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OF THE

NUCLEAR REGULATORY COMMISSION

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P R O C E E D I N G S

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MR. CAMERON: Good morning, everybody. My name is Chip Cameron, public liaison within the Office of General Counsel's office at the Nuclear Regulatory Commission, and it's my pleasure to serve as your facilitator for today's meeting.

I'd like to briefly cover what the objectives of this workshop are, what my role as the facilitator will be and also some very simple ground rules to guide our discussion today.

As far as the objectives of the workshop, as you all know the NRC is planning to do an update of the spent fuel transportation package performance study, commonly called the modal study that was done in 1987, and the NRC wants to insure that the new study addresses all the important issues related to package performance. So with that in mind NRC has invited the public and knowledgeable representatives of the broad spectrum of interests that are affected by transportation issues to share their recommendations, their concerns on the scope and methodology of this new study.

The NRC hopes that this early input will help to insure that the design and implementation of the study will provide the best information for furthering the NRC's public health and safety responsibilities.

My personal objectives as facilitator today is try to assist you in three ways. One is to keep the discussion organized, understandable and on schedule. Secondly, to make sure that everybody has an opportunity to talk to express their concerns, their comments. And third, to keep track of any action items or recommendations that might come out of this discussion. I'll be using these flip charts to do that and for other purposes.

In terms of the ground rules for the discussion, each of you has what's called a name tent in front of you and if you wish to speak during any of our discussion sessions, please turn that name tent on end like that and that will allow me to keep track of who wants to speak without you having to keep your hand up or waving your arms or whatever. It will also help us to keep a clean transcript for the meeting.

Donna, our stenographer, is over here and she will be transcribing the meeting for us and those transcripts will be available to the participants and the public at this meeting and I believe it will also be posted on the NRC website.

I may not take all of the tents in the order that they were raised so that we can try to follow discussion threads on related points rather than jumping from one unrelated point to the other. And from my experience I found that, there may be comments that don't fit neatly into the agenda item that we're discussing and so for those items, we're going to keep track of those and what people normally call a parking lot, what I call a paddock, and we will come back to those before we end to discuss any of those issues that were raised that might not fit into a particular agenda item.

Our focus is the issues related to the update of the package performance study. I know that there are a lot of broader issues on transportation generally, and although the NRC is receptive to hearing comments on those, there may be issues that will need to be more fully addressed in other forums or through other means. But I would note that there is a video being made by the NRC on spent fuel transportation and there will be some filming of our discussions just as a backdrop for other parts of that video.

We have Big Shot Productions here doing that for us today and they may, they would want to do some interviews not in here but during the breaks out there. They may be asking some of you if you would like to do a five minute interview. So I just wanted to warn you about that in advance.

What I would like to do before getting to just a brief agenda overview, is to go around the table and have each of you introduce yourselves to us and I should say the focus of the discussion is here at the table, but comments from the audience are also very important to the NRC and so after each discussion item we will be going out to those of you in the audience for any comments or questions that you might have.

We have a stand-up mike there but I will also bring this talking stick out to anybody who wishes to talk. And in terms of the transcript, those of you in the audience who speak please give your name and affiliation if appropriate for the transcript. For those of you up here at the table, at least in the beginning stages, please give your name so that the stenographer knows who is speaking.

I think that Donna is going to get used to where you are and when she sees the card go up and you talk she'll -- at some stage we may be able to dispense of the names, but we'll give her a chance to get that down. So let's go for introductions and let's start at the middle of the table right here with Susan.

MS. SHANKMAN: Good morning. My name is Susan Shankman. I'm the deputy of licensing and inspection in the Spent Fuel Project Office which is part of the nuclear material safety and safeguards office in NRC.

MR. KAMPS: Good morning. My name is Kevin Kamps. I'm the nuclear waste specialist at Nuclear Information and Resource Service here in Washington.

MR. VANAGS: Hi, my name is Uldis Vanags. I'm nuclear safety advisor in the State of Maine. I'm also representing the Northeast High Level Waste Transportation Task Force here today.

MR. PRITCHARD: Good morning. I'm Ed Pritchard. I am the staff director of the Hazardous Materials Division of the Federal Railroad Administration of the U.S. Department of Transportation.

MR. FRONCZAK: I'm Bob Fronczak. I'm assistant vice president, Environment Haz Hat with the Association of American Railroads.

