and the fire, as well as the fire's effect on the cask.

Thank you.

MR. CAMERON: Any comment from Sandia or NRC on Bill's point?

[No response.]

MR. CAMERON: All right.

Kevin?

MR. KAMPS: In addition to the pool, is there any consideration of the torch fire test?

MR. SORENSON: Well, there is, and that's one of the proposals that we'll talk about this afternoon.

MR. KAMPS: Okay. And I was just curious why it was rated as a B. Do you have the explanation?

MR. SORENSON: Well, we feel that we can well capture through analyses the impact of different fire environments on the cask, and we have looked at different scenarios with extra-regulatory fire environments and feel that we can well capture that environment and also that the resultant effect in response to the cask is not severe enough to warrant -- it wouldn't make a big difference in the transportation risk analysis calculation.

MR. CAMERON: Lisa.

MS. GUE: I guess basically, with the same comments that I made with respect to the need for a full-scale testing of actual casks for collisions, obviously it's disappointing to us to not see an A rating or a clear recommendations for full-scale physical testing of actual casks in fire scenarios.

Certainly, again, I understand this is an

extra-regulatory test, but actually, the first -- the regulatory fire test is one with which we do have serious concerns, both in terms of the time -- the regulatory time of fire and temperature of fire, and so, therefore, we feel that these so-called extra-regulatory tests are actually our only indication of how a cask might perform in an actual -- or even in a realistic fire scenario. So, again, I just emphasize Public Citizen's continuing request for full-scale physical testing for fire.

MR. CAMERON: I think Lisa's comment raises a more general issue that perhaps the NRC can provide some information.

The criteria for A was very important, as I remember it. The criteria for B was important.

Has there been a decision or a presumption, at least, yet that all of the A's and B's will be done, or is there still some further winnowing that needs to be done where only the A's will be taken into account, for example?

Could you address that, Rob?

MR. LEWIS: Yes, sir.

I think we probably should not get hung up on whether something is an A or B too much.

The case is not that all A's will be done, some B's will be done, no C or D will be done. That's not the

case at all.

I think NRC has -- this was just Sandia's recommendation based only on their technical opinion, and sometimes, for example, there is mutually exclusive options that are both rated an A, or one might be rated an A and one's a B.

This is a good example, because the next slide we're going to talk about the calorimeter test, which was rated as an A, which has the same purpose as the test that we're talking about here.

The test here was rated a B, I believe, probably because we would be using a damaged cask. Damaged casks may be less able to get the data we need than an un-damaged cask. So, the calorimeter was the favored option, and that was given an A.

MR. SORENSON: And just to add on that, the slide is not quite complete. On page 22 of the issue report, we do say it's an A rating if it's an un-damaged cask, B rating if it's a damaged cask.

MR. CAMERON: Lisa?

MS. GUE: Just to quickly respond, I guess my comments with respect to what I said is -- with respect to what was being recommended, is how I termed it, were based on the Table E-1 in the preparatory materials that were sent

out to us, which give the rating, the estimated cost, and the recommended option, and in that chart, neither the cask fire test for an un-damaged cask or a damaged cask are recommended by Sandia.

So, it was that recommendation, statement that I was expressing disappointment in.

MR. CAMERON: Any comment on that?

MR. LEWIS: I see what you're talking about. I'm not sure why that's not X'd. I think the calorimeter test is X'd.

MR. CAMERON: Okay.

Well, the comment, I guess, is clear, and as a general matter, when the study design proposal goes out, there will be issues that are in the study design proposal to be studied. They will no longer be rated A or B or whatever, but a B could very well turn up in the study design, and an A could not turn up in a study design, right?

DR. SHANKMAN: And in fact, that's part of the meetings in Nevada and now. These were preliminary ratings. They are just -- you know, you have to sort things somehow and get the discussion going, and the design of the study is -- as I said, we're closing in on the design of the study, and then the proposal for the study goes out. So, if your comment is, whether you call it A or B, we need to do it,

then that's the comment we take away.

MR. CAMERON: Okay.

MR. SORENSON: One more comment, Lisa, in terms of the recommended options.

The calorimeter pool fire test is rated A with a recommended option whereas the cask is not. We couldn't do both, and we felt, from a technical standpoint, that the calorimeter would provide us more technical information for the potential cask.

DR. SHANKMAN: I think, Ken, it would be good if you distinguish between them and what data you think you're going to get from one that you couldn't get from the other and why it would be the recommended option, because maybe it's not well understood by everybody in the room, including me.

MR. SORENSON: All right. Well, I think I'd like to defer to Joe, our thermal expert.

MR. CAMERON: Joe, will you come up? And we'll take -- we'll have Mike Baughman on next with his comment after you get done.

Go ahead, Joe.

MR. KOSKI: Okay. Thanks, Chip.

This kind of has to do with, when you're doing a study, what's the right tool to get the right data. If we

have a real cask, it's a very complicated structure. It's typically steel-lead-steel. We've got closures, impact limiters. It's a very, I would say, complicated geometry which you have to build some very careful models in order to capture all the details.

If you have a calorimeter, it's a very simple structure. It's a cylinder, typically, and it has the same shape and mass as the cask that we're interested in, but it's also much easier to understand the data that we get, and here, there's kind of a fundamental difference between what we're doing structurally and what we're doing thermally.

Structurally, we're trying to validate the codes as they deform the materials and to get the material interactions there.

Here, we're trying to understand what is the fire environment, what is the fire doing to our cask.

So, there's kind of a fundamental difference in the focus here.

So, those are some discussion things that may help you understand why we are recommending looking at a calorimeter rather than looking at a cask for this particular case.

MR. CAMERON: This is Jerry Sprung from Sandia.

MR. SPRUNG: Joe left out two points, I think.

First, if the cask is damaged, the instrumentation that we put in at first may be damaged, which makes the information you get not quite what you would have liked to have gotten.

So, an un-damaged cask gives us -- excuse me -- a damaged cask that's been through a collision test that was instrumented before that test gives us the possibility of some problems.

The second is that the feature you're trying to capture most is the interaction between the fire and the cask, and that's the rate at which heat is transferred to the cask, the heat flux, and that's gotten quite precisely by the calorimeter test.

MR. CAMERON: Okay.

Let's go to Mike Baughman, and then I think we'll go on to another testing issue.

Mike?

DR. BAUGHMAN: I was just going to suggest that perhaps item 3.4.3.1, which has been rated as a C -- it's first-responder fire/accident conditions -- may be directly related to, you know, the outcome of these tests or certainly public confidence, and you might want to consider in your study design linking that to these, because if a

first responder adopts a let-it-burn policy, the perception of the public is, then, we're going to have a much longer fire of greater intensity, and they may be very unfamiliar with the regulations, but their perception is this is just going to burn and burn and burn until we have a problem, and I think, in many cases, there will be a let-it-burn policy adopted.

MR. CAMERON: Does anybody want to discuss the point that Mike just made, that suggestion?

[No response.]

MR. CAMERON: All right.

DR. SHANKMAN: I'd ask Kevin and Lisa, particularly, to think about that and think about -- again, you know, Mark brought up the concept of money, and I think it's important to know what information we're buying and what it tells us and others.

It may be that it doesn't tell us anything that we didn't know, but it might be a demonstration to others of information that we might know, but a clearer nexus between their concern and cask performance and fire performance.

Maybe I'm not saying it well, but if Mike is right, that it shows us whether the let-it-burn policy of emergency responders would be a better policy, then I think that that -- although it may not relate directly to NRC's

regulatory role, it may be helpful in understanding the consequences of accidents and, therefore, the risk to the public.

MR. CAMERON: Okay. Good point, Susan.

Kevin, and then we'll go to Lisa.

MR. BLACKWELL: I just wanted to comment on that, having been a first responder, and still am, in the Coast Guard.

Most first responders that receive any kind of training -- that's the first thing they're taught, is to assess. Okay?

So, there will be a lag time involved until it's felt that they have a comfortable position with what they're dealing with and a course of action. That takes time.

However, on the up-side, in regards to lengthy duration of fires, you even have a -- I wouldn't say test case of sort but an incident that did occur involving fresh fuel with packages that were nowhere near the type for spent fuel up in Massachusetts, where that let-it-burn attitude was taken, but it was found out that, even though that was the policy that the first responders decided to adopt, the damage to the -- this was, in this case, fresh fuel -- was such that there was no release of the fresh fuel from the actual rods themselves even in the event they let it burn,

and these were packages that were much less high-integrity than the ones that are for spent fuel.

So, there has been some precedence there how first responders may respond to a radiological accident, especially in the wee hours of the morning, which is when these things usually occur anyway, if they occur.

So, I just wanted to point that out. That's all.

MR. CAMERON: All right. Thank you, Kevin.

Rob?

MR. LEWIS: I would like to second what Kevin's saying.

I think, in terms of a first responder doing something that exacerbates the accident, we have to keep in mind that the thermal test that's in Part 71 that a cask will survive or wouldn't be certified is a very severe thermal test.

So, we need to know the probability, if you will, that that first responder action would be meaningful, and by meaningful, I mean it would make the fire worse than the regulatory fire, and you know, add to that the probability that the first responder would make that error in the first place, in the training he has in the emergency response guide book and with all the special arrangements that are made with these shipments, such as constant communications

and control centers.

MR. CAMERON: Okay.

Lisa?

MS. GUE: I certainly see the benefit of gaining greater understanding about heat transfer rates, but I'm not sure if I understood correctly the way that that was described.

I thought that the calorimeter tests -- or, rather, to use a full-scale actual cask would involve -- would be difficult to model because of the complexities in its design.

In addition to the heat transfer rate information, obviously one of the reasons we're interested in the fire test is to know exactly what the response of the complexities of an actual cask would be in a fire situation, and without repeating what I said earlier about concerns with the parameters of the regulatory test, it does seem that some of the so-called extra-regulatory fires could actually occur during the transportation campaigns, and we just need to know what the results would be on the complexities of an actual cask, and to know that it's easier to model a simplified cylinder isn't really very reassuring.

MR. SORENSON: I think, for the calorimeter tests, this will give us a better understanding of the physics

involved with heat transfer.

If you went straight to a cask, you have the physics coupled with the specifics of the cask design, and it's hard to discriminate what's driving what, and so, I think the reason for our emphasis on the calorimeter test is to make sure we understand the physics of what's going on in terms of the heat transfer before we apply that to an actual cask design.

I'll open it up to Joe, too, if you have any further comments on that, Joe.

MR. KOSKI: Unfortunately, we could go on for hours, but I'll try to keep it brief.

There's a term that's been bandied around here which has a specific technical meaning, boundary conditions, and that is what we put on our models to make them respond, and in the case of a drop test or a structural test, these are forces, typically, and in the case of a thermal situation, it's the heat transfer at the outside of the package.

I'm kind of revealing my bias here to kind of try to get some scientific information at the same time we're doing these technical tests, but that's what we're trying to do with the calorimeter test, is actually get what's going on in the fire environment.

I do agree that, with even a damaged cask, we could get a lot of really good data from that kind of a test, and it would increase the public confidence in that particular case. So, I am willing to go with either way.

I think we're going to gain a lot with either option. The question is can we afford both, and which one of those will give us the most information to go on to the future with?

MR. CAMERON: Okay. Good. That was a good characterization of that choice that's faced.

Last testing issue?

MR. SORENSON: All right. The next one in the packet is the calorimeter test, and I think we've covered that pretty thoroughly.

The last one is the 3-D modeling of pool fire, and again, this is like the collision test, finite element modeling.

For 6672, we did what we referred to as a one-dimensional finite element analysis.

This is a recommendation to do a three-dimensional analysis on the cask that's tested in a fire environment, and again, the intent is to be able to confirm the analyses to the actual response of a package for this test, and we rate that as a A proposal.

MR. CAMERON: Any comments on this -- desirability, cautions, anything like that?

[No response.]

MR. CAMERON: All right.

Well, let's go out to the audience. You've heard a discussion of lots of testing issues and some general information about the NRC and about this study.

Is there any questions or comments out here before we break for lunch?

All right.

If you could just state your name and affiliation for the record, please.

MR. LYMAN: Thanks. I'm Ed Lyman from the Nuclear Control Institute. I just want to make a few comments about the general proceedings here.

Our organization has been calling for a long time for a reexamination of the parameters involved in the regulatory test, as well as the assumptions underlying the implementation of that test, mainly that the notion of graceful failure, that it's okay if there are a set of accidents which will be experienced which are more severe than those simulated in the regulatory tests because of the presumption that the cask will only gracefully fail, that if you increase the severity of the accident, you're not going

to have the catastrophic failure.

And that's why we think this series of tests you're proposing is essential, it's what we've been calling for for a long time, and it really has to be done in a credible way on actual packages and with worst-case accident conditions.

Now, the issue did come up of the meaning of how do you interpret these extra-regulatory tests, especially if results come across that are not anticipated or are unpleasant for the regulators in the industry, namely you find modes of catastrophic failure when you're exceeding the regulatory conditions by a small amount, and I think NRC is going to have to grapple with the issues if they discover -- or actually confirm, because I see that some of the simulations that were done in the Sandia study for March show that small -- for instance, doubling the time of the regulatory fire, increasing the temperature 1,000 degrees would lead to seal failure within -- of the truck cask -- within, you know, only an hour or so.

That I would consider a severe weakness and a challenge to the notion of graceful failure.

So, one question is how is NRC really going to grapple with the issue of looking at the actual regulatory implications of some of the results of these tests, because

there's no formal feedback.

However, the public is going to expect that, if the results come out and show that the packages that are proposed or certified for use today are inadequate, that the regulations are going to have to be tightened, and therefore, that's going to raise international issues, as well.

So, that issue really has to be considered and maybe even an understanding in advance of how that information is going to be fed back into the regulatory framework.

Now, on the details of the actual testing that's proposed, just one comment on the issue of fuel testing.

I was concerned when I heard that you're going to use only surrogate spent fuel in the series of tests, because that, I think -- that's led to some of the inconsistencies of the gaps in the database over the last 20 years or so, is the fact that you used un-irradiated fuel when you really want to see what the behavior of spent fuel, which, of course, is physically and chemically considerably different, is, and also, the issue of how do you deal with the changes in the physical and chemical state of high burn-up or MOX fuels in an accident scenario, which is not really adequately addressed, I think, in the issues report,

especially due to the changes in the physical state of spent fuel and high burn-up, the development of the rim, the development of hot spots in MOX fuel, the increased pressure, the fission gas release or accumulation in the plutonium, in the macroscopic plutonium particles.

These are effects which aren't well understood, there's very little experimental evidence, and the database that you're so relying on dates from lower burn-up fuel from, you know, tests done in the '70s, like the H.B. Robinson spent fuel.

You're going to have to really do a lot of work to demonstrate that you can extrapolate from those results the higher burn-up without doing additional tests, and if you can't really credibly show that, you're going to have to deal with how are you going to demonstrate that the release fractions that you assume are adequate for the high burn-up fuels which are going to form an even larger fraction of the spent fuel that's going to be shipped in the future.

I have other comments, but I will save them for later.

Thanks.

MR. CAMERON: Thank you very much, Ed.

Do we have any questions or comments for Ed on what he just raised?

Kevin?

MR. BLACKWELL: This is for my own benefit, clarification.

Were you advocating using spent fuel in the tests in the packages? I don't think that's what you're advocating, but I'm not sure.

MR. LYMAN: Well, in a technically defensible program, you're going to have to demonstrate that you understand the effects and the impact of the physical and chemical changes in spent fuel and their impact on release fractions.

In an ideal world, yes, you would need to have that kind of information done.

I know that there's very little infrastructure now for doing those kinds of tests. There are some example -- or there are some facilities in Europe which are producing data which is of some or limited relevance but might contribute some understanding, like there are core tests in France, which were done really for understanding fuel behavior during a LOCA at higher temperatures but has seen differences in, for instance, MOX and LE spent fuel at high burn-up in the fission gas release.

I would say that it really is a problem that you have to deal with, is how do you accurately incorporate

these effects and make sure that the models and the data that you have accumulated can be extrapolated to these other effects.

If it can't be done, then the whole technical basis of what you're doing is questioned.

MR. BLACKWELL: I understand what you're saying, and speaking for DOT, I think we would probably have -- there would be a problem with that in the aspect of all packaging that's used to transport has materials performance-oriented packaging, performance-based, and nowhere does anyone advocate or require or suggest that the package be tested with the hazardous commodity that it's going to be transporting, for obvious reasons, especially from the emergency response community.

I mean you're actually creating a situation where -- you're creating an emergency response situation.

So, I understand where you're coming from, and if there's a way that it can be done that it can be extrapolated or something, that's fine, but I think we would have some problems with actually using the hazardous material in the package during testing. That would cause a whole different set of concerns.

MR. CAMERON: It might have an effect on the public witness aspect of it, I suppose.

Rob?