MR. RESNIKOFF: I'm Marvin Resnikoff, Radioactive Waste Management Associates based in New York City. We generally work for state and local governments on transportation such as the State of Nevada and Utah.

MR. EDLOW: Good morning. My name is Jack Edlow with Edlow International Company, company for 42 years in the traffic management of nuclear materials.

MR. HALSTEAD: Bob Halstead, transportation advisor, State of Nevada, Agency for Nuclear Projects.

MR. SHELOR: Good morning. I'm Dwight Shelor, the director of the Office of Transportation Waste Acceptance and Integration, Office of Civilian Radioactive Waste Management in the Department of Energy.

MS. MUSTIN: Good morning. My name is Tracy Mustin. I'm the acting director of the

Office of Transportation within the Office of Environmental Management Department of Energy.

MR. WANGLER: Good morning. I'm Michael Wangler. I'm the director of the Package Approval and Safety Program within the Office of Environmental Management Department of Energy.

MR. BOYLE: Good morning. I'm Rick Boyle with the U.S. Department of Transportation. I head up the radioactive materials transport branch in the Office of Hazardous Materials Safety.

MR. HOLDEN: Robert Holden, National Congress of American Indians.

MS. WESTRA: Good morning. I'm Heather Westra, coordinator for the Prairie Island Community in Minnesota. Our interest in this workshop stems from the location of the nuclear power plant immediately adjacent to the tribe's reservation and rail lines going right through the reservation.

MS. SUPKO: Good morning. I'm Eileen Supko, Energy Resources International. We're based in Washington, DC. We're a energy consulting company.

MR. KILLAR: Good morning. I'm Felix Killar with the Nuclear Energy Institute. I'm also chairing the Nuclear Industries Task Force on Transportation. We're looking on things such as the Modal Study, the implementation of ST1 and other international and national regulations.

MS. SHOLLENBERGER: Amy Shollenberger with Public Citizen.

MR. RAWL: Good morning. I'm Rick Rawl. I'm with the Transportation Technologies Group at Oak Ridge National Laboratory.

MS. ENG: Good morning. My name is Patricia Eng and I'm chief of the Transportation and Storage Safety and Inspection Section. It is my staff that will be overseeing the study we're going to be discussing later today.

MR. HOLT: I'm Mark Holt with the Congressional Research Service at the Library of Congress. I'm head of the Energy and Mineral Section.

MR. CAMERON: Okay. Thank you all very much. We might as well include these last two here. Charles, I didn't mean to slight you. Go ahead.

MR. MASSEY: Good morning. I'm Charles Massey. I'm the manager of the Transportation Safety programs at Sandia National Laboratories. We are the technical contractor who will be preparing the package performance study that we're here to talk about today.

MR. EASTON: And lastly I'm Earl Easton with the U.S. Regulatory Commission. I head a group of technical reviewers that does safety reviews for transportation and storage, packages, in the office of the Spent Fuel Project Office.

MR. CAMERON: Okay. Thank you. We are working on getting the microphones going here and I think the way the agenda works at the beginning here we'll have time to do that.

I just wanted to go over the agenda very briefly for all of you and I hope everybody got a copy of the agenda that was out on the front table. What we're going to do is begin with four brief presentations by the NRC to provide you with a common set of information as backdrop for the discussions today.

At the end of those four presentations, we're going to go out to the participants around the table and also to the audience for clarifying questions. I realize that the presentations could kickoff a lot of the discussion that we're going to have today.

What I would like to do is save that discussion for the discussion agenda items. But to make sure that you do understand the information that was presented, we will have some clarifying questions after the completion of those four presentations and we hope not to go too long on all of those four.

After we do the clarifying questions, we're going to take a break and then we'll come back and start in on the first of our discussion items and these are accident likelihoods as you can see at the 10:30 spot on your agenda.

I will have a brief tee up, so to speak, by Charles Massey from Sandia Labs so that you will get an idea of what that particular discussion topic is all about. We'll have discussion around the table. We'll go out to the audience for questions or comments and after that first discussion area we're going to go to lunch and we're going to come back at 12:45, and we're going to continue with our discussion issues.

The first one after lunch is container performance during collisions and then we're going to go to container performance during fires. We'll take a break, come back and talk about spent nuclear fuel assembly behavior and accidents, then testing and computer simulation methodology issues. Then we're going to come back and address any issues that we haven't talked about so far, perhaps issues that have been up in the paddock, but also very importantly a process issue. In other words, how do people think that the NRC should keep the public involved during this study? I think we will get some good ideas on that. Then we're going to wrap up and adjourn by 6 o'clock.

Is there any questions on the agenda at this point before we get into the presentations?

As I said we can build agenda items in at any time. We'll keep track of them and put them in the proper place. What I would like to do now is -- Susan, could you test your mike? We're going to keep working on the mikes.

Our first presentation is Dr. Susan Shankman of the NRC. Susan is deputy director for licensing inspection of the Spent Fuel Project Office at the NRC and Dr. Shankman has been with the Spent Fuel Project Office since 1996. Her office is responsible for review and approval of designs for spent fuel storage systems and transportation package systems for the NRC.

Her group is also responsible for inspection in the development of regulations and guidance for spent fuel storage and transportation.

Prior to joining the NRC, Dr. Shankman was an analyst at the U.S. Public Health Service and special assistant to the Maryland State Superintendent of Schools. She received her bachelor of arts degree from Beaver College in Glenn Side, Pennsylvania. Her master of science degree from Queens College City University of New York and her doctorate from the University of Southern California. I would like to turn it over to Dr. Shankman.

DR. SHANKMAN: Good morning. I want to begin by welcoming you all. I'm happy to see you here and I appreciate that you are here. We have distinguished panelists at the table, but we also have a group of very interested people around the room and I hope we all get a chance to participate today.

As Mr. Cameron said, I am the deputy director of the Spent Fuel Project Office at the NRC.

The Spent Fuel Project Office has convened or assembled this meeting this morning with a very specific purpose of hearing your concerns about the transportation of spent fuel. We are sponsoring a study that Sandia is helping us with and that study is to look at package performance. That's the container as well as contents of spent fuel packages that will be transported throughout the United States.

I want to emphasize that there are no middlemen here. I am the deputy director. I sign the papers that go out that approve designs. We have with us today the members of our technical team who will also be working on this study.

The NRC and those people I will introduce later are the people who will make the decisions about what is studied and how it is studied.

For me this is not an abstract concept. I live in Garrett Park. It was started as a railroad town. The main line that goes from Washington West, goes 300 feet from my house and I too am concerned about what's on those trains.

My job this morning is to give you a little background, so I will start by talking about what the NRC is and what we do, who we are.

The NRC is an independent federal agency. Our mission, our job is to protect public health and safety. Like other regulatory agencies we set standards and we enforce them. The mission of the Spent Fuel Project Office is to set those standards and enforce them in the design and fabrication of packages for spent fuel transportation.

We don't actually move the fuel, we regulate those that do. We approve the designs of the package systems. The other aspects of fuel transport are regulated by other agencies.

NRC is a very experienced agency since 1974 when the AE, Atomic Energy agency, was split into a regulatory side and a developmental side. We have been regulating atomic agency at licensed activities. We regulate nuclear power plants. We regulate medical uses of materials. We regulate waste and disposal issues and we regulate the transport of radioactive materials.

The staff at the NRC has more than, if you can subtract 1974 from 1999, it's many years of experience in regulating these activities. We have been reviewing cask designs and their construction and fuel characteristics and observing nuclear power plant fuel operations for all these years.

We use that experience every day. And we try to make sure that what we are doing results in safe transport of spent fuel.

Our mission, as I said, is public health and safety. We make rules. We approve what licensees plan to do. We do that by issuing licenses and certificates. We review these things using standardized guidance with standard review plans.

We provide guidance to licensees and certificate holders on how to meet the requirements of the rules. We inspect performance and then we enforce compliance with those rules.

NRC has several guiding principles in how we conduct our operations. The first one is independence. That does not mean that we are isolated. Part of today's goal is to hear your concerns but we do keep an unbiased and objective approach to our work.

Efficiency is one of our guiding principles. We believe at NRC that the taxpayer, the rate payer and licensees are entitled to the most efficient and effective management and administration of our activities.

Clarity. Our regulations are meant to be coherent, logical and practical and we often need your help in making sure that that is accomplished.

Reliability. Another of our guiding principles. Regulations should be based on the best available knowledge and the reason we continue to do studies is our knowledge evolves and we look at the information we get from our studies and look at our regulations and our guidance to see if they are still effective and efficient.

Openness. Anyone who has dealt with the NRC for a while will know that we have evolved into, at this point in time, deeply believing that regulations are the public's business and that public involvement is vital to having regulations that meet our mission.