MR. LEWIS: For many reasons, we will not test any cask with spent fuel in it.

I would just like to say, though, that we do acknowledge that whatever surrogate we use in the cask will need to be representative. That's in section 4.3 of the issues report, and I would refer you to that.

You mentioned graceful failure, and I'd like to make a little comment about that.

The acceptance criteria for all casks are stated in Part 71. We have had very favorable experience domestically, not only with spent fuel but with all large quantities of radioactive material using those.

Now, with studies we do, such as NUREG-6672, which you'll hear about this afternoon, and the package performance study are what NRC uses -- in NUREG-0171, I should say, all the way back to '77 -- are what NRC uses to confirm the adequacy of those regulations.

I would rather call it a margin of safety than a graceful failure, but I, for one, do believe that these casks have a very large margin of safety that goes beyond regulatory tests, because whatever conservative assumptions we use when we certify a cask, all the conservative values that are used for material properties are incorporated into

consensus standards.

So, I would be very surprised if we had some test that was slightly over a 30-foot drop and the cask catastrophically failed.

Now, although I would be very surprised at that, if that did happen, we would certainly do something about that. We would not continue to use that cask.

MR. CAMERON: Final comment on that, Ed?

MR. LYMAN: First clarification. I wasn't advocating the full-scale package test be done with spent fuel in them, but I was suggesting that those kinds of experiments, of course, have to be done in hot cells. I'm saying that there are facilities where burst tests were done with spent fuel, you know, way back, and I'm not necessarily advocating that those be restarted. I'm just suggesting that this is an issue that needs to be explored.

On the issue of graceful failure, you know, I'd just like to repeat that if you run the regulatory fire for -- well, I see the data here -- for steel, depleted uranium, steel truck cask, you reach the seal failure temperature of 1.06 hours compared to 30 minutes. A doubling of the time will lead to the seal failure temperature being reached.

I would question whether that is an acceptable margin.

MR. CAMERON: Okay. Thank you, Ed.

Anybody else out here before we break?

I see Jerry has his hand up, so let's take his comment, and then we'll go to lunch.

Jerry?

MR. SPRUNG: I just wanted to note that there are connections between the proposed tests. We wanted to do a full-scale test of a cask, and we think that's better than a scale-model test, because you can put an assembly in the cask, and that gets you some information on how the assembly behaves during an impact.

We did propose that the bench tests of the rods and pellets would be supplemented with hot cell tests on pellets to determine the behavior of spent fuel both at average and high burn-ups.

MR. CAMERON: Okay. Thank you.

Let's take a break for lunch and come back at 1:15. That gives us an hour and 20 minutes.

[Whereupon, at 12:00 p.m., the meeting recessed for lunch, to reconvene this same day, Wednesday, September 13, 2000, at 1:00 p.m.]

AFTERNOON SESSION

[1:25 p.m.]

MR. CAMERON: Just a couple of announcements before we get into the topical area of cask performance during collisions -- and that's slide 21 in Ken Sorenson's presentation, if you could possibly find slide 21.

There is a sign-in sheet out front. If you haven't signed in yet, do that at some point, and then we'll be able to keep track of things better.

There's a new effort at the NRC to try to make sure that we're doing a good job on public meetings and, quote, "a good job," unquote, covers a lot of territory, but in order to get some feedback from people, we do have an evaluation form that is out on the desk, again. It has 17 fairly easy questions, I think.

So, if you could fill that out and leave it or mail it in. I think it has a -- I think it's already franked and you can just put it in the mail to us. We would appreciate that.

And we do have a couple of new people at the table with us, and I'd just like to take the time for them to introduce themselves.

Ed Lyman from Nuclear Control Institute is with us, and Ed, if you could just tell us a little bit about

yourself and the NCI.

MR. LYMAN: I'm Ed Lyman, Scientific Director of the Nuclear Control Institute, which is a non-profit organization that focuses on nuclear non-proliferation and related safety issues associated with the nuclear fuel cycle.

The interest of NCI in transport of radioactive materials has gone back long before my day and focuses primarily on marine shipments of spent fuel, vitrified high-level waste and plutonium.

Our concerns are with the gaps in the database associated with the performance of Type B packages in marine environments where accident conditions may be considerably more severe than those in the land-based modes simulated in the Type B test.

Our other main concern with transportation is the sabotage issue, and we remain concerned that existing physical protection regulations, both domestically and internationally, for transport are not adequate, because they don't consider what we consider appropriate threats, and I would like to say something more about that after the end of this presentation.

Thanks.

MR. CAMERON: Okay. Thank you. Thank you, Ed.

We also have Mike Wangler from the Department of Energy who's joined us.

Mike, could you just tell us a few things about what you do over there at DOE?

MR. WANGLER: Thanks, Chip.

My name is Mike Wangler. I am with the Department of Energy's Environmental Management Office of Safety, Health, and Security. I'm in the package certification arena.

My program, or the program that I'm associated with, generally has the responsibility for regulating transportation packaging within DOE, at least those packaging transportation activities not related to the naval nuclear proposal program.

And I apologize for being late. Unfortunately, I got called downtown for a late-morning meeting. So, I'm glad I was able to come for the rest of the day.

MR. CAMERON: Great. And thank you for joining us.

And I'd just remind those of you at the table, for the benefit of the people in the back of the audience, just pull that mike a little closer to you, speak into the mike when you're talking.

We're going to go back to Ken Sorenson from Sandia

to walk through the issues.

We also have John Cook at the table, who is going to be presenting later, and I will introduce him, but why don't you introduce yourself a little bit, too?

MR. COOK: Thanks, Chip.

I'm John Cook with the Spent Fuel Project Office. I'm a Senior Transportation Specialist. I work in Susan's group.

MR. CAMERON: Okay. And just remember to speak into the mike.

Now, do I have everybody now, I guess, around the table?

Okay.

We're going to walk through the topical areas the way they were presented in the report now, again focusing on the A and B issues, and the first topical area is cask performance during collisions, and the first issue here is characteristics of collision accidents.

I'll turn it over to Ken for a description.

MR. SORENSON: Thanks, Chip, and good afternoon, everybody.

Let me just reiterate, as we go through these proposals, that these are an assimilation of public comments that we've received over the past year-and-a-half.

Sandia has assimilated them under these broad topic areas and then have defined a proposal based on these comments that we think would address the comments, and so, please keep that in mind as we talk through these different proposals, and we'll go through collisions and then fire and then the highway accident probabilities and then sensitivity studies in those topic areas.

This first one this afternoon relates to angle of impact that the cask may have during an accident scenario and then how an accident scenario will progress.

Typically, you start out with an accident, you have a set velocity vector and an angle of impact, and as the impact progresses, the velocity vectors and the angle of impacts will change.

In 6672, the assumption we made for the mechanical impacts was all the impact from an accident was absorbed through cask deformation; there was no kinetic energy that was transformed in the cask rotation or changing the velocity vector and that sort of thing.

So, what this proposal is to address public comments is to look at the distributions of potential cask angle impacts and velocity vectors and how that might change the progression of an accident and how that would affect the response of the cask during these severe accident

conditions, and we rate that as a B.

MR. CAMERON: Okay.

Bob Fronczak, is this the issue that you were bringing up earlier about what speed -- there may be other attributes of rail collision might be possible? I don't know if you want to reiterate that comment, if it was applicable, or say anything else about it.

MR. FRONCZAK: Actually, no, this isn't what I had in mind.

MR. CAMERON: Okay.

MR. FRONCZAK: I mean speed is one element of force, I guess. The key is, ultimately, what forces the casks experience and can the cask withstand those forces. So, some of that will be picked up here.

MR. CAMERON: Okay. All right.

Kevin.

MR. BLACKWELL: A quick question, and maybe this doesn't need clarification, but I want to bring it out anyway, just for my purposes, as well.

When you're talking about the characteristics of collision accidents at these speeds, you're talking about speeds of the conveyances carrying the packages, correct?

MR. SORENSON: Right.

MR. BLACKWELL: Not speed of the cask moving at

that speed in the event of an accident, correct? The conveyance collision speeds is what you're talking about?

MR. SORENSON: Initially.

MR. BLACKWELL: Okay.

MR. SORENSON: Yes.

MR. CAMERON: Okay.

Are there any other comments on this one?

Bill Lake?

MR. LAKE: Thank you, Chip.

I was just curious about what kind of information you would get out of a test of this type and, in addition, how would you define such a test?

I'm having difficulty understanding how you would define a test that would cover many different scenarios. It's a single-scenario test scene.

MR. SORENSON: Well, keep in mind, this is not a proposal for a test. This is a proposal for analyses, distribution of angle impacts and velocity vectors and those sorts of things.

So, I think how we progress -- and Doug, if you'd like to chime in, feel free, but how we progress is look at event trees and different potential accident scenarios with different targets and look at distributions of velocities and impact angles based on that.

As I said earlier, I think 6672 -- that is a conservative analysis in that all the kinetic energy goes into cask deformation, not into cask rotation, that sort of thing. So, that would be the benefit, I think, to this sort of analysis, is to be able to discriminate between different angle impacts for the casks and the effect of that.

MR. CAMERON: I guess, conceivably, there could be a different accident consequence because of this more -- that might be shown by this more sophisticated analysis, or you would have more confidence. Is that the idea behind it?

MR. SORENSON: Yes.

MR. CAMERON: All right.

MR. SORENSON: It definitely would have an impact on the consequence.

MR. CAMERON: Okay.

Anybody else on this one?

[No response.]

MR. CAMERON: Okay.

Well, let's go on to the next cask performance issue.

MR. SORENSON: This is section 2.2, collisions with non-planar objects, and one way to put this is what we call the back-breaker test, and we had a lot of comment from the public in terms of, well, what if you hit a bridge

abutment or a concrete abutment in between the impact limiters at these high speeds? What is the effect on the response of the cask? And that is what this proposal addresses specifically.

The proposal that we have here is to do a finite element analysis for some scenarios where a cask would be impacted, in between the impact limiters on a non-planar object such as a bridge abutment to see what the response of the cask would be.

That is rated as a B.

A subordinate proposal for that would be to do literature review of the technical issues and make judgement based on that, and we rate that as a C.

MR. CAMERON: Okay. Any comments on this issue, particularly this last point about the benefit of a literature search versus the way that -- the finite element analysis? Anything on that?

[No response.]

MR. CAMERON: Okay.

Next issue.

MR. SORENSON: The next issue is associated with crush and crushing environments for casks.

Again, we got a fair number of comments about, gee, what happens if you have a bridge section collapse onto

the cask and you have a crushing situation, and our feeling is that the inertial forces, crush forces that develop during the drop-tests for certification are much larger than you would get for the dynamic or static crush forces that you would see from a situation like this. However, we still could do some analyses to look at that and show that that is, in fact, true.

So, for that, we give that a rating of a B.

MR. CAMERON: Bob?

MR. FRONCZAK: This is one of the issues that we felt pretty strong about, and I guess, in looking at what you're planning on doing, we'll just have to wait and see what it shows and go from there.

MR. CAMERON: And when you say -- can you elaborate a little bit on "felt pretty strongly about" in terms of why you felt pretty strongly about it?

MR. FRONCZAK: I brought this up at the Bethesda meeting in November, but in rail accidents, it's very common to see cars stacked one on top of another, especially if there's a cut situation and the accident happens, say, at a bridge or something like that and all the cars go off and pile on top of each other, and that's not a scenario that the cask is subjected to.

In other words, it's not subjected to the crush

load test.

MR. CAMERON: Okay.

MR. FRONCZAK: And we think it should be.

MR. CAMERON: Great.

Lisa?

MS. GUE: Thank you.

I would hope that the relevance of these tests, not only the ratings that are given here but also how those ratings are evaluated in terms of what the proposal eventually is, is considered with respect to, again, what the specific proposals currently under consideration are, and here, I realize that this probably links with perhaps a future discussion later this afternoon, but with respect to what exactly the transportation being proposed are, this kind of concern -- the relevance of this concern is dependent upon which shipping routes would be used, for example, to a repository at Yucca Mountain, what the preferred mode of shipments would be.

If the preferred mode -- or if significant numbers of shipments are being carried by train, how many shipments would be on a train, would they be dedicated trains.

I think all of these very concrete issues that, as of yet, the proposals under consideration have not resolved have a direct relevance to your evaluations of whether or

not those kind of tests need to be done, and I hope that some of those unresolved questions, I guess, of the proposals under consideration could be determined in a very concrete way before decisions are made about what needs to be studied.

MR. CAMERON: Maybe this isn't the exact time to do this, but can we put into -- can we explain how the study is going to consider or bound, or whatever the right term is, the actual routes and modes of transport? Can we talk about that at some point? Because I think that's what Lisa's question is.

MR. SORENSON: We do talk about that in 6672 this afternoon. We do cover that.

MR. CAMERON: Okay. But I mean if there is a concern that, are your tests going to be -- show what's a realistic condition, what is our answer to that?

DR. SHANKMAN: I think part of the study design is to decide, are you going to stay within credible -- based on accident data that we know from the Volpe Center -- we did talk about that. They have a lot of information about the kinds of accidents and the -- I think it's mile by mile, Kevin, right? They have the kinds of profiles of what kind of accidents you have and where you have them and what kind of forces, and we'll have to look at that.

But in terms of the routes, I don't think it's going to have an impact for us. We will -- we are not in the business of approving the routes to Yucca Mountain. By the law, we need to review the cask design, but the routes themselves are a matter of DOE and DOT regulations and selection of routes that meet the regulatory standards of DOT and DOE's implementation of that.

So -- but you might say, well, what's going to happen if your crush tests show something, would that mean that the alternative should be another kind of transportation or special arrangements or regulatory controls on the shipments, and I don't know the answer to that.

I don't know if Bill Lake does or if Kevin does, but --

MR. CAMERON: I think that that's -- I suppose that's one way that the study could have an impact on what transport mode was shown, if it showed that something was particular hazardous.

I mean I guess that that's what's going to be the implication in reality.

I don't know.

Lisa, is that --

MS. GUE: Well, I just want to clarify. That is

actually one level of the process, as you point out, that if these studies indicated one mode was more dangerous than another, I would hope that the licensing and regulatory structure would take that into consideration in which routes and modes were eventually proposed.

But the other direction is that, right now, as I understand it, we're commenting on what valuation Sandia is putting forward in terms of the relevance of these issues, and the relevance of these issues in terms of how relevant this particular issue is to the NRC's mandate for regulating cask design is directly influenced by which mode this cask is going to be used in and what the routes are that this cask would be traveling along.

I guess I'm generalizing just for the purpose of making the point more strongly that if this particular issue is something related solely to train travel, there were a decision to not use trains as a mode of transportation, then obviously the relevance of this issue is much lower.

If, on the other hand, the concrete proposal before us indicate that train transport is going to be a major form of shipment, then the relevance of this becomes much more important, and I guess, in my comments on your evaluation of how relevant these are, I feel like it would have been more helpful what exactly the modes and shipment

routes are.

DR. SHANKMAN: You can take as an assumption that, when we approve a cask, its mode-independent, and we approve them to ship spent fuel, they meet our regulations, and we do not specify that they are -- I mean sometimes the practicality of the cask, the size of it or whatever, might mean that, because of Department of Transportation regulations in terms of safe carriage, it couldn't be used on a truck, it would have to be on a train, but that is not something NRC considers in our review.

They are approved independent of mode. They can go on a barge or a train or a truck if they can meet the safety requirements of DOT.

So, when we approve a Type B package for spent fuel, we do not -- sometimes it's requested that it be approved for rail or for -- in the case of WIPP, some of them were approved only for truck and now they want them to be approved for rail, but that's an artifact of what was requested.

But our regulations do not speak about a rail cask or a truck cask or a barge cask. Our regulations are for the safety transport of material in any mode of transportation except where it's illegal, and that has to do with air transport of certain materials, but that's a whole

other venue.

So, the selection of the routes by the Department of Energy is not something that is going to be dependent on the safety of the cask. I understand why it's your concern now, but --

Bill, do you want to --

MR. LAKE: Yeah, and I don't think I'm going to make you any happier.

As you know, we have not decided on the routes. That will probably occur closer to 2010, when we're preparing to ship, but we think we know where the shipments will go. We do know where the materials will be coming from. So, we've made some estimates of representative routes in the EIS that we're preparing, but that's about the best we can do right now.

It's premature to make definite routing plans.

MS. GUE: I understand those factors, and just to reiterate, I feel ill-equipped to be able to comment on your evaluation of the relevance of various issues like this without the information about which routes would be used and which modes.

MR. CAMERON: Is there any assurance -- and I know people have their cards up, but is there any assurance for people when they look at the results of the study that the

study done independent of the actual routes or modes? I suppose that, well, if it wasn't going to be rail transport, then that part of the study would be not relevant, and I guess what the NRC needs to assure ourselves of is that there's enough on highway transport, for example, that all the different possible options are covered, but I'll be quiet and go to --

Rob, did you want to add anything before we go to Kevin and then Ed Lyman, and we'll come back to John Vincent on this, before we go to a new topic?