So transportation, safety of spent fuel is what brings us here today. To give you a perspective I think most of you know that there are seven classes of hazardous material and radioactive material is just one of those seven classes that spent fuel is a small percentage of the shipments that are made of hazardous material.

The study we are beginning today, I should say, will be on very technical experience and while Sandia National Lab is the contractor that we have selected to do the work, we will be carrying out the study with NRC staff and I want to introduce them today because they will make the decisions with oversight by myself and my staff.

They will make the decisions on how we conduct the study and what is studied. So let me start with Mr. Rob Lewis. Mr. Lewis is a predicality expert, shielding expert, those areas, but he's also the project manager for this. By the way, everyone I will introduce has a name tag and I hope that at the breaks we will take a opportunity to talk to them personally as well as in the forum.

Ms. Sara Kopel is our expert on containment. Dr. Henry Lee, structural expert. Mr. Ron Parkhill who will be working on thermal issues and Mr. Jeff Ponset is our materials expert. This is the team that will oversee this project from beginning to end.

The last few years NRC has been integrating risks into our decision making. What that means in the area of transportation is that we make sure that on an ongoing basis that we understand the risks that we regulate. If we learn something new, new data, we use that and we make sure that what we're doing every day continues to maintain safety. That's what this study is about. It's an effort to gain more knowledge than we have. We believe we have a continuous mission to keep learning more.

Earl Easton sitting to my right. Mr. Easton is going to discuss the previous studies that we have done so that we can put this study in the context of where we are.

NRC's goal is to conduct impartial and rigorous safety evaluations when we issue a certificate or a license. Another way to say that is we try to be effective and efficient and realistic how we use our guidance and our regulations.

We make decisions in an open way. We try to include the public in the review of our rules that's mandatory, but we also have all of our meetings noticed and this meeting is also part of our effort to involve the public in our decisions.

We support our decisions with experience, facts, statistics as you know show spent fuel transport is safe and we want to maintain that safety.

Public involvement. And I think I said this many times now this morning, but I just want to reiterate it, is an important part of our efforts. You can help us and you can help us throughout this study and there are many ways you can continue to be involved besides today by telling us what you think, what you are concerned about and especially by being candid. The more we know about what the concerns are, the better we can use our resources to be sure that regulatory requirements are met and that those requirements minimize risks.

There are forms on the table outside that you can send back to us. Some people don't like to say what they want to say in a public forum. You can either put them on the forms or leave them with us today or you can send them in. They are already preaddressed but not prestamped.

After we have incorporated the feedback from this meeting into a comprehensive report, we will end phase one of this study in which we will recommend, with Sandia's help, will have a recommendation of how to proceed with the study. At that point we intend to involve the public again. We intend to have more meetings. Everything that we are doing will be on our website. How to get in touch with us through the website is also on a information sheet.

Really what I wanted to say this morning is as the deputy director of the division, I can tell you personally that all the ideas that we have will be considered. They will be evaluated and they will be explored. There is nothing that anybody says today that will not be on the transcript and therefore we have the ideas and I urge you if you don't say what you want to say today to write to us. You can also contact us through the web.

Let me end by saying this study in

particular cannot be done without your help. We need you to be candid. We need you to express what is your concern. We need you to tell us. You can either write to us, call us or tell us in person today. So thank you very much for being here. I'll pass the mike back to Chip.

MR. CAMERON: Thank you, Dr. Shankman. We're going to continue with providing background information to you and go to our second presenter Ms. Patricia Eng from the Nuclear Regulatory Commission staff.

Ms. Eng is currently chief of the transportation and storage safety and inspection section of the Spent Fuel Project Office and her part of that organization is responsible for developing the regulations for transport and storage, radioactive materials and she also oversees the inspection of facilities and organizations that are involved in a design fabrication, maintenance and operation of packaging and storage systems.

Before Pat came to the Spent Fuel

Project Office she was, has been in a variety of positions at the NRC, including being the technical assistant to former Commissioner Gail Duplank (phonetic) and Pat has also served as a resident inspector at one of the NRC's licensed power plants. She's a registered, professional mechanical engineer with a bachelors of science degree in nuclear engineering from the University of Illinois and Pat is going to give us an overview of the regulatory framework. Pat?

MS. ENG: Thank you, Mr. Cameron. Good morning and welcome. My name is Patricia Eng and I am the chief of the Transportation and Storage, Safety and Inspection Section. I am responsible for the oversight, the study that Dr. Shankman referred to earlier and this meeting is very important to us.

We want to establish a dialogue, an open and candid dialogue with you so we can identify the issues that we need to focus on when we conduct this study. In order to help focus our discussions throughout the day, I would like to describe how the different federal agencies that are here today work together to oversee the safe transport of radioactive material.

There are three major players. They are U.S. Department of Energy, the U.S. Department of Transportation and the Nuclear Regulatory Commission. I would like to discuss a little bit about the Department of Energy and we have three very qualified representatives from the department here with us today and they introduced themselves earlier.

The department was given the assignment of identifying, characterizing and ultimately operating a long-term geologic repository for the disposal of our nation's high-level radioactive waste which includes spent fuel. This was done through the Nuclear Waste Policy Act of 1982 and subsequent amendments and I won't go through the legislative lesson, but that's where DOE was given this assignment.

At the moment the department is actively evaluating the suitability of the Yucca Mountain sight as the potential place for the repository and as part of the licensing process the department prepared a draft environmental impact statement that was published this past August by the office of Civilian Radioactive Waste Management.

One of the issues that's addressed in this draft environmental impact statement is the impact of transporting high level waste across the country from 77 different locations. The nuclear regulatory commission is currently reviewing this draft environment impact statement and we hope to complete our review later this year. In the meantime the department is holding a series of public meetings at various locations to get public input on their environmental impact statement.

The department is required to ship the high-level waste in nuclear regulatory commission certified transportation packages and they have stated that they will comply with applicable NRC and Department of Transportation regulations.

So today we're joined by Ms. Tracy Mustin, Mr. Dwight Shelor and Mr. Michael Wangler from the department. Thank you so much for coming.

Next let's look at the Department of Transportation. The Department of Transportation is the regulatory authority overseeing transport of all kinds in the United States. As part of their job, they establish the requirements for the transport of all hazardous materials, and as Dr. Shankman mentioned earlier, radioactive material is a subclass of hazardous material.

The research and special programs administration of the Department of Transportation has issued regulations regarding the labelling and marking of transport packages, placarding of vehicles and defining what needs to go into the shipping papers that accompany such shipments. They also established training requirements for both shippers and carriers and in the case of the Federal Highway Administration, they have established guidelines for selecting transport routes on our nation's highways.

Without going into a lot of detail, on the table outside there is a copy of those regulations regarding route selection. With us today are Mr. Rick Boyle who is chief of the Radioactive Materials Branch of the Research and Special Programs Administration and Mr. Ed Pritchard who is the staff director for hazardous materials for Federal Railroad Administration. Thanks for coming.

Now let's get down to my agency, the Nuclear Regulatory Commission. With regards to transportation, the NRC provides technical assistance to the Department of Transportation and we provide assistance to them in three ways. First, we've established regulations related to the transport of missile material and large quantities of radioactive material.

As Dr. Shankman alluded to a few moments ago, we also conduct inspections of transportation activities and enforce the regulations by imposing sanctions when necessary.

Second, we play a role in insuring the physical security of shipments along the transportation route. This includes insuring that there are continuous communications capability with the shipment at all times when it's in transport, that the law enforcement agencies along the route are knowledgeable of the shipment and can respond if needed and that predesignated safe havens are identified. So what if a driver needs to stop for any particular reason such as a flat tire or any particular reason? A suitable location is already known where he or she can pull the vehicle off the road and response can be dispatched.

Today we'll focus on the NRC's third major responsibility and that is the certification of spent fuel transport package designs. In order to certify a design for use, we do a thorough technical review of the proposed design and you've met the technical review team and we require that each design be tested prior to its first use.

Today's discussions will revolve around the scope and the content of these technical reviews. First, why are we doing this study and why now?

Briefly let me describe our regulatory process. The Spent Fuel Project Office is responsible for writing and enforcing regulations for the safe transport and interim storage of spent fuel. Our regulations are based on sound engineering judgment, experience in the fast technical data we can get our hands on.

In a few moments Mr. Earl Easton will discuss the transportation safety studies that we have done in the past and hopefully you will understand how we based our regulations.

Since that time the computers that we used to do the analyses have shrunk in size and yet increased our calculational capability in amazing ways that we never foresaw. We have much more detailed and powerful analytical tools at our disposal now than we did then and we're also starting to see that the industries proposing new transportation cask designs that are very different than the ones that we looked at back in the '70s and '80s. So it makes sense to us that it is time for us to take another look at transportation and look at the regulations that we put in place, particularly before the repository opens its doors.