MR. FRONCZAK: I agree that if you don't have -- if you're not going to transport by rail, then I'd take the crush load question off.

MR. CAMERON: Obviously, rail is a possibility, so that you need to think about that.

How about Rob Lewis?

MR. LEWIS: I just wanted to point out that, in a couple of slides from now, we're going to talk about event trees. One of the proposals involves event tree development, and we do have different event tree for rail and for highway.

As you go through that event tree, you determine what accidents in that event tree could challenge a cask, and that's part of this question.

There's different crushing environments in rail and in highway, but what we want to make sure that we look at in the study is that, regardless of the mode, that both of those are safely accounted for.

MR. CAMERON: Okay.

Kevin, and then we'll go over to Ed Lyman, and then back to John.

MR. BLACKWELL: Let me see if I can back up here a little bit with regard to Dr. Shankman's comments.

Jose, correct me if I'm wrong, but the event trees that were developed by the Volpe Center in regards to other studies they're doing are based on train accident data that's in their database, correct?

MR. PENA: Correct.

MR. BLACKWELL: I was pretty sure of that, too.

Jose Pena is from our research and development section in FRA.

So, I wanted to clear that up, that you were correct in that.

MR. PENA: I think there is one additional event which is not based on accident data but which seems to be logical.

MR. BLACKWELL: Thanks, Jose.

The other thing was that, as far as Lisa's

question about -- I think, at this point in time, you could probably -- if you needed to make a decision as far as counting on the study from the rail aspect, you can primarily assume any rail route could be used.

If it services the origin and services the destination and can get you there between point A and B, it has the potential of being a usable route, as it stands right now.

Now, of course, you've got to keep in mind one other thing, is that once a route may be selected from a origin to destination, that doesn't necessarily mean that that route may remain as the route that's going to be used from point A to point B, because in the rail environment -- and Bob, you can step in if I'm wrong on this, but it's a changing environment. A lot of it has to do with the condition of the infrastructure, and if the rail carrier decides that there is a portion of that route that needs to be worked on, then it may alter a segment of the route that was selected from a particular shipping campaign. That could happen.

So, I just wanted to throw that out, but in answer to your question, I guess, on this study, assume that any rail route that currently exists could be used.

MR. CAMERON: Okay.

Let's go Ed Lyman, and then we'll come over to John Vincent.

Ed?

MR. LYMAN: I'd just like to comment on the question of mode independence.

I think what was questioned is the logic of this concept, and clearly, originally, all modes, including air and sea, were considered equivalent with respect to the regulatory tests.

That is, particular accident environments were considered on a case-by-case basis, so that assumption is questioned.

So, then we have NUREG-0360, which distinguishes air transport of plutonium from other modes, and in the marine environment, there are certain accidents which one can argue would generate accident environments which aren't accounted for among the Type B tests.

So, I think the point that is raised here is that the assumption is that, at least with respect to road and rail, the accident environments are equivalent.

If particular scenarios are identified like this pile-on crush that might lead to further distinction, then, and there is a precedent for NRC to introduce further rulemaking to address that. So, there is a precedent if

that's the case.

MR. CAMERON: Okay. Thank you, Ed.

John?

MR. VINCENT: I just wanted to indicate from the PFS perspective that I can assure Lisa that there is one very determined piece of information associated with this, and that's in regard to mode.

PFS will ship all of its spent fuel that goes to the facility by rail. It might need to be necessary to ship small amount of it from the reactor site to the nearest local rail-head via heavy-haul, but that will be insignificant to the total.

Everything will go via rail, and at a 40,000-metric-ton capacity, that could be all of today's existing inventory, or half of the total projected inventory, will go by rail.

MR. CAMERON: Okay. Thanks for that information, John.

Let's, I think, switch gears and hear what Mike has to say.

Mike, are you on a different point?

DR. BAUGHMAN: Well, it does have to do with the collisions, and it just seems to me that, during a previous workshop, maybe when we were just getting the scoping input

several months ago, somebody brought up the notion that, when we're looking at collisions, that we ought to consider spearing, and I think it was in conjunction with rail accidents, in particular, where the -- you know, the track itself or whatnot, under some circumstances, it's fairly common for the track to come up, and you can actually spear something.

And it seemed like it was a very good idea and it was something that could be somewhat unique but also in terms of how it might actually interact with the cask, and I'm just wondering where in all of this is considered. Has it been considered?

I don't know, from FRA's perspective, is that an important consideration yet? Is it a non-starter? I don't know, but I just remember hearing it brought up previously, and I thought it had some merit.

MR. SORENSON: I think I'll defer to Jerry, because that was before my time, I think, at those meetings.

Jerry, do you recall anything about spearing?

MR. SPRUNG: Spearing is just a special case of a puncture or a shear event.

The problem we have in trying to analyze that is determining the chance of their being a spear or a probe that is both sharp enough to set against the cask when it

strikes it and robust enough not to bend as it tries to drive through the very thick layers of steel and uranium, what have you, in order to get into the fuel.

We can model this. The hard part is estimating the chance of such a probe being present at an accident site and properly oriented to produce the spearing.

MR. SORENSON: This goes back to looking at the event trees again, I think, and the associated probabilities.

MR. SPRUNG: The event trees in the modal study don't go that far. We had to add on an estimate of what we thought the chance of such a probe's existence was.

MR. CAMERON: Okay.

Does that answer the question, Mike?

DR. BAUGHMAN: I think it does, although when we think about, you know, some of the other possibilities -- and maybe this is through your event tree analysis, but I don't know what kind of data we have about probability of different things happening, but you know, the probability of a bridge collapsing on a rail car versus a rail car being speared in a derailment -- I mean, intuitively, it just seems to me like there's a greater chance of there at least being a section of track coming against the cask compared to a bridge falling on a cask.

MR. CAMERON: Will we go into this in more detail when we get to the conditions?

MR. SORENSON: In the event trees, we can talk about that some more.

MR. CAMERON: Okay.

Well, why don't we go on to the next collision issue?

MR. SORENSON: This one is section 2.5, and it has to do with comments revolved around looking at different impact speeds, in analyzing that into different yielding targets.

Now, in 6672, we looked at lots of different impact speeds, but we didn't actually do finite element analysis on the target themselves.

What we did was looked at the force-deflection curves of the casks that were impacted by these severe accidents, looked at the maximum force associated with that, the force-deflection curve, and then looking at the different target hardnesses that we had, the force-penetration curve, and the associated maximum force on that force-to-penetration curve for the target, then we're able to determine what would be the speed needed to reach that maximum force, and so we didn't do specific finite element analyses of the cask and the target together, and

so, this proposal is to do a finite element analyses of both the cask and the target together.

We rate that as a B, because we do think that the method that we used in 6672 properly captured the response of the cask for these different targets.

MR. CAMERON: Okay.

So, again, this is an additional analysis that wasn't done before.

MR. SORENSON: Right.

MR. CAMERON: Any comments on this one, or questions on it?

[No response.]

MR. CAMERON: Okay.

Do we have one more collision?

MR. SORENSON: A couple.

MR. CAMERON: A couple. Okay.

The effects of human error and then dual-purpose casks. Okay.

MR. SORENSON: All right.

There were a fair number of comments on, well, gee, what if you don't torque the bolts properly or what if the impact limiters are not properly put on the cask and those sorts of things? How do you account for that in your analyses? And for 6672, we did not, but we can certainly

model and analyze scenarios that might be associated with an operational or human error in terms of putting these casks together and transporting them and that sort of thing, and that could be analyzed, and we rate that as a B.

We do not rate it as an A, because we feel that there are very good controls on the operational aspects of these transports, and the probability of those sorts of things are relatively low and associate consequences we don't think would be greatly enhanced by the operational errors. So, we rate that as a B.

MR. CAMERON: How about comments on this need to consider human error, what types of human error will be considered in looking at this?

Any comments on that?

Lisa?

MS. GUE: In terms of how this type of test might be worded and interpreted, I think it would be necessary to acknowledge that one of the interesting things about human error is that it's rather unpredictable, and of course, there are some aspects of the process where you could predict potential human errors, but basically, our analysis of risk in that respect is limited by our -- by the limits of the human imagination for what could go wrong, and I think it would be dangerous to convey by this type of

testing that all potential unexpected errors had been accounted for and evaluated.

Rather, it would be important to note that this is an important aspect of cask performance and to qualify the results with the fact that this is something that really can't be accurately predicted.

MR. SORENSON: I think you do have some of the issues we talked about this morning with testing, what human errors do you choose and then what are you missing and that sort of thing.

MR. CAMERON: How do you decide what human errors you choose?

Kevin?

MR. KAMPS: Maybe along the same lines, and perhaps it's a deeper human error than some of these examples of failing to torque the bolts properly, but the explosion that took place at the Point Beach reactor in Wisconsin, with a dry storage cask, was a human error in a sense that the chemical reaction was missed by the NRC and by the cask manufacturer and by the utility company itself.

So, I think, for that reason alone, that this issue deserves a higher rating than a B.

MR. CAMERON: Okay.

Any comment?

[No response.]

MR. CAMERON: Mike.

DR. BAUGHMAN: If the NRC elects to go forward with testing, full-scale cask testing, and you test the full cask and you run into problems of, you know, the public being able to extrapolate those results, I think one of the criticisms you will get and one of the reasons why the public not be -- or may be unwilling to extrapolate is because of the propensity for human error in all the other perhaps thousands of casks that are subsequently manufactured.

And so, I think that that linkage, if you go forward with a full-scale cask test, I think you're going to have to pay a lot more attention to the effects of human errors as a package, then, of studies, rather than something, you know, like giving it lesser significance.

If you don't go forward with full-scale casks tests, then it may not be as significant.

DR. SHANKMAN: Can I clarify, so that I -- I'm trying to understand, how is this distinct from air-worthiness in production of planes or any other endeavor in which there's a design component and a fabrication component and the design is certified by the regulator, which is what we're in?

I'm trying to understand what we could test for that would be different from the data that already exists in terms of variability of human performance, and maybe you don't know the answer, but I'd like to understand how we could capture that in this analysis that would somehow make it more specific to this than what we already know about, as I said, variability of human performance in design and fabrication endeavors for all kinds of dangerous and prone-to-accident -- you know, planes, trains, whatever.

DR. BAUGHMAN: Well, I guess I don't know that I have a specific response to that, but I guess I'm not an advocate of the full-scale cask test, the single test. I don't believe there's merit in doing that.

I don't think you gain the public confidence benefits that you think you might, and if you -- I guess what I'm saying is, if you go forward and do not address the human errors aspects of this and at least couple those two and recognize that one of the criticisms you will get for people not being able to accept your single full-scale cask test is that we don't know whether or not every subsequent cask will be manufactured up to specs. Somebody's going to screw up along the way, and so, that's the issue I'm raising.

I don't know that there is any other study you can

do to firm that up. I think it's going to be a relic of having done one cask and then hoping people can extrapolate with confidence over all the other casks that would subsequently be shipped.

MR. CAMERON: Okay. Thanks, Mike.

Let's go to Kevin, then we'll come back over to Ed.

Kevin?

MR. BLACKWELL: This is just a real quick point.

While it's pretty clear to me, it may not be clear to others who are commenting on the study, but when you talk about human errors -- and I'm going back to the actual draft study where it reiterates the issue for the meeting.

It talks about looking at human errors and human performance factors with respect to cask manufacture and loading of the cask in preparation for transport. There's also a statement in there about human performance in transportation.

You may want to be very clear that you're not planning on evaluating human performance error, human error in the transportation mode, such as the truck driver, the locomotive engineer, that kind of thing, because there is a difference between the personnel who are preparing it and the personnel who are, quote, "transporting" it.

So, it's just a clarification.

MR. SORENSON: That's a good point.

MR. CAMERON: All right.

Ed? Ed Lyman?

MR. LYMAN: Also in that vein, I think the issues of quality control during manufacture should be evaluated separately from the human errors in preparing the cask for transport, because those are very important issues themselves, and as was discussed before, the only way to probably convincingly address the variability in quality control is to sample -- you know, take statistical samples of the actual casks that are produced and test them in the same way you would test this first cask.

So, that may be the only way to really deal with that problem in a substantive way.

MR. CAMERON: Okay.

Jerry.

MR. SPRUNG: There is a subsequent slide coming that will deal with the probability of the error. This slide is trying to just deal with the result. This is an attempt to say, if an error of this sort happens and this is the condition, what happens to the cask, which we can try to address by a finite element calculation.

MR. CAMERON: Okay. I think that's an important

clarification, and we will get to the other issue.

Ken, do you have anything further to say or ask about this one before we go on to dual-purpose?

MR. SORENSON: No.

MR. CAMERON: All right. Let's do that.

MR. SORENSON: Okay.

The next topic of public input was on dual-purpose casks, and the comment basically was expect to see a lot of payload configurations for the dual-purpose casks where the spent fuel would be canistered in a storage configuration and then transferred with the canister into transportation configuration.

So, you would have a confinement barrier -- additional confinement barrier in the transport cask that consists of this canister that the fuel is in.

This specifically was not covered in 6672. This can be analyzed quite readily through risk assessment and finite element analyses, and we rate this as an A.

MR. CAMERON: Okay.

Comment on the proposal to include dual-purpose casks?

Okay, David?

MR. KRAFT: It's more of a question for clarification.

Dave Kraft, NEIS.

You're introducing another step in the process here, and -- more handlers, more procedures, kind of backs up to the previous slide, in a sense, in terms of calculating those probabilities, or have all of those factors been examined in reaching this conclusion?

MR. SORENSON: No, not specifically.

MR. KRAFT: For example, you have a drop as you're transferring from the pad to the transport vehicle.

MR. SORENSON: Like an in-plant accident or something like that.

MR. KRAFT: Perhaps, yeah. I'm using that as an example, though.

MR. SORENSON: Sure. For this proposal, the intent is to have a configuration that is not damaged at all, just like in the analyses that were done in 6672.

I think if we were to look at human error in manufacturing, that sort of thing, that would have to be incorporated in the other proposal with the dual-purpose configuration.

MR. CAMERON: Okay.

Does that answer your question, Dave?

MR. KRAFT: Yes.

MR. CAMERON: All right.

Rob, and then we'll go over to Lisa.

Go ahead, Rob.

MR. LEWIS: I'd just like to reiterate, though, that those types of accidents would be assessed as part of the facility license.

Just because they're not part of the package performance study doesn't mean that we haven't considered that in licensing the facility.

MR. CAMERON: Okay. That's a good point to keep in mind.

Lisa?

MS. GUE: How are the different proposals interrelated?

For example, how does this proposal to consider the dual transport -- or the dual-purpose casks relate to the previous proposal with respect to the testing of the spent fuel itself?

So, would there be consideration of the impact of the spent fuel on dual-purpose canister and on the transport cask?

And that's just an example, really, of all of these different collision considerations.

MR. SORENSON: And I think if you follow the logic through to the end, you could probably link just about all

of these different proposals.

For example, take your example of the spent fuel performance.

If we did that separately, independently, that certainly could be transferred to looking at its response when it's canistered, as well, because once you know the response to the fuel to any given sort of loading, then that's independent of the design of the cask, and determining the boundary conditions on that fuel will tell you how that fuel is going to respond, whether it's in a canister or whatever.

But we did not, in the issues study, make an attempt to look at co-dependencies in these different proposals to any great extent.

MS. GUE: Thanks.

In that case, I guess my comment would be, then, that as the more specific test plan is developed, I would urge that these interrelations and co-dependencies be taken into consideration, because otherwise I could see a danger of overly fragmenting the issue, which in reality -- in reality, this would act as an entire system, as one system, and the information will be only useful to the extent that it predicts the system as a whole.

MR. CAMERON: Is that clear to NRC, that comment?

All right.

Ed, did you have a comment, or is your card still up from earlier?

MR. LYMAN: It's from earlier.

MR. CAMERON: All right.

Before we move on to the fire issues, let me just check in with the audience to see if there is any comments from anybody out here, or questions, on the material that we just covered on collisions.

Anybody have a comment or a question?

[No response.]

MR. CAMERON: All right.

Well, let's go into the fire area.

MR. SORENSON: Okay.

The first one is section 3.1.4.2, and it has to do with public comments associated with different characteristics of fires with different fuel types, and as the comments show here, the historical data indicate that most hydrocarbon fuels and open-pool fire tests behave fairly similarly.

We can do some tests to actually model and determine specific fire characteristics for specific fuel types.

It's not so easy for an open pool fire because of

the external weather conditions, could be done indoors, but -- it's possible, but as we say here, it's got to be carefully done.

So, our feeling is most hydrocarbon fuels are -- have similar fire characteristics, and we rate this as a B. We don't think there would be a whole lot of new information that we would get out of this sort of testing.

MR. CAMERON: Okay.

Anything on fuel combustion temperature that might aid in how the study design proposal should be developed?

[No response.]

MR. CAMERON: And I take it, Ken, we're still on our mode of attack here where we're doing A's and B's, and then we're going to generally see if anybody has a comment on C's and D's later on, right?

MR. SORENSON: Yes. That basically is it for the thermal. The rest are C's and D's on thermal.

MR. CAMERON: Okay. All right. And just let me underscore that, if any of you have comments on any of the C's and D's, we're going to come back and gather those in later on.

Thank you, Mike. See you later.

Okay.

Well, I guess we're into the next area, then,

highway and railway accident conditions and probabilities.

MR. SORENSON: We did have one comment earlier on torch fires, Kevin? Was that yours?

Should we just cover that real quickly?

MR. CAMERON: Yeah, sure.

MR. SORENSON: Torch fires, since that was brought up specifically.

There's quite a bit of data and information, actually, in the oil pipeline industry on torch fires, and what this proposal is is to do a survey of that data and determine the effects that that would have on transportation containers.

We do rate that as a C, because we do not see that as really having a large negative impact on casks over and above the actual regulatory fire test.

MR. CAMERON: Okay, Kevin. Did you have a question only on that, or did you have a proposal that those types of fires should be rated a higher priority, or you know, perhaps you don't know the answer to that right now.

MR. KAMPS: Yeah. I don't. I'd have to look into it more, but it just seems like the torch would be a greater impact than a house fire, which is the temperature of the test right now, as I understand it, the standard.

MR. CAMERON: Okay. All right.

MR. SORENSON: With that, we'll move on to the probabilities?

MR. CAMERON: Yeah, let's do that. Let's go into that.

MR. SORENSON: The first one that is a B is the specific routes, and we've had a lot of comments today, as well as at other meetings, associated with, well, what about looking at specific routes, and we will explain a little bit in 6672 that we have looked at a fair number of real routes and then mapped those into what we call representative routes, whereby we could determine transportation risk, but the question still arises, well, what about, you know, from point A to point B, what about that route, it's got some special considerations, and so, the proposal is to look at specific routes and see that -- doing the analysis, see that they're contained within the envelope of 6672 risk assessments.

MR. CAMERON: Okay. So, the specific routes are going to be factored into the study.

MR. SORENSON: For this proposal. It's evaluated as a B, as well.

MR. CAMERON: Okay. I mean that is the proposal.

MR. SORENSON: Were we to do it, yes.

MR. CAMERON: Comments?

Lisa?

MS. GUE: First, just a question of clarification.

As I read through this recommendation, I understood that five specific routes -- Sandia would propose to collect a representative samples of potential routes. I mean you're not proposing, or are you, that this test would consider those specific routes to be used, for example, in shipping waste to Yucca Mountain?

MR. SORENSON: Correct, because there's no specific routes yet identified for that.

MS. GUE: So, then, again, my comment would be that, in that this assessment of probabilities builds up to a risk analysis, as you just stated, the utility of this study in terms of any kind of safety analysis for the specific proposals underway, Yucca Mountain and the PFS proposal, for us, would be related to a risk analysis that could also, subsequently to determining probabilities, which, as I mentioned before, are related to the specific routes to be used, also need to be able to incorporate the consequences of any potential accident, and the consequences are related very directly to where the waste would be when the accident might happen.

So, here again, we urge that the study incorporate -- acknowledge the direct link to the current proposals

being considered by the NRC and the Department of Energy and request the specific routing information from those proposals before the study is completed.

MR. CAMERON: Rob, do you want to add some information on that?

MR. LEWIS: Yeah. I would just like to point out that this study and all the NRC studies that have been done previously, the four that I mentioned -- they're not studies to determine the impacts of Yucca Mountain or the impacts of the PFS site.

They're generic studies, and what we're trying to look at is the adequacy of our regulations, for one, and what we mean by specific routes here is, if you take two points in the country and we pick a specific route between those points, there's a lot of parameters that vary with the route, such as accident rate.

What we would be trying to do here is determine if, for that specific route that we picked, if the generic route that we used in 6672 is representative of that route, and I should also add -- one more thought I wanted to add there are spent fuel shipments that aren't involved with Yucca Mountain or with PFS, and this study needs to cover those, as well.

MR. CAMERON: Go ahead, Lisa.

MS. GUE: Just to quickly clarify, I do understand that my comments relate to the overall scope of what the purpose of this study should be, as much as they relate to, I guess, how the study should be conducted, but to us, it seems important that these very major shipping campaigns are currently being proposed, and if our confidence in the regulatory structure for those specific proposals is to be in some way linked to this study, it's important that the routes examined actually lead to Yucca Mountain and actually represent the routes that would be traveled by those shipments, which, again, would be unprecedented in terms of number and scope to anything else that has happened or is going to happen.

MR. CAMERON: Maybe when we talk about the NUREG -- the results of this study may be put into play when specific decisions on routes are going to be made.

I guess that's a question as to how will this -- you know, Lisa has brought up a couple times what are the specifics going to be, the interplay with the specifics of the actual transportation, and it's a question of whether you bring them in here or whether the results of this are brought into the choice.

Go ahead, Rob.

MR. LEWIS: I would probably characterize it a

little differently, Chip.

This study -- the goal of this study is to say, for example, that given the current rules -- pick interstates, use the main-line railroads where they're available, those kind of routing rules that exist, that aren't really NRC's rules -- we would want the study to show that any route that's used is safe or is appropriate and the material could go on any route, and for something like the EIS for Yucca Mountain, for example, we would focus in on the routes specific to that site.

The EIS for PFS focuses in on the routes specific to the PFS site.

But this study, once again, is more generic in nature and is not used to make routing decisions.

MR. CAMERON: And more on that, perhaps, from Bill Lake.

Bill?

MR. LAKE: I was going to say very much of what Rob had said, but stepping back one more, the EIS -- the Yucca Mountain EIS has the same issue, because we haven't identified routes. It's not time to identify routes. We have to use representative routes.

We, too, believe that the regulations are route-independent. So, if you follow the DOT rules, which

basically tell you to go -- to use interstate highways, except for cases where states suggest something else or recommend something else and they're approved.

The other side of this is I would hate to hold this process up until we've decided on routes to Yucca Mountain or PFS.

Yucca Mountain is still in the characterization stage. It's possible at this point that Yucca Mountain will not be the repository. We may be going somewhere else. I don't anticipate that, but it's not yet licensed. It hasn't been recommended.

There are a couple of important steps that have to take place before Yucca Mountain is the repository.

MR. CAMERON: Okay.

Lisa, do you have a final comment on that?

MS. GUE: Yeah. Thank you. Just to note, I guess, that there is a potential here for a somewhat circular argument in that I'm being told that this study is a generic study and shouldn't consider specific routes to Yucca Mountain, for example, at the same time as you just mentioned the environmental impact statement for the Yucca Mountain proposal doesn't include specific routes either, and part of the justification that can be offered for that oversight or that omission is that tests such as this one

indicate a low probability of accidents.

It's important for people who live along the specific routes that will be used to know what the specific probabilities are of an accident and the risk that is being imposed upon them if their input is -- if they're to be given the opportunity for informed input into these processes, and again, I do understand that this comment lies somewhat at a higher level than the detail of this particular level and relates to the scope of what this project should be, but my concern remains, I guess, despite the comments.

MR. CAMERON: Okay.

If anybody around the table can try to put this in context to alleviate Lisa's concerns, that would be welcome.

MS. GUE: I'm not sure that they can be alleviated right now.

MR. CAMERON: If they can.

MS. GUE: I definitely want them just to be there.

MR. CAMERON: Okay.

I just want to make sure that we all understand the relationship between this study and regulatory licensing decision-making, okay, because I think that that's where we get into this being done for one purpose and how are those other regulatory decisions and the products associated with

them -- how will they use this study?

I think maybe we can try to come back to this again. Ken brought up the fact of some of what comes out of this particular study may change the NUREG, okay, that we're going to talk about this afternoon, 6672, right? Yeah, there it is, 6672.

But maybe -- why don't we use that discussion to see if we can put this in context again? That's what I would suggest, I guess, now.

But let's go to Kevin, and then we'll come over to this Kevin.

MR. BLACKWELL: Did you want defer discussion this till 6672?

MR. CAMERON: No. Why don't we make sure we get all this on the record now, and we'll see what we get to when we get there.

MR. BLACKWELL: Kevin Blackwell, Federal Railroad.

My comment is probably very simple. I mean maybe the problem here is that people might misconstrue the term -- using the term "specific routes." Maybe it should just be selected routes, because it is a study. You're not specifying the routes.

I understand the results of the public comment, but even that brings up, in and of itself, with the

time-lines of when things may or may not move to Yucca Mountain, no matter what routes you select now, doesn't necessarily mean that, even if Yucca Mountain does open up, those are going to be the routes that are going to be there when that happens.

So, whatever accident rates you come up with for whatever timeframe you're looking at, those accident rates are fluid, too, depending on the time-frame that you're looking at them in.

So, you're never going to get a definitive answer on this from an aspect of what the public comment is, is let's get a handle on what the accident rates are along the routes to be used, because what you're using now, five years from now could be totally different, could be less, could be higher. It's a very fluid situation, and I don't think you have a -- you're going to have a definitive answer.

But for purposes of the study, to answer that comment, you have to pick some routes that are likely to be used, and of course, the main lines on the railroads are ones pretty much likely to be used. That's the best infrastructure. That's the one that's probably going to be used. Same with the interstates.

So, it's a best practices, I guess you could say, situation, but you're never going to be able to give the

public a definitive answer on the exact routes and the accident rates along those routes during the timeframes that this material is going to move unless you do it very close to when those shipments are going to move.

MR. CAMERON: Okay. Thanks, Kevin.

Let's go to Kevin Kamps.

MR. KAMPS: I am glad that Lisa brought up the bigger picture of all this, the Yucca Mountain DEIS and the Private Fuel Storage DEIS, because a lot of these processes are happening simultaneously, in real time, and traveling along some of the highway routes that are projected to be used for shipments on these campaigns, the public is having tremendous difficulty keeping up with all these different processes.

There's a lot of confusion about what's going on, and I didn't even know that the comment deadline on this is the end of this month. Did I understand that correctly?

DR. SHANKMAN: But we'll take them after. It's a proposed deadline, but if you had comments afterwards, we would certainly consider them.

MR. KAMPS: Yeah. I would encourage it to be considered that these deadlines be extended. The Private Fuel Storage DEIS deadline is September 21st.

People are having difficulty even coming up to

speed with, really, the large volume of information that's coming their way, so -- in addition, there's the NRC consideration of adopting IAEA standards for transportation, and there's been discussion of where in the country workshops might be held on that subject, and there are requests -- I know there are requests from concerned citizens that hearings on Private Fuel Storage be held in transport corridor states, and there's been no hearings scheduled for these places.

So, these deadlines are coming up very quickly, and that's one reason I think that the public feels locked out of decision-making and involvement.

DR. SHANKMAN: Kevin, just a point of clarification. This is an informal comment process. The other two that you refer to are much more formal and are governed by the Administrative Procedures Act and NEPA legislation and 10 CFR 51. So, there's a whole other structure related to that.

I won't comment on that, but for this study, if you have comments after the date that we have in our paper, we will be glad to consider them as we are working on our proposal.

MR. LEWIS: We would ask that you let us know that you're going to have comments, so we can plan over the next

couple of months.

DR. SHANKMAN: Please.

MR. CAMERON: Okay.

Ken, how about the next issue?

MR. SORENSON: Okay.

I'll skip a couple of the C's and D's and go to section 5.3.4.2, which is occurrence frequency of route wayside surfaces, and the comment is really to take a step back and take a much closer look at what sort of wayside surfaces you have along the highways and railroad surfaces to be sure that we all understand and characterize the surfaces that casks may be impacting in the event of an accident.

So, the proposal is to develop occurrence frequencies for these different structures. In 6672, we began an analytic process using GIS that was really very effective in terms of being able to develop frequencies for different target hardnesses that we had along some specific routes, and the proposal here is to extend that to more routes so that we can better define these wayside hardness frequencies, and we rate that as an A.

MR. CAMERON: Okay.

Is this issue -- does everybody understand what's being suggested?

DR. SHANKMAN: Does everybody know what GIS is?

MR. CAMERON: You might as well tell us.

DR. SHANKMAN: Go ahead.

MR. SORENSON: Geographic Information Systems. It's a way of managing spatial data, like map data, and typically it's done in layers, and so, you can manage and use spatial data in areas like this to determine population densities or wayside surface hardnesses or things like that in a quantitative manner.

MR. CAMERON: Okay.

Thank you, Susan, for bringing it up, and I think some of the comments that Lisa has made about synergistic effects, about different permutations of how you combine all these, as well as the reality of what is actually done, I think we can note that those may apply to a lot of these different issues that are being raised, but any specific comments on this particular issue?

Lisa, go ahead.

MS. GUE: Just to be on the record at this point, again, of emphasizing the relevance of specific routes for the -- for an adequate consideration of highway conditions.

Is this when we're talking about the weather conditions, as well?

MR. SORENSON: No. That's a different proposal.

This is just for wayside hardnesses that we're looking at.

MS. GUE: Okay. Should I save my comment for weather conditions?

MR. SORENSON: Well, that's a C or a D, so we may not get to that one, actually.

MR. CAMERON: The C's or D's -- weather conditions --

MR. SORENSON: Do we have a specific time for that?

MR. CAMERON: Yeah. We were going to -- we'll get to that specifically, okay, Lisa, so you can talk about your concern with the weather conditions, because it was raised before, and we'll get to that one.

All right.

Kevin, did you have a comment?

MR. KAMPS: No.

MR. CAMERON: All right.

Kevin.

MR. BLACKWELL: Just a quick question for my purposes in regards to the slide.

The comments in the proposal are not rail-specific on this proposal, right? Even though the comment seems to be geared toward rail, the proposal is not, correct?

MR. SORENSON: Correct. We look at both rail and

highway.

MR. CAMERON: Do you have something further on that?

MR. BLACKWELL: I just wanted to clarify, because looking at the public comment, it appears to be geared solely toward rail wayside surfaces, and I wanted to make it clear that the proposal is not rail-specific but rail and highway.

MR. CAMERON: Okay. Good.

MR. SORENSON: And actually, we did that for both rail and highway in 6672.

MR. CAMERON: Okay.

Next, conditions and probabilities, A or B.

MR. SORENSON: That's human errors. This is where we look at the event tree probabilities for human error, and got a fair number of comments about, well, gee, what happens if a mistake is made in the manufacture or in the loading or in the buttoning up of these casks.

Again, it does not relate directly to drivers and things like that, but more preparing the fuel in the cask for shipment.

The proposal is to estimate frequencies based on existing data of human error, to determine what the impact of those frequencies would be on a cask that is in a

hypothetical severe accident.

If you have a operator error in buttoning up this cask, how would that affect the payload during a hypothetical accident, and we rate that as a D. Again, as I had mentioned earlier, we don't think that that would have a large incremental effect over transportation risks that have already been computed.

MR. CAMERON: Okay.

There were a couple issues that came up on this previously.

Any additional comment on looking at human error?

Kevin, did you have a clarification?

MR. BLACKWELL: No.

MR. CAMERON: All right.

David?

MR. KRAFT: David Kraft.

I just want to underscore what Lisa said earlier, getting back to the fact that you're going to have different teams of people, presumably, dealing with loading, as opposed to driving and accompanying and escorting. Those trees are somehow going to have to be integrated to calculating the probability.

MR. SORENSON: Okay. Thank you.

MR. CAMERON: All right.

Anybody else?

[No response.]

MR. CAMERON: Okay.

MR. SORENSON: The next comment deals with speed and fire duration distributions for mechanical loadings, in thermal loadings, a lot of comment about different types of fires, particularly rail environment, as opposed to the highway environment.

So, the proposal is to re-look at the speed and fire duration distributions that were used in the modal study and that we used in 6672 based on data -- new data that may be out there that wasn't used in the modal study to see if those distributions need to be changed, and we rate that as a B.

MR. CAMERON: Lisa.

MS. GUE: Just a question of clarification.

In this and other proposals, when the Sandia comments include a proposal to evaluate recent accident data, is that general data for all accidents along the selected rail and highways, or is it specifically accidents that have involved NRC-certified shipments?

MR. SORENSON: We use all data that we possibly can to look at potential for these types of accidents to occur. It does not have to include specifically radioactive

material.

MR. CAMERON: All right.

We might as well keep moving through.

MR. SORENSON: All right. The next one is the event trees and probabilities, branch point probabilities. We rated this a B. We think this is a very important aspect of the transportation risk assessment.

Event trees and probabilities that were used in 6672 were those that were defined in the modal study back in 1987. So, it's 13-year-old data, and we think it's important to go back and re-look at the actual event trees themselves, the unique events that define the scenarios and the associated probabilities with those unique events in light of new data that is out there, the database, to make sure that these event trees and the associated probabilities still properly reflect the transportation accidents that have occurred over the past 13 years.

So, we want to make sure that these trees and probabilities are still valid today.

MR. CAMERON: Could you just clarify one thing for me?

We just were talking about weather conditions as a C or a D issue. Under public comments, it says weather-related scenarios.

Are those being incorporated into this A issue, or are we talking about weather-related scenarios in two different contexts here?

MR. SORENSON: I think -- actually, we have them in two different contexts, in this one and also how there may be correlations between weather for representative routes in accident rate, but this -- we'll also look at weather scenario under this task to see if there should be specific scenarios related to weather conditions as part of the event tree and then associated probabilities.

MR. CAMERON: Okay.

David?

MR. KRAFT: Well, I just wanted a clarification and confirmation. I thought I heard you say it was rated B, but I see it's listed as A, and I also didn't know if those public comments actually matched -- were the correct ones that matched what we were talking about.

MR. SORENSON: If I said B, I mis-spoke. It is an A.

MR. KRAFT: And these are the actual summary of the public comments on this particular one?

MR. SORENSON: Right.

MR. CAMERON: Okay.

Any questions on this particular proposal?

[No response.]

MR. CAMERON: All right.

Let's go to the next one.

MR. SORENSON: The next one is historic severe accidents, look at historic severe accidents, and again, I think this relates back to the previous proposal with the event tree, and we want to make sure that we capture all existing data, whether it's old or whether it's in the last 13 years, of accidents that have occurred, and that will include severe accidents, as well as not-so-severe accidents. That requires a re-look at the database to make sure that we've captured all those in the existing event trees. We rate that as an A.

MR. CAMERON: And will it be clear to people in the study proposal what severe accidents, unusually severe historic accidents are going to be considered, for example, for purposes -- if people think that there's one that we should consider that we didn't factor in there, how will that be done?

MR. SORENSON: We certainly could highlight severe accidents that we've discovered in the database that are put into the event trees.

Just looking through the event trees, you would not be able to pick that out, but certainly be possible in

the packaging performance study proposal to highlight specific events that are incorporated -- or will be incorporated into the event trees.

MR. CAMERON: Okay.

Any comments on severe accidents?

Kevin?

MR. BLACKWELL: Just a question on this. I'm no number-cruncher or accident-evaluator at all, but I'm curious, when you were looking at these severe historic accidents, how far back are you going?

My point is this: I'm curious in that, if you're looking at something -- take the rail environment -- a derailment that happened back in the '70s, where you had levies, you had tank cars exploding and that kind of thing, is there any factor looking at the probability of that occurring today, after 20 years of improvements to the type of packaging used in the rail industry?

MR. SORENSON: The short answer, I'd say yes. Let me defer to Jerry, because he's the one who is tasked with this.

MR. SPRUNG: I think we're missing an idea. This particular proposal doesn't deal with probabilities. It says let us look at the historic database and look at the most severe accidents or the more severe accidents we can

find in that database and ask whether the speeds, the impacted surfaces, the fire temperatures, the durations of those fires, are incorporated by the ranges of distributions of those parameters that we develop from other studies.

That is, we don't want to discover that the speed distribution we use in generic or in specific studies tops out at 120 miles an hour if there are historic accidents that show that there were some at 150, okay?

The question of the probability of a particular specific historic accident is meaningless. There's no way to estimate the precise chance of that thing occurring again. So, what you're really trying to make sure is that which you have seen to occur is encompassed by the ranges of these parameters that you use in your generic assessment.

MR. CAMERON: Susan?

DR. SHANKMAN: You always have the issue of deciding what's realistic and what's likely and where you draw the line at probable versus possible, and I think this is an attempt to make sure that, if there's data existing about something that did happen, that we don't just miss it completely in our analysis.

Particularly if it's within range, it would be very foolish not to include it.

So, it's just a way of -- we're not doing a

bounding study, but in a sense, we're going to let existing information help us understand what a bounding study would be.

The other thing is -- I don't know how many of you were at the meeting where there was a woman who kept saying things happen all the time that never happen.

Her point was that there is always the possibility that something will happen, even though all your data suggests that it doesn't, and I think this is another attempt at looking at the physical realities that have happened and making sure that we include that thinking in the study.

Is that correct, Jerry?

MR. SPRUNG: We want to confirm that that which has happened is incorporated in the range of things that we say might happen.

It's very difficult to decide what that hasn't happened might happen sometime in the future.

DR. SHANKMAN: Okay.

MR. SPRUNG: You're not concerned with the probability of it happening but the fact that it did happen and may happen again.

DR. SHANKMAN: We're going to use accident analysis to look at probabilities, you know, other data, but

this is just another set of data to be considered.

MR. CAMERON: All right.

David?

MR. KRAFT: In this particular piece, are you considering only domestic accidents, or would you even find a value to look abroad to other nations, perhaps, that have relied more heavily or on a different standard on rail?

DR. SHANKMAN: That's an interesting point. I don't know that we have considered it. We'll have to think about it.

You know, there's always the issue of the standards to which they were licensed and evaluated and what their safety standards are in their road construction, and in this case, we have focused on domestic issues, because we're looking at campaigns in this country.

If you know of something that you think would fit because you know of the parameters, we'd like to hear about it.

MR. KRAFT: I'm bringing it up in the context of this specifically, because you're going on very definite incidents that already occurred.

It would be a lot easier to get information from abroad on those than, you know, to analyze their whole transportation system.

DR. SHANKMAN: Right. The Volpe Center has helped us before, and they have some very specific information in that they have -- it's consistent how they've gathered it, and that helps, also.

MR. KRAFT: Okay.

DR. SHANKMAN: So, you're introducing a variable in data collection, also.

So, I'm hearing your point, but I'm not sure how we could use it in a meaningful way.

MR. KRAFT: Okay.

MR. CAMERON: Bill?

MR. LAKE: Thank you, Chip.

I think the reason that you're doing this, the stated reason, is excellent, and it's a good basis for doing it.

I suggest that there's also a side benefit to this in that identifying real accidents and placing them into the context of your report may help the translation between the analyses and tests and reality, which I think all of us have difficulty doing.

MR. CAMERON: Okay. That's a good suggestion on a potential link.

Why don't we do the sensitivity analysis slide, see if there are some C or D's that people want to talk

about, and then check in with the audience, and then take a break before we go to 6672?

MR. SORENSON: Okay. The last A or B proposal in the entire report, then, is the sensitivity study, and the comments really say you need to look at the sensitivity of these various input parameters that you're looking at that develop transportation risks and in terms of one parameter may have an overriding effect on transportation risk, as opposed to other parameters, and it would be worthwhile to know which parameters are really driving the risk numbers, and so, our proposal is to do a sensitivity analysis on different input parameters to see the relative impact on the actual transportation risk estimates that we get, and that is a A proposal.

MR. CAMERON: Ed, do you want to make a comment on this one, or ask a question?

MR. LYMAN: Yeah, and this is related to the following slide, obviously, which was rated a D, which is the full uncertainty study.

I think, clearly, what's been missing from Sandia's risk analyses to this point is this type of analysis, and I think, from my perspective as a, you know, member of the public, to see an enormously complicated probabilistic -- well, semi-probabilistic risk assessment

coming out with a single number without any idea how the numerous elements combine to produce that value and without any idea how the final result is dependent on the assumptions, that's clearly something that would greatly improve the validity or the credibility of this type of analysis.

But having said that, I think, no matter what the result of the sensitivity study is, it's worth doing this analysis with a full accounting of the uncertainties, both the statistical and the -- and those due to lack of information -- I forget the term of art for that, but certainly, without those uncertainties, to be able to take a single number, you know, you have 6672 coming out with a number to two decimal places.

The implication is that, you know, that number to better than 10 percent, and I'm saying that it's clear that there are factors which have uncertainties one or two orders of magnitude, and so, that really has to be factored in.

MR. CAMERON: Are you recommending that this slide that is now the full uncertainty study, which is rated a D -- are you recommending that that be elevated?

MR. LYMAN: I think that whatever number is produced by this kind of analysis, you have to have an error bar associated with it, so that you can tell. You know, as

a former physicist, no experimental result is meaningful without that kind of error bar.

MR. CAMERON: Comments or questions from NRC or Sandia on that recommendation?

MR. SORENSON: I think it's a good comment.

One of the reasons for the differences in the recommendations, I think, is that we feel that the sensitivity analyses will give us a much clearer picture of the forces going on in terms of how these different components relate to cask response and eventual source term release, as opposed to looking at specific uncertainty boundaries for the individual parameters.

To have a uncertainty bound on a -- two orders of magnitude -- on a parameter that does not really relate to source term release probably is not all that critical, and so, our thought is to first look at the sensitivity analyses and make sure that we understand which parameters are driving the transportation risk numbers and, at that point, maybe further recommend more detailed uncertainty studies on those parameters.

MR. CAMERON: Okay.

David, did you have a comment?

MR. KRAFT: Not on this. I wanted to back up.

MR. CAMERON: Let's back up.

MR. KRAFT: I just wanted to back up to cask performance during fire, section 3.3.3. It's rated a D, and I had a question based on some of the comments that were made earlier, and perhaps some of the colleagues from the rail industry can comment on this.

In situations where you do have car pile-ups and there is a fire, is it realistic that sometimes debris, because of the fire, will fall or structures will be weakened because of the fire and then fall on things?

The reason I bring it up is the notion of the spearing was talked about as a variation of puncture. Well, isn't this a variation of drop, also, and is that a realistic scenario on some train accidents, where you do have cars cascading into one another, where fire will either weaken things so that they do fall, in which case you'd have a shearing effect on the cask or not.

I bring it up in the context that this is rated a D, and if that's a more realistic thing that we're not looking at, perhaps we should have a higher analysis.

MR. CAMERON: Comments on that proposal? Any questions?

Bob?

MR. FRONCZAK: Bob Fronczak.

I don't know of any situation like that. I mean

generally what happens is, if you have a fire, it will impact an adjacent car and the materials that are in that car, in years past, like Kevin indicated, we've had levies where adjacent LP gas cars exploded.

Nowadays, they vent, but they can vent and burn for extended periods of time.

We had one -- and I think I mentioned it in Bethesda again -- in Wisconsin that I think burned for something on the order of three weeks, but again, no cars exploded, nobody was hurt or killed in that accident.

MR. KRAFT: Any incidents of surrounding structures may be falling, if it were in a yard or on a bridge or tressel or anything like that?

MR. FRONCZAK: I don't know of any incidents like that.

MR. KRAFT: Okay. Again, I didn't know if this was real world or not.

MR. BLACKWELL: The only incident I can think of off the top of my head would be the derailment, but that was where cars went off a bridge at the derailment time, not later down the road, you know, because of a fire environment.

MR. KRAFT: And I just had one other question of clarification on this last page, 5.3.4.6, the historic

review again.

Simply put, are you just doing reverse modeling here?

MR. SORENSON: The intent really is to make sure we capture historic events so that we can demonstrate that the events that have actually occurred are captured in the event trees that we have and in the subsequent cask modeling to make sure that transportation risks capture those sorts of severe accidents, as well.

MR. KRAFT: I just want to make sure -- I don't know if I'm pushing it farther or maybe it's just being stated a slightly different way. You're actually going to be testing validity and reliability of your decision trees perhaps by using what has already happened? That's what I mean by reverse modeling.

MR. LEWIS: I can try to give you maybe an example.

We have this NUREG, which is a brochure that summarizes the modal study, and what we're trying to do with these specific historic case studies, if you will, is very similar to what they did in the modal study.

They picked four accidents -- a fire in 1982, a bridge -- something fell off a bridge in 1981, a train fire in 1982, and a very big derailment in 1979 -- and they put

those on -- we had this graph of collision force versus thermal force, and they tried to place those on that curve and see what would have happened had a spent fuel cask been there, and that's the same thing we're trying to do with these.

We're just trying to maybe get some more specific historic case studies.

MR. KRAFT: So, that would strengthen your certainty that your probability calculations are correct.

MR. LEWIS: Right.

MR. CAMERON: Okay.

We sort of talked a little bit about some C and D issues, and we wanted to make sure that, if people had some C and D's that they thought should be moved up, that we talked about those.

There was one thing that Lisa brought up on weather conditions.

Is there a slide on weather conditions, Ken, that you can put up?

MR. SORENSON: Yes. Let me see if I can find that quickly.

Yeah, dependence of accident rates on accident conditions like weather.

MR. CAMERON: Lisa, do you want to say anything

about this one?

MS. GUE: Yes.

Unfortunately, I don't quite have it at my fingertips where I read this assessment, but somewhere in here, Sandia assessed the public comment saying that, rather than considering specific -- or dis-aggregating specific weather conditions, the average incorporates both the worst-case and best-case scenarios, and so, I guess my comment and my concern relates, again, to how this study might be, in the future, used by the NRC to evaluate potential changes to regulations, and intuitively, more severe accidents would seem to be more likely under harsher weather conditions, for example under winter driving conditions.

I guess it would be useful to have a better picture of that so that when -- again, when specific proposals are being made or whether the regulatory structure is being evaluated, this kind of study might not only give a general overall picture but might also say that -- or provide a basis for some kind of consideration of the fact that shipments, for instance, during the winter, under icy conditions, do have a much higher probability, and there again, the converse is that shipments during the summer might appear safer.

It seems like that kind of specific information would be very helpful as a basis for regulating some of the current proposals.

Now, just in anticipation, I realize that the NRC is regulating the casks and not specific when their shipments take place, but here if I could just make a general comment that applies, I think, to all of this process, it has to be acknowledged that transporting spent fuel is never a goal in itself but is always a means to an end, and although the regulatory structure seems to take it in little pieces like that, really these things have to be considered as a part of the bigger whole, I guess, and this really needs to be analyzed with respect, also, to how worthwhile the transportation risk is relative to the goal that you can achieve by transporting.

MR. CAMERON: Comments on that from the NRC?

MR. VINCENT: Maybe I can answer the question for you.

In point of fact, when a transportation actually occurs -- and I'm talking about my prior experience coming out of Buffalo, where you get huge lake-effect snowfalls -- I assure you that the last person that makes a decision as to whether or not to drive, after the utility itself who's sponsoring it, is the driver.

They are not idiots. They are trained for this, they know exactly what the cargo is, and they will not drive under those conditions, and to the extent you get data from the state police on weather conditions, they stay put. They're already on the road, they make for safe haven. They do not drive under those conditions.

MR. CAMERON: Rob?

MR. LEWIS: I guess this is -- one thing I would ask that you consider is that we're looking at -- we're using average accident rate, and we say that includes some severe weather conditions and some very good weather conditions which would have a higher or a lower accident rate, but if you look at, you know, several thousand shipments over several years, the use of the average accident rate, you can take the number of shipments times the accident rate per mile, times the number of miles, and mathematically, you get the expected number of accidents.

Now, that includes the fact that some shipments are made in worse weather and some shipments are made in better weather.

The average expected number of accidents, which is clearly what you're looking for in something like a risk study, accounts for that.

MR. CAMERON: Lisa?

MS. GUE: Well, in fact, my concern is that that's only part of the way that this study might be used, to describe a picture of what the average risk has been.

I am suspecting that this study might also be used, whether officially or unofficially, in a more prescriptive way to paint a picture of how risky transportation -- proposed transportation schemes will be and what validity current regulatory structures have in guaranteeing public safety, and in that respect, it would be more useful -- that's, I guess, the point I was trying to make, is it would be more useful in that respect to have some of those data dis-aggregated, especially in situations where there could be clear regulatory decisions made.

Just to make a very simple example -- I realize it would be more complex than that, but for example, not to ship during the winter because accident probabilities would be much higher, if that's the case.

DR. SHANKMAN: I understand what you're saying, and I think now it connects better with what you were saying with the bigger picture, and for that, we would have to look to DOT, who does make the safe route, en route determination, and criteria for safe transport, and so, we're going to focus on the cask and cask safety, and DOT, I think, has work underway, as far as I know, to look at

contribution of different variables to accident rates, and that would be something they would have to consider, but I understand your concern.

I don't think that NRC is -- since we don't regulate the selection of routes or the selection of mode or the selection of times to ship, we'll maintain looking at the safety across all conditions, and then, if there would need to be some kind of -- I know Bob and his organization has looked at whether they should have voluntary special arrangements for transportation of different hazardous cargo on train tracks, and that's voluntary, and each of the modes in DOT have looked at that, but -- so, I think we'll pass this on, and -- but NRC is not -- I'm not sure that it would serve any purpose in this study to disaggregate it, because it's an accident rate applied to a certain situation, but we'll look at it.

MS. GUE: And again, to the -- very quickly, but to the extent that the results of this study might be used to demonstrate to, for instance, the DOT that nuclear waste transportation schemes are not unduly hazardous, the precision of this study will influence those regulatory considerations by the Department of Transportation, and so, again, I just see the danger of overly fragmenting these questions to the extent that nowhere is there room for

consideration of the bigger picture which intuitively and factually is obviously true.

DR. SHANKMAN: We can talk off-line. I'm not sure it is.

I think if you look in the data on dangerous goods, I think Class 7 radioactive goods are not the most dangerous and isn't where the Department of Transportation has spent a lot of time, because it is the least -- in terms of statistics -- the least dangerous, the least hazardous of the dangerous goods, but that's a whole separate discussion.

MR. CAMERON: Okay.

Let's go to Kevin and then to Bob.

Go ahead, Bob.

MR. BLACKWELL: I have a different topic.

I don't know if what some of what Lisa was saying may or may not be true in regards to probability of -- you know, how weather affects accidents.

I mean you're going to have a whole range of weather affecting problems, whether it be winter, summer, spring, or fall.

There are going to be floods. There are going to be excessive heat that causes problems with sun-caking of rails. You can have problems at both ends of the spectrum.

So, to say that there is one time of year that's

better to ship than others may not necessarily be true. That's why taking an average is probably the best way to go, and of course, as has been said, even weather can shut down the railroad at times, believe it or not. That has happened. So, it's common sense on when to move, when to ship, and that does play a part in the rail environment.

The other thing I wanted to comment on was Dr. Shankman's statement where, in regards to DOT's looking at the weather, in regards to radioactive materials, it's not that they are any less hazardous than any of the other hazard classes.

It's more than, in relation to the amount of that particular hazard class that moves, it's a very, very small percentage in relation to organic peroxides, flammable liquids.

So, of course, the more you have transported, the more problems you have with accident rates and weather affecting that, etcetera, etcetera, and even when it increases, it's still going to be a very small percentage of the amount of regulated hazardous material that is moving at any given time in this country.

MR. CAMERON: Okay.

Bob, do you want to make a comment?

MR. FRONCZAK: I think I'm on slide 28, torch

fires, and I think this was one of the issues that we brought up in the scoping process, if you will, and it relates, again, to Wisconsin and the fact that tank cars are designed to vent and burn now, and the likelihood of a levy like Kevin referred to that happened, you know, fairly routinely in the '60s, you know, virtually does not exist anymore, but the way I read your comments is that, you know, this is really already fairly well studied, and what I was curious about is did you plan to either point out some other research or address it at all in the project?

MR. SORENSON: Well, it just depends on, I think, how NRC decides to allocate the proposals that we have here, which ones to go forward with and which ones not to go forward with, as a C rating, below the A's and B's.

So, it just depends on -- it doesn't mean it's not important, necessarily, but it depends on how the resources are allocated.

MR. CAMERON: Okay.

Anybody else have a C or a D issue?

Lisa.

MS. GUE: Thanks.

I'm not sure if these are C or D issues, but they're things that have been discussed so far.

First of all, our discussion today opened with the

recommendation of testing on a full-size -- full-scale testing on a rail cask, and I would advocate for testing on the truck cask, as well, and this again relates to my concern for information about which modes would be used in the proposed transportation schemes, but at least, so far as we don't know that information, I'm wondering why only the rail cask was selected, and I would advocate for a truck cask also to be tested.

MR. CAMERON: What is the answer to that?

MR. SORENSON: Well, 6672 is the rail cask that really failed earlier in the extra-regulatory severe environments than the truck cask, and recognizing that there are limited resources, the recommendation was just to look at the rail cask, as opposed to the truck cask.

MR. CAMERON: Okay.

Did you have a comment on that, Lisa, or another question?

MS. GUE: Actually, I have another separate comment, and this relates to, again, how this probability study relates to a risk analysis, and just a comment for the NRC in its consideration of how the results of this study would be presented and interpreted is that I know that the modal study has sometimes been used to show that -- or in an attempt to demonstrate the safety of these railway

shipments.

And I want to emphasize that, in fact, risk is obviously a factor not only of probability but also of potential consequences, and these worst-case scenario attempts do not at all consider the consequences in terms of radiation release into waterways or what kind of -- even just at a very basic level, the economic consequences of a clean-up effort if this were to happen in a populated area.

So, perhaps that's not within the scope of this study, but in that case, the treatment of the results should make that clear that that's something that hasn't been considered.

MR. CAMERON: It seems, from some of the comments that we've heard today, that it might be good for the NRC, when the study is done, to really spell out what the potential use of the study, the context of the study is, because there could be misunderstandings about what the implications are of the study.

MS. GUE: I just had one final comment which relates to the cost of any of the proposals, and I wonder if there's been any thought given to suggesting that some of the responsibility for bearing these costs is borne by those entities proposing to make the shipments.

Obviously, it's their projects that are

introducing the potential danger to the public.

DR. SHANKMAN: Well, you know we're a 100-percent fee-recoverable agency, which means that all the costs of what we do is borne by the licensees and applicants for certificates.

So, all of the costs of this study are paid by -- not by -- well, it's a long story. I could say not by taxpayers, but it's not exactly true. But the point is, 100 percent of the costs of this agency are recovered from the people who use the agency for commerce.

MS. GUE: I appreciate that, and I guess this relates a little bit to the suggestion that it might be possible to secure a donation of a full-scale cask. Obviously, not all licensees that are proposing shipment can do that, but subsequently, then, I have concerns about the analysis of the feasible costs, I guess, especially relating to our previous discussion about the calorimeter test versus the full-scale fire test.

Certainly, it's our position that, if safety concerns cannot be financed and if very conservative testing regimes cannot be maintained, that really attacks the validity -- or the viability, rather, of this overall, and public safety should never be compromised by economics.

MR. CAMERON: Okay.

Thank you, Lisa.

Let's go to Kevin, and then we'll go to David, and then we'll check in with the audience and take a break.

MR. KAMPS: Well, Lisa's last point there was actually the point that I was going to bring up.

I have heard a number of times today that tests that have been the subject matter of public comment have been eliminated because of cost considerations, and I think that, if the NRC is 100-percent funded by nuclear industries, that perhaps that needs to be addressed.

This is a very hazardous substance, and it's an unprecedented proposal of shipping it through communities in this country, and this is one of the last processes that will take place before these large-scale shipment campaigns begin, and I think that the job should be done right at this time.

MR. CAMERON: Rob?

MR. LEWIS: I just want to make it clear that, in the issues report, we hope that all the comments we've received are reflected in there, and none of them have been discounted or eliminated on a cost basis.

There may be two technical ways to solve a problem. One might be cheaper than the other, and the proposals should state that and reflect that -- for example,

the calorimeter and other tests of the full-scale cask -- but the ratings that are given are solely based on the technical merit of the results that would be produced.

MR. CAMERON: Okay.

So, nothing has been eliminated at this point on cost alone, but I think that Kevin's point would still be relevant if, when we get to the design study and we're doing cost-benefit, that would be a relevant issue.

Let's go to David and then to Ed and then finish off with Bill.

David?

MR. KRAFT: Just a couple of quick comments, just to reinforce, I think, Lisa's request for truck testing.

It would seem to me that a lot of parameters on the highways have changed since that initial evaluation was done. Coming from Illinois, you know, our speed limit is still 55, while in Michigan, just 30 miles away, it's 75, a lot of those kinds of things, plus the fact that Illinois has graced the rest of the country with hundreds of illegal truck driver licenses.

Those are the kinds of factors that are real world, that really, I think, bear to some of the issue here, and perhaps a truck test wouldn't be an unreasonable thing to request.

Second thing -- this could be after the horse is out of the barn, but it is something to at least bring up, if there are any other licenses.

At lunch this afternoon we were talking about the notion of where do you get the casks, how do you fund it, that sort of thing.

This might be something for NRC at least to consider for the future, that if there are any additional licenses, or certifications, rather, to be granted, that a condition of certification is a full-scale test or you don't get the certificate.

It's also probably in a regulatory way, but it's equal pain for everybody if you do it that way, except for those you choose to grandfather the ones in who did not have to be subjected to that.

It seems like something the agency could do and really solve a lot of problems rather quickly.

MR. CAMERON: All right. Thanks, David.

Ed Lyman?

MR. LYMAN: Okay. I have two comments.

One is on this issue of the fact that the agency recovers its fees from the regulated industry.

I imagine there's going to be some concern among the industry that funding some or all parts of the study,

including full-scale, beyond-regulatory tests, and I know that in other areas where the industry has not seen certain activities by NRC as in its interest, like most of the work of the Office of Research, that one finds that the budgets and appropriations there shrink.

I'm wondering how you anticipate -- do you anticipate that you will actually get a substantial part of this funded or appropriated.

The second comment I want to bring up is a longstanding issue that Nuclear Control Institute has had and something that we would suggest be added to the package performance study, and that's an updating of the performance of packages against acts of sabotage.

In particular, the only public data on cask response to sabotage attacks was generated back in the '70s, and it can be argued that those studies did not reflect a credible threat, and we think that this should be a part of this study, since the risk of sabotage is, in our mind, one of the potentially largest risks of a large-scale spent-fuel shipping campaign, and as part of that, we would like to see cask response to a two-stage sabotage attack where an attacker actually gets physical control of a package, is able to penetrate it with a shape charge, and is then able to insert explosive into the cask cavity, a scenario similar

to what is postulated by Sandia in its discussion of theft of immobilized plutonium.

Such a scenario could actually also be applied to sabotage of spent fuel casks, as well.

Thanks.

MR. CAMERON: Okay. Thanks, Ed.

Susan, do you want to say something about the sabotage issue?

DR. SHANKMAN: Yes.

Ed, are you aware of the petition from the State of Nevada, and did you comment on that?

MR. LYMAN: No, we did not comment on it. I am aware of the petition, but that is a petition for changing the rule.

This would be one avenue for providing evidence to support changing the rule.

DR. SHANKMAN: Understood. And we are looking at sabotage but as a separate topic and not part of this study, and we're also acting on that petition.

So, to say that we recognize sabotage as something that needs work in the sense that we always have to be vigilant to look at it and re-evaluate it, and we do have -- you know, Part 73 is -- has as part of it a six-month update that's done by our threat assessment team.

The other thing is that, in terms of fee recovery, you may be aware that the agency did ask for some of its budget to be off-line, and that was defeated in Congress. So, that's an area where we probably agree a lot that there may be things that should not be fee-recoverable, but right now, that's the law.

MR. CAMERON: All right.

Let's go to Bill Lake.

MR. LAKE: Thank you, Chip.

I would just like to go back to Kevin Kamps' comment.

I had the same problem as Kevin did when I first read the report. On page 3, the way you describe the ratings and the cost factors side by side made that connection in my mind.

MR. CAMERON: Okay.

So, I think we have to be clear about that, since apparently it's created some confusion, or perhaps confusion to come, I don't know.

Do we have anybody in the audience who wants to comment on this last segment that we've talked about?

We are going to come back and look at 6672, the NUREG, and what the implications for that might be of this study. That will be one issue that we're going to talk

about, but does anybody have anything that they want to add at this point?

[No response.]

MR. CAMERON: Okay.

It's 25 after three. Let's take a break till quarter to four. I think that we can be out of here by five, so hopefully that will be helpful to plan. I don't know how many comments it will be or how much discussion on this next segment, but let's start at quarter to four.

[Recess.]

MR. CAMERON: We're going to spend a little bit of time now on the NRC's NUREG-6672, and anything that you want to talk about in regard to this is fair game, but I think what the NRC wanted to focus on is the draft publication that they're thinking about issuing, which is -- the intent is to explain the spent fuel transportation risk to the public.

So, we're going to start off with John Cook from the NRC, who is going to give you an overview about the NUREG, and John is a health physicist. He's also in the Spent Fuel Project Office, and he was the NRC's Project Manager for the re-examination of spent fuel shipment risk estimates.

He's been with the NRC since 1980, and before

that, he was with the Environmental Protection Agency's Office of Radiation and Indoor Air, and he has a Master's degree in environment and industrial health from the University of Michigan.

And John, if you could just sort of give us an overview on this, and then we're going to go to Bob Luna from Sandia Lab, once removed. We'll explain that, but we'll go to Bob Luna after that to talk about the brochure.

Okay.

MR. COOK: Thank you, Chip.

Good afternoon, everyone.

I'd like to provide you with some background on the reexamination of spent fuel shipment risk estimates for NUREG/CR-6672, which I'll just refer to as the reexamination from now on, if that's okay with you.

I'd like to explain briefly how this study fits in with other risk studies that we've done, and we've already seen some charts to that effect earlier today, what were some of the factors that led us to do the study, the analyses in generalities that were done as part of the study, and finally what our view of the results are.

As you can see from this slide, the NRC has been studying spent fuel transportation risk for about 25 years now.

The first study, done in 1977, the Final Environmental Statement -- that's what FES stands for -- i sour baseline document and provides us an estimate of the radiological impacts both from incident-free and from potential accidents from transportation of all radioactive materials.

The next study done in the sequence, as referred to earlier, is the modal study. It was a narrow effort just looking at spent fuel shipments and just accidents from those shipments.

It was an attempt to try to explain how our standards in Part 71 compare to real-world accident conditions.

That brings us to the topic report, the reexamination. It, like the previous two, is an analysis. There was no physical testing done as part of the reexamination.

Also, it just focuses on spent fuel, but it does provide another estimate of doses, both incident-free and accident, as did the original 0170.

Now, of course we've spent most of the day already talking about the package performance study, the big difference for that, of course, being the very likely possibility of either scale or full testing in that project.

The reasons for doing the reexamination, first, is the agency's mandate to closely and continuingly review transportation of radioactive materials, and in this regard, over the last 20 years, many hundreds of shipments of spent fuel have been completed in the United States, using NRC-certified packages and under U.S. Department of Transportation regulations, and those standards have provided for adequate protection of the public health and safety during that entire period.

But in the mid-1990s, the question became what about the future, that we had changing factors, those being the likelihood of spent fuel shipments either to a possible repository or to an interim storage facility, the fact that the changing characteristics of the fuel with respect to what was previously analyzed -- that is, the spent fuel would be older when it was going to be shipped relative to the previous analyses that had been done, but the shipments would be made in larger-capacity packaging, so you have some factors going in both directions, if you will.

And we thought it would be appropriate to analyze those impacts, and finally, the fact that we did have the results of the modal study and other technologically-advanced approaches for analyzing both packages and releases gave us a time and an opportunity to

think that this was a good point to take a look at this again.

So, we asked Sandia to look at the spent fuel shipment risk analysis that had been performed in 0170 and consider these new factors, re-do that analysis, and provide us with a comparison.

Now, with respect to the objectives, it's true that the potential shipments either to a repository or to an interim storage facility was a driving -- one of the driving forces.

As has been mentioned earlier, the NRC also authorizes current spent fuel shipments. So, it's -- necessarily, this is a generic analysis, and it is not specific to any individual facility.

We asked Sandia to take a look at the most -- the recent cask designs available at the time when the project was initiated and, for the first time, to take a look in the cask's response to accidents, how the seal region behaves. So, that was a new feature for this study.

And also, we asked them to consider the latest codes available.

Sandia had developed RADTRAN-1, the original dose -- radiological transport dose model for 0170 back in the mid-1970s, and they've continued to evolve that code, and

they're currently at Version 5.

So, we wanted them to use that version of the code in order to be able to give us the comparison between the earlier study, the 0170 study, and this study.

With respect to the results, as you can see, the reexamination risks, in total, are less than those that were estimated in the modal study, which, in turn, are less than those that were estimated in the original 0170.

So, what this tells us is that the 0170 risk estimates for spent fuel transport are bounding with respect to future shipments.

The other output of the reexamination effort was as input to the package performance study. That is, it did identify -- and I think we heard mention to some of those earlier today -- possible candidate topics for further evaluation.

I do want to return for just a minute back to the 0170 and its findings and conclusions, because it's important in that we make comparisons against it quite frequently, and this, once again, was based on the shipment of all radioactive materials by all modes.

And the Commission found that the risk from all of that transport was small and that the agency's current regulations provided for adequate protection of public

health and safety during radioactive material transport, and what we think the reexamination effort is telling us is that, with respect to the spent fuel analysis done, both in 0170 and as compared to what was done in the reexamination, that those conclusions remain valid -- that is, risks are small -- and that the current regulation is adequate to provide adequate protection of public health and safety.

The reexamination report itself runs about 515 pages, and we have this available on CD format. There are some copies at the back of the room, if you didn't already get a copy, but it is a rather technical document once you get past the executive summary, and for that reason, we've tried to provide some more easily digestible versions of this, and as part of your mail-out, you received a 24-page discussion paper about NUREG-6672, and we are attempting now to further reduce that to a brochure in the 8-to-10-page format for public consumption, and we would be interested in any comments that you might be able to provide us as to how well those presentations work or, on the other hand, how well they may not work. But in any event, we would be interested in your comment on those two communication products.

And with that, I think I'll turn this back to Chip. I think Bob Luna is going to follow shortly with more

information on the brochure.

MR. CAMERON: Okay. Thanks, John. And if there are any questions to John, let's take those up after we get Bob Luna up here to talk about the discussion paper, and Bob is a consultant to Sandia National Labs on the transportation studies that Sandia is doing for us.

He's a mechanical engineer, has a Doctorate from Princeton University, and was the manager of transportation safety studies at Sandia for a number of years, and I'm going to turn it over to him.

DR. LUNA: Thanks, Chip.

I'm going to -- what I'm going to try to do here today is give you a 15-view-graph overview of a 25-page summary of a 500-page document.

So, as you might expect, this is going to be fairly highly concentrated in content, and I urge you to spend your time looking at 6672 because of its really very complete content and ability to cover the subject.

This talk is about the process of soliciting input from you with regard to what's in the summary report, which I wrote with a co-author who is on the tech writing staff at Sandia, and also to provide you an overview of what's in 6672 itself.

So, there's two things that I want to do here.

Now, this is what the cover of the report looks like, and John already covered this to some extent, but the questions to be covered here in reexamination were to address public concerns that had been addressed with regard to spent fuel transportation, particularly in the light of the third bullet -- i.e., the perspective that there might be a significant increase in the number of shipments in the near future.

This was taken on as a result of continuing oversight by NRC that began with 0170 and has continued to this time, as John already pointed out, and to reckon that -- or to show the effect of changed spent fuel characteristics that are likely to be shipped in the future and also to take advantage of better analysis techniques that are now available that were not available during the modal study or NUREG-0170, in particular.

Now, John sort of gives you an outline of what the documents look like or what the predecessor documents look like, and here they are in picture form on the screen.

The one on the lefthand side is NUREG-0170, "The Final Environmental Statement on the Transport of Radioactive Materials By Air and Other Modes." That report, as a matter of fact, I'm pleased to say that I was the project manager on from 1974 to 1977. So, I have a working

knowledge of what's in that and how that was done.

The second one is a report called "The Urban Study," which was sort of a corollary to 0170, which looked into what the impacts might be for shipments that are in very high population density areas.

The third one, the dark-colored one, is the modal study that John talked about, which was -- looked at accidents only and looked at package capability to withstand accidents and applied some of the same analysis tools we use now, used some of the same data that was used in 6672, but was not able to go into the same degree of depth and evaluation that 6672 did, especially with regard to the fuel response within the spent fuel cask itself.

And the one on the far right is the 500-page document that John talked about, which I condensed to a 22-page version and condensed in this talk.

Now, I don't think anybody in this audience probably needs to see this slide of what spent fuel is -- this happens to be a BWR spent fuel element -- but we're going to be talking about fuel pellets on the right. Fuel pellets go into cladding and make up fuel pins. Fuel pins are assembled in something called an assembly, strangely enough, which is then used in a reactor to produce energy, and so, the uranium values are expended, at which point it

becomes spent fuel.

The spent fuel is hot thermally and hot radiologically -- i.e., it produces intense radiation and has to be shielded and contained in order to prevent harm to people.

And in the transportation mode, that shielding and containment function is provided by a spent fuel cask, of which this is one example. There are several pictures that are in 6672.

The principle features here of this thing are the doughnut things on the end, which are the impact limiters to handle direct end-on impacts into hard surfaces and protect the seal and valve areas; the circular containment structure, which is surrounded by the lead, which is a shielding material; and then an outer shield, an outer layer of steel which contains the whole thing.

These things -- this one happens to be a lead-steel -- steel-lead-steel cask. There are monolithic casks. There are casks that are shielded with uranium.

Now, I'm going to talk about risk assessment methodology here very briefly.

The methodology in 6672 is exquisitely detailed and is really very, very -- it's very, very advanced, but basically what happens in the risk assessment process is

answering three questions: what can happen, how likely is it to happen, and how serious are its consequences.

And so, the next couple of slides are going to talk about accident risks in two contexts: one, looking at accidents themselves and then also look at non-accident risk -- i.e., when the material goes from the origin to the destination point and nothing too particularly strange happens in the process.

So, in non-accident risk, you ask yourself what could happen.

Well, what will happen in the non-accident case is that there is a low-radiation field around the cask, and it's always there, and it is part of the design process. That radiation field is limited by regulation to less than 10 millirem per hour at six feet from the vertical outline of the conveyance upon which the cask is contained.

And in 6672, using the RADTRAN computer code, multiple exposure scenarios to this low-level source are analyzed, and the results are summed to produce a consequence.

How likely is it is it is very likely. It is 100-percent likely, because it happens all the time.

How serious are its consequences? The radiological dose to people is estimated and summed in a

population dose number. That is the sum of the doses received by all people who are exposed.

In the accident risk case, the question is what can happen? Well, you've already heard a lot of talk about event trees and refining the event trees.

The event trees define -- or help define what can happen.

It presents a sequence of events that make up a scenario by which a cask may be challenged and may, in fact, be damaged sufficiently to release materials. Many parts of the event tree lead to cases in which there is no release, but some can lead to release situations.

The event tree provides the scenarios. The analysts go back and they look at impact speeds and fire, and they make an estimate about what situations can produce a release from the cask, and what happens then is those two pieces of information are brought together.

The things that can produce a release are meshed to the event trees, and you look at where the event trees come out and whether it traces into a place where -- into a situation in which a release can occur.

How likely is it is -- also comes off the event tree. The event tree gives frequencies as you move up the tree.

You have a basic probability of an accident, and then you have the probability of a collision, and then you have a probability of a collision with a fixed object or a moving object, and so on and so on, until you get to a situation in which you have a speed and a fire duration, and that is the second line, and those speed and fire durations are the things that the analysts work within looking at cask response.

How serious are its consequences? The damage and release consequences take you to models in RADTRAN that allow you to estimate after transport of whatever material is released to the population -- take you to the place where you can make an estimate of the total number of people exposed and what their radiation dose was.

And so, after 430 pages of information and manipulation and calculation, you get to results which are capsulized in these two graphs which give you the accident risk results from 6672 compared to 0170 for highway accidents and railway accident situations.

Now, I'm not going to look in great detail at the numbers.

The important thing, as John pointed out in his talk, is that 6672 estimates of the risk are significantly lower than those made in -- made by 0170. This is not to

say that the risk of shipping spent fuel is lower. This is to say that our estimates suggest that it's lower than was originally estimated, and the actual risk, since we are really dealing with conservative estimates -- the actual risk is probably less than the numbers that are shown here, as estimated by 6672.

The same kind of presentation for the non-accident situations: Here the results show basically the same thing; 6672 accident-free risks are somewhat lower than those estimated in 0170, and the reason that there is a less dramatic decrease in risk is that the basic physics of exposure and the basic models that have been evaluated in 1975 with 0170 and these models are really quite the same.

There was not the room for additional detail and evaluation that there was in evaluating the accident risk situations.

So, the degree of risk is -- the estimate of risk is pretty consistent between 0170 and 6672.

So, the risk summary is, per shipment risk, both accident-free and accident risk, are lower than estimated in 1977, and in addition, the yearly risk from typical numbers of shipments in the next few decades is also lower than estimated in NUREG-0170, and since, in 1977, it was asserted by the NRC that the regulations were adequate to protect the

public against unreasonable risk from the transport of radioactive material, since the risk, in fact, is now estimated to be, in fact, lower, that conclusion made in 1977 really still holds.

So, now I've told you about 6672, and I hope I've inspired you to actually look at it and look at all of the detailed information that's in it.

Actually, at this time of day, I'm not sure there's that much inspiration in the world, but it's worth a look, trust me.

With regard to the summary paper, we would like your -- I would like your input with regard to the level of detail that's in the summary of paper, its understandability, the points of concern that are addressed, and the overall tone of the presentation.

We will take that information and try to incorporate what you think it lacks and needs into the brochure that John referred to, which is going to be a little more condensed, in fact, than the summary paper. But we would like to have your comments, either in writing or verbally today, as you may consider appropriate.

MR. CAMERON: All right. Thank you very much, Bob. Why don't you join us for this discussion? And there's at least three categories of inquiry here that we

can follow.

One is the points that Bob put up there in terms of the understandability, level of detail of the discussion paper.

Another line of inquiry might be what I call context issues. In other words, what are each of these documents used for, and what's the relationship, for example, between the package performance study and NUREG-6672.

And of course, the third line of inquiry might be any comments or questions that you have on the substantive information that is contained in 6672.

So, I would just open it up. We're going to go to Susan first and then however you wish to proceed.

Susan?

DR. SHANKMAN: Okay. This is really a commercial.

We've spent a lot of time and effort in this agency on NUREG-6672, and we needed to do it, we felt, because the documents that form the basis for our regulation in terms of determining that they were adequate to protect public health and safety had been around for a while, and there were better computer models, as Bob and John said, and there were better information, and so, we did 6672.

But when it was done, it's an enormous volume, it

has a lot of data in it, and it clearly won't answer -- when someone says can you explain to us, if something follows the NRC regulations for spent fuel, why do you believe that those regulations are adequate and that the risk is an acceptable risk within the context of protecting public health and safety.

You could not send somebody that document and expect that to be responsive to someone asking you that question.

So, we asked Sandia to develop a plain-English brochure, and in the manner of technical writers, they came up with the discussion paper, and our agency -- and Sandia agreed -- said this is not a document that you can send to somebody who asks you -- I know Kevin and Lisa both talk about people along the routes and their need for information, and I don't think giving them NUREG-6672 is responsive, not that it doesn't have the information in it, but it's not presented in a way that my sense is that it could be easily understood and conceptualized.

The accuracy of the data -- I'm not talking about that. I'm talking about the concept of being responsive to somebody who has information needs.

So, what we're talking about when we say we're going to make a plain-English brochure out of this is taking

the information and presenting it in a way that it's clear what we did, what did in the study, what information we have available, what it's saying in terms of risk, and bounding it in saying what it is not saying.

We don't want to overly promote this brochure as being the definitive document on the risk of transportation of spent fuel, but we do think it's a good start in terms of laying out what we know and how we calculated it and giving people an idea of what this agency is using as information.

And I know Mark Holt -- I told him at the break that he wrote a paper several years ago, after looking at congressional debate and talking to our staff and doing a little research, I'm assuming, and I don't know what else you did, but you went in and made a magic potion and you wrote it in English that I think anybody can understand, and often we talk about explaining this to someone that you meet at a social gathering and they ask you what you do and you say you're involved with the risk of transportation of spent fuel and they say, okay, so is it safe, you know.

It's an attempt by the agency to lay out what this study did, what it did not, and have it in a manageable information brochure.

So, that is -- this is my commercial, if the diversity of the people around the table, in the audience, I

think, can help us come up with something that would be responsive and be responsible in that it would say what we've done and where we are in terms of our assessment of risk, and I think that is a -- for a government agency, that is the right thing to do.

Whether we need to do more work, whether the package performance study needs to answer other questions, whether there's more scientific information that should be obtained, that's a secondary question to what I'm asking you to comment on, which is have we well-described in a manner that's understandable what we did and what it tells us, us collectively, meaning the reader as well as the agency.

So, that's my commercial.

MR. CAMERON: All right.

Well, let's follow that commercial, perhaps.

Not all of you may be ready to comment on those issues at this point, but why don't we see what people do have to say about that, including, Mark, from your perspective of the publication that you did.

But let's start with Lisa.

MS. GUE: Thanks.

I'd like to focus my initial comments here on what was suggested as the fourth point there, the overall tone of this presentation.

It's my opinion that the draft summary here really glosses over the public's legitimate safety concerns, and in order to be credible, without even starting to address the other issues of understandability, this kind of document has to begin with the knowledge and the general underlying concern that I think many members of the public feel, which is that base-level truth that spent nuclear fuel is very dangerous.

And if I can just give a couple of examples, I guess, of a few points where I think that -- where I think it's glossing over evidence, and I can start even with the picture on the first page, which seems to indicate that -- and I realize there's no statement that this is, you know, to scale or whatever, but still, the initial impression you're left with is that spent nuclear fuel transports are going to be something, you know, smaller than your average family sedan, unless that car depicted there is longer than 20 feet. The trailer of that truck is shown to be shorter than the car, which just understates the actual scale of the question you've addressed.

And then even in the summary -- I guess the summary in the background where it states that -- on page 9, I guess, under "Spent Fuel: What Is It?", the statement on radiation is that radiation interacts with living cells.

Clearly, that is true, but it doesn't accurately characterize why members of the public should be concerned about this or actually are concerned about their shipments of spent nuclear fuel, and to meet the public at that level is a concern, and again, to not be too patronizing, I guess, about these legitimate concerns, there should be some kind of statement here about the specific dangers of that interaction with human cells, that, in fact, radiation kills living cells.

Another example is on page 15, where it discusses the potential risks. Routine accidents should be included in the risk assessment. That's one thing that I think we've overlooked. We tend to emphasize the accidents.

But there on page 15 there's just the example given here that -- talking about people located next to a shipment for a long time might experience a high dose rate of up to 10 millirems per hour, but then it goes on to say, if they remain close to the cask for a few hours, they might receive a dose of 10 millirems.

Clearly, if they remain close -- "close" isn't a very precise term, but it's conceivable that people stuck in traffic for a few hours, within the six-and-a-half-foot range, would actually be subject to a few times 10 millirems of radiation exposure, and I think, at the least, this

should be balanced out with a more extreme safe case scenario, rather than consistently understating the risk.

Incidentally, another comment related to this consideration is accident-free risk assessment. It would be helpful, I think, to provide a translation in terms of what 10 millirems really means.

Another example of what 10 millirems of radiation means that might be understandable to many people is that that's roughly equivalent to a hospital x-ray, examples that people are familiar with, and there again, people are familiar, then, with the precautions that typically accompany a hospital x-ray.

I wanted to mention, as well, on page 11, there is discussion there of how -- shipment requirements for other hazardous materials.

I think, there again, this tends to downplay the very real and legitimate concerns that the public has and has a right to hold for specifically shipments of high-level nuclear waste by comparing it to requirements for other hazardous materials.

That seems almost manipulative in that adding high-level nuclear waste to the mix doesn't do anything to make the other hazardous shipments more safe, and secondly, in fact, the presence of those other hazardous materials on

the roadway could actually result in more severe potential accident scenarios for the nuclear waste transportation scenarios.

Now, I think that there isn't only a question of credibility, understating the potential risk, it also actually, I think, could have a practical down-side, which is that if this results in a less conservative -- if consistently promoting nuclear waste shipments as less dangerous than they may actually be results in a less conservative approach to safety -- that is, people saying, oh, well, you know, this isn't really anything dangerous, that could actually increase the likelihood of preventable accidents and, again, damage the credibility of regulatory agencies involved.

MR. CAMERON: Well, thank you, Lisa.

I would ask whether anybody around the table generally but anybody from Sandia or the NRC has any questions for Lisa about her comments.

[No response.]

MR. CAMERON: Okay.

Before we go to Kevin, let me get a comment right here.

MR. O'CONNELL: My name is Brian O'Connell. I'm with the National Association of Regulatory Authority

Commissioners.

The public utility commissions look out after the interests of the ratepayers who are paying for the disposal of nuclear waste when we overdo it.

It's useful to contrast, perhaps, this proposed publication to the one that Public Citizen has on their web-page, if you've seen it.

It says -- well, first of all, it's called "Radioactive Routes and Rails: Are Your Emergency Responders Prepared for a Nuclear Waste Accident?"

It's only two pages, but among the facts that it chooses to include are that a person standing one yard from an unshielded 10-year-old fuel assembly would receive a lethal dose of radiation, 500-rem, in less than three minutes.

Would someone please explain to me why that is relevant to the transportation of nuclear waste? But it's on their web-site, and I think it's what was passed out to the public during the mobile Chernobyl stunt this summer.

That is public disinformation. You referred to responsible providing of information. This is an example of irresponsible dissemination of misinformation.

That's my only comment.

MR. CAMERON: All right.

I feel that, you know, we are on the NRC NUREG, but I feel that, since Brian put that on the floor, we should allow Kevin and Lisa, David, whomever, to talk to that point, and I'm going to start with Kevin.

MR. KAMPS: Well, Mr. O'Connell actually brought up the point that I was going to raise, and that is, in this document, I can't see where it's stated that -- just what he read. There's no description of what the danger of high-level nuclear waste is.

So, I've had people ask me, upon reviewing similar documents, why is there so much precaution taken? They don't understand. Like there's a diagram of all the levels of shielding on page 9.

People don't understand, given the lack of information on the dangers of high-level waste, why all this shielding is necessary.

So, it's really -- it's a basic question that comes out of why are all the precautions taken?

So, it's something -- I think what Mr. O'Connell read is something that needs to be in here. What is the danger of high-level waste?

Is there anyone in the room who disagrees with what he read? It's a simple fact about high-level waste, that unshielded exposure is deadly.

So, I was going to raise that point even before he read that publication.

MR. CAMERON: All right.

Lisa, did you have anything that you wanted to say at this point, anything more?

MS. GUE: Well, I think I basically agree with Kevin, but in direct answer to the question that was asked, I think that essentially what is needed is an acknowledgement that high-level nuclear waste is, at the base level, a very dangerous substance, and that's why all the concern about transportation, and again, I just want to emphasize something that I raised earlier, that transportation, in itself, is not the goal.

Transportation is a part or a means to an end in a bigger project.

The acknowledgement that we are dealing with a highly dangerous substance, or the lack of that acknowledgement, is at the root of my concern that this document glosses over the public safety concerns by not acknowledging it.

MR. CAMERON: All right.

Let's go to Bill Lake, and then we'll come back to Kevin, because he has some other comments.

Go ahead, Bill.

MR. LAKE: I think Kevin's got a followup.

MR. CAMERON: Go ahead, Kevin.

MR. KAMPS: I just wanted to add that when we finished our tour in Las Vegas -- the Yucca Mountain project has an information center that it invites the public into out there, and it's really -- it's a joke in Las Vegas that people go into the information center and there's not a word about the danger of high-level waste.

There's a lot of information about how careful the Department of Energy is in handling and transportation and disposal of high-level nuclear waste, and there's not one word why that's even necessary.

So, that's my point that I tried to make earlier, is people are left with that question, and that's a real-life example of a lot of money having been spent to create a public information center that does not inform the public about the basic dangers of high-level nuclear waste and why all the precautions are necessary in the first place.

MR. CAMERON: All right.

Well, let's go to Bill Lake now.

MR. LAKE: On a slightly differently subject, it's my understanding that part of this effort is to relate the regulations to these extra-regulatory events, and I know

that was attempted to be done back in the modal study, and I guess the point -- that was an intent, and I think Ed Lyman brought up a good point that I think is worth looking at, and he referred to it as the graceful failure.

That is, of course, the concept that we all go by, and what I mean by that is we have one set of tests, the regulatory tests, and form criteria following those tests, and those are the performance criteria, if you will.

Because of the design practice and experience, we expect acceptance under that one set of conditions and one set of tests to predict that casks will perform in much more severe accidents, and that's what we expect this study to show.

After all that lead-in, my point is we might try to get something like that at least into the summary document, because I think we've got all the information now, but I'll leave that to Bob to figure out how to put it in there.

But I think that would be useful information, and I'll have to thank Ed for raising that point, because I've had that concern myself, how do you make that connection.

MR. CAMERON: Yeah, Bob?

DR. LUNA: I was intrigued by the conversation about them not portraying the hazard properly, and so, I

went back to the text, and I was looking at page 8, and it says -- in the bolded print, it says, "A spent fuel assembly must be contained and shielded because it is intensely radioactive," and down in the text, it says "Spent fuel assemblies are highly radioactive and are always shielded when out of the reactor. Spent fuel emits radiation and heat at a rate," blah, blah, blah, and "radiation from the assembly or release and dispersal of the pellet material from the rods into the air would produce a significant hazard."

So, I think the text is not without some portrayal of this as a significant hazard to man.

MR. CAMERON: Okay.

I think that that may be true, but perhaps these other comments need to be looked at to see if it's not taken away on another hand. But at any rate, the reason we're all here is to hear comments on -- suggestions on how it might be improved.

Mark?

MR. HOLT: Thanks.

My suggestion would be that some acknowledgement be put into the summary brochure of some of the issues that we talked about today, since there are, obviously, a lot of further studies that we've already identified, areas where

we'd like to have more data, to try to give some indication that there is some work to be done on this, and in some ways, it sort of helps increase the credibility of it to acknowledge that some tests could still be done and that this is not necessarily the complete definitive study, since obviously, NRC is planning to spend millions of dollars to do further study.

That might be helpful. Maybe all the A and B issues could be quickly summarized with factors in all the other studies, and also, it would help answer the inevitable criticisms there are going to be based on those A and B issues.

MR. CAMERON: Thanks, Mark.

Kevin Blackwell?

MR. BLACKWELL: Real quick -- and this kind of goes toward Lisa's discussion a little bit -- comments and discussion a little while ago.

As a suggestion, on page 11, on the chart showing the comparison of radioactive to other hazard classes, I can see where Lisa was probably coming from in that John Q. Public may take that the way that she was describing it, and it may be easily fixable by simply making statements in here that -- plain-language-type statements that, to put it in perspective or to give you a comparison of the radioactive

materials and transportation compared to other routinely transported hazardous material classes, explain why this chart is here, in other words, to the layman, give him a perspective to know why it's here and how to do use it, in so many words, in a couple of sentences.

That might help go toward making it clear that you're not intending to put this here to show that radioactive materials is not a dangerous material, but there are other dangerous materials of different natures out there that are more routinely transported and to give the public a perspective of what is out there that you are more familiar with every day, such as gasoline, that kind of thing. This kind of gives you a little bit of a perspective, and that may help in clearing that kind of interpretation up.

MR. CAMERON: Okay.

Let's go to -- Kevin, do you have further comment?

MR. KAMPS: Just a quick one.

I would suggest that some of these hazards and potential forms of injury be listed as possible -- it's generalized, I agree, I see it there, but some of the potential impacts of being exposed to high-level radioactive waste, why are the precautions taken.

MR. CAMERON: Okay. Thank you for that comment.

We've heard from Brian in the audience. Do we

have anybody else out here who would like to make a comment on any of the issues associated with 6672 at all?

[No response.]

MR. CAMERON: Lisa. We'll go back up to the table.

MS. GUE: Thanks.

I also had a couple of comments on the NUREG itself, and overall, I guess, given the intentional process that we've participated in this morning and previously on the scoping paper and how that process emphasizes the need for public participation in the question of what is studied and how risk can satisfactorily be implemented, it seems really unacceptable that this NUREG has been finalized in a closed process without any opportunity for public input on a draft, for example, and we would request, therefore, that this report be reissued in a draft format and a process for public input be initiated.

One of the questions that I'd like to raise, if there were that kind of opportunity, would be, actually, what do these lowering numbers mean?

It's not clear whether they reflect actually lower risk than previously estimated or lower risk than previously experienced or, in fact, if they're just a function of the different methodologies used in different studies.

Left outstanding is that open question on credibility of the statements in the discussion paper, where it just opens up by saying that -- on page 4 in the summary, there is just a statement there that the risk has decreased, and yet, it's unclear, from my examination of the NUREG, what those changing numbers actually may mean.

Not to belabor the point, we do have the same concerns that I stated this morning with respect to discussing risk on the basis of actual proposals and transportation routes that would be used for these large-scale shipments, and that would mean discussing transportation routes that actually lead to Yucca Mountain and Skull Valley, as well as the need for full-scale testing.

I think, also, the interpretation of this report, or the conclusions, I guess, of the NUREG, should be qualified by an acknowledgement of the unpredictable effects of human error on risk assessment and that there should be more attention given to the potential consequences in a very real way, and there again, there would need to be information about very real routes to be used and what those consequences could mean in terms of economics and in terms of environmental impact.

MR. CAMERON: Okay. Thank you, Lisa.

Bob, go ahead.

DR. LUNA: I guess I have one comment.

As I tried to point out in my presentation, the fact that risk estimates in 6672 are lower than they are in 0170 does not say anything about what the actual risk is.

However, because 0170 was very, very, very, very, very conservative in the way it treated potential accidents and releases and because 6672 is fairly conservative with respect to how it treated that, I think the Sandia team is -- and I am relatively confident that we are getting a reasonably -- we're honing in on where the actual risk level is and has always been on a per-shipment or a total yearly shipment basis.

The risk is the risk. The estimate tools get better, and we are able to converge on a realistic number about what that risk is, and that number seems to continually get smaller.

That was the only clarification.

MR. CAMERON: Go ahead, Lisa.

MS. GUE: Just in response, I guess if there's a possibility or a likelihood, even, that those changing numbers reflect a different methodology and a slightly -- which means that, actually, the different studies are studying slightly different things, then the statement like

the one in the draft discussion paper that the estimated risk for spent fuel shipments is less than was estimated is perhaps a little bit too bold if it's not qualified in any other way.

It seems that this is mostly the result of a different methodology, and that should be acknowledged, that it's something different that was studied, and perhaps you'd come up with the same numbers if you used the previous framework for studying.

This bold statement seems to indicate that risk has decreased.

DR. LUNA: No. The statement says that the estimate of the risk has decreased, and in fact, we are studying exactly the same process, but we are studying it in greater detail and with greater attention to all of the features that affect the total risk, and as a result, we believe -- I believe that we are homing in on a reasonable representation of what the actual risk from shipment is in the long run.

I don't think it's a question of getting the -- of changing the problem that's being solved. I think it's a question of doing the problem of concern better and more accurately as time has gone on.

But obviously, you're free to put whatever

interpretation on that that you like, but the text does not suggest that the risk is lower. The text suggests that the estimates of risk are going down as time goes on. The risk is what the risk is.

MS. GUE: Perhaps what's needed, then, is an acknowledgement that those two sets of estimates incorporate different variables.

MR. CAMERON: Okay.

Kevin, do you have a comment on this last point that Lisa and Bob were discussing?

MR. BLACKWELL: It's more of an observation, I guess. I'm getting a little confused in hearing the conversation here.

I see it as a daunting task -- this comment was made in Vegas, as well -- in that, on the one hand, there is discussion that this -- or the brochure, whichever, needs to be tailored to the public understanding, but then again, as you're talking about things needing to be put in that -- I'm going to be quite straightforward -- my wife wouldn't know from the tail-end of a truck if you put this kind of information in here, because she's not -- I'm using her as an example, as John Q. Public -- she doesn't understand risk assessment, she doesn't do that for a living.

So, I guess you have to clarify here as to what

level of the public are you trying to get this to, someone who has some knowledge of what risk assessment and risk estimate is or the public in general, who, for the most part, doesn't have a whole lot of knowledge, if any, of what risk assessments are, because it's not what they deal with on a daily basis.

And I'm hearing conflicting statements made that, on some things it's to the public level, on other things it would be to a higher level, and it's going to be very difficult to tailor a brochure to fit this information here that you can give to John Q. Public walking down the street, you know, and say read this and he or she will have a clear understanding of what this was meant to say, and I just want to go on record as saying that.

MR. CAMERON: Okay.

Let's go to -- Susan, do you have a followup on that, or a different point?

DR. SHANKMAN: Both.

MR. CAMERON: All right.

DR. SHANKMAN: It's late in the day, but I just wanted to say it's a problem for an agency such as NRC, who does highly technical work, to respond to, I think, legitimate requests for information from people who are touched by things that are regulate, and we've gotten a lot

of requests asking us how do you know that transporting radioactive material like spent fuel is safe and what's the basis.

And if you say, well, we did a study and, you know -- we want to be responsive by saying the level of detail that we did in the study without replicating the level of detail in the discussion of what we did and at the same time being -- not overly promoting -- and I think that was Lisa's point, that we may have glossed over some of the uncertainties in our analysis, and the level of risk, and I think we can do something about that and still stay within the need to -- the audience that we want to communicate with.

At the same time, in terms of the study itself being open to -- as a draft, our goal in doing that particular study was to see whether 0170, which is our original basis for the regulations in terms of an environmental impact statement, was -- whether we knew anything new and whether our analyses could show us that the risk was greater than that which we had accepted as adequate protection of the public.

And what we found in 6672, using better analyses and slightly refined data and data from new sources and better sources, was that the risk that we had estimated was,

in fact, still valid and that the risk estimate now was lower, not that the risk had changed, although it might have changed from better casks, and there may be a slight change in risk, but basically that the risk level that we found was adequate for public protection was still bounded and that we didn't have to redo our environmental impact statement.

So, that was the goal, but it gave us more information about the risk estimate, and as Bob said, it gave us a better chance to be closer to estimating the actual risk, and the number is lower than our conservative estimates in the '70s and even in the '80s.

If we put it out for public comment, we would spend a lot of time responding to public comment, and what I'd rather do -- and I think, as an agency, it's more responsible -- if you have comments that we can handle in future studies, either in package performance or in other work that we might initiate, we would be happy to have comments on that NUREG.

Just because it's out doesn't mean we don't want comments on it. All of our documents are always open for public comment, but to have a formal public comment period where we have the work redone in response to comments I think would not be as productive as to move on into the package performance study and to see if there's other

research that should be initiated.

So, I welcome comments on 6672. If there are big gaps, we have to, as an agency, understand that and see if we need to initiate other work, but NUREGs typically are not put out for public comment, and maybe the agency is changing the way it's doing business, but -- and that is why the package performance study is being done in a different manner, to not have the same error repeated where we do a study and then we say, hey, guys, what do you think, and you say, well, why didn't you ask us at the beginning?

So, for package performance, we're asking you at the beginning, and for NUREG-6672 -- how many years was that in progress, John? Four years. Four years ago, maybe we should have done the same thing, but we didn't, and we're not going to go back in time four years. We're going to go forward and make progress towards getting a better risk analysis done for severe accidents.

So, to answer your question, do we welcome comments on 6672? Yes. Will we respond by having the study redone? No. Will we respond by moving forward and doing new research? I hope so.

MR. CAMERON: All right. Thanks, Susan.

How about Bill Lake?

MR. LAKE: Thank you, Chip.

This is another recommendation of something for the summary report.

There are a lot of comments on human error and how it's been addressed and could it be addressed, and looking at your other documents, obviously you've addressed it, maybe only in a qualitative sense, but it may deserve some mention in the summary document, how you looked at it, describing what it is in terms of casks.

Casks, of course, are passive devices. There's definitely some human interaction, in closure, in assembly, and so on, and although they're difficult to predict, I guess I wouldn't call it quite unpredictable.

I think you can make some reasonable estimates, and it would be worth mentioning in the document. So, I think there's a lot of concern.

Thank you.

MR. CAMERON: All right.

Lisa, did you have another comment that you wanted to make?

MS. GUE: Just very quickly, if I could respond to the response to my comment, I guess, and explain a bit more, the reason why I think public participation in determining what variables are important to consider in the risk assessment is vital is obviously linked to the same reasons

that that has been incorporated into the study.

My concern is that this NUREG seems very likely to play an extremely pivotal role in licensing considerations of the current proposals for high-level nuclear waste shipment program, and I am looking at a scenario right now where the NUREG document, which excludes or neglects some of the important considerations that it now sounds like it might be possible to include in the PPS, such as, for instance, the human error factor, full-scale testing scenarios, have already been finalized, and the PPS study is not even due to be released until 2003.

In the meantime, we're looking at licensing -- the potential for licensing of the shipments to the Skull Valley and the site recommendation report being received for the Yucca Mountain proposal within the coming year.

So, while I certainly appreciate the agency's efforts to move forward and applaud the participatory process that's being used in scoping the PPS, I am concerned about the lack of participation in the NUREG, which seems to be the document will govern the licensing and regulatory considerations of the large-scale specific proposals for waste shipment currently on the table.

MR. CAMERON: Any NRC comment on that potential mismatch in terms of time?

DR. SHANKMAN: As I said, we welcome comments on 6672, and in the licensing process, I'm sure there will be debate and hearings and other things where those issues can be brought up in the proper context.

The regulatory basis, actually, is 0170, back in the '70s, and this reexamination doesn't have regulatory status. It's a NUREG document.

But I understand your concern, and as I say, you can put comments on the record, and you can also make comments within the licensing process of Yucca Mountain, if that's the repository site that's chosen by DOE and if they come to us for licensing, which, of course, is still a question-mark.

MR. CAMERON: All right,.

Anybody else out here in the audience? Any final comments?

Yeah, Brian?

MR. O'CONNELL: Well, I just wanted to make a positive comment on the document. It does an excellent job at summarizing some very difficult information.

The only thing I would add is to put in further bold, this material is solid and it will not explode. You have it in there, but in terms of public understanding, you go around within the great state of Nevada and ask about

this, and they will say it's liquid and it spills. That's what they think.

MR. CAMERON: All right.

Anybody else?

[No response.]

MR. CAMERON: Anybody else around the table want to make a final comment before we close today?

[No response.]

MR. CAMERON: All right.

Well, I'm going to turn it over to Susan to say some final words.

I would just thank all of you for your great participation and attention here today.

Thank you very much.

Susan?

DR. SHANKMAN: I think I've said plenty, and I want to thank you all. I really appreciate that people were candid and open, and we benefitted, and I hope you did, too.

[Whereupon, at 5:05 p.m., the meeting was concluded.]