In order to make sure that we are providing for the safe transport of spent fuel, we need to evaluate how all these differences and calculational capability and new designs will perform. Therefore it's very, very important that we hear from our stakeholders, which of course includes the public, so we can focus on the issues that are important to safety so that we can insure the transport of radioactive materials continues to be safe. Thank you.

MR. CAMERON: Thank you very much, Pat. Our third presentation is going to be by Mr. Earl Easton. Mr. Easton is the section chief of the

Technical Review Section of the Spent Nuclear Fuel Project Office. That section is responsible for review of shipping and storage packages and he's going to give us an overview on past studies that have been done and some background on spent fuel packaging and transport.

Generally, Earl has been with the agency, the Nuclear Regulatory Commission, since 1982 and he has a chemical engineering degree from the University of Maryland. Earl?

MR. EASTON: Thank you, Chip. For those of you who do not yet know me, I am as stated Earl Easton, section leader in the Spent Fuel Project Office. I have been involved in the area of transportation safety for about 15 years. Actually if I calculate the date from when Mr. Cameron said 1982, it's closer to 17 years.

My first assignment at the commission was as a safety reviewer for spent fuel shipping packages. Later as a section leader I was either directly or indirectly involved in many of the transportation risk studies completed by the

Nuclear Regulatory Commission.

Currently, I head a group of expert technical reviewers who are responsible for the safety review of both storage and transportation casks for spent nuclear fuel. Many of those reviewers are in the audience. Some have been introduced to you and I would also encourage you to take advantage of their expertise during this meeting.

As I look around this morning, I am particularly pleased to see the number of experts in the area of transportation sitting at the table and in the audience. Many of you I have had the pleasure of working with in the past, but there are some new faces and I look forward to working with you in the future.

I am also pleased to see the number of people that have turned out in the audience representing the public and other interest groups. My experience has shown that your participation in this process is vital. It is through you, through your comments and the expression of your concerns, that help us do a better job in assuring that transportation is safe.

This morning I have been asked to say a few words about a subject very important to all of us. That is the safety of spent fuel shipments. It is an important subject. Spent fuel is a hazardous material. It will be transported through your communities perhaps or near your communities and as much as we do not like to admit the possibility, accidents do happen.

During my 15 years in this area I have witnessed many changes. Today's casks are being designed to hold larger quantities of fuel. We're taking advantage of new technologies and new material. The capability of analytical tools for analyzing the safety cask have taken leaps. And indeed the federal government's policy on where ultimately spent fuel will be transported and shipped is involved.

The latter change, of course, I think

has a significant impact on the numbers and destination of future shipments. But throughout my time at the commission, there is one thing that has not changed and I am proud to say that it is the NRC's commitment to protecting public health and safety.

How do we know spent fuel shipments are safe? And how do we assure that spent fuel shipments will remain safe in the future?

We know that spent fuel is being shipped safely today because first, spent fuel casks are designed to meet fairly rigorous performance standards. These standards consider the possibility of accidents and rather severe accidents.

Second, the safety record of spent fuel shipments has been excellent. Third, the NRC has conducted a series of safety and risk studies on shipping casks designed to its performance standards. All of these studies have indicated that the risk of spent fuel shipments is low even when considering severe accidents.

The largest factor in ensuring the safety of spent fuel shipments is, of course, the robust nature of spent fuel shipping cask design. All spent fuel cask are designed to meet a set of very rigorous performance standards. And if I can direct your attention to the slide, this is a list, depiction of those rigorous standards. These include a pretty severe impact test, followed by a puncture test, fire test and an immersion test.

At the conclusion of these tests packages have to retain the radioactive material with virtually no release.

These standards were developed in cooperation with other countries at the IEA. They're world accepted and they have been in place for about 30 years with these basic requirements unchanged.

If I can go to the next slide. Second, just let me briefly go over what is the history of spent fuel shipments. From the time period 1979 to 1997, there have been approximately 1300 commercial spent fuel shipments in the U.S. These shipments have taken place largely between nuclear power plants or between nuclear power plants and spent fuel storage locations such as West Valley.

The exact location and destination of these shipments along with the routes that are published annually by the NRC and are made publicly available. Every year the NRC puts out a tabulation of spent fuel shipments. It gives where shipments originate, where they go to and what routes they take. This is all a matter of public record and publicly available if you request.

Approximately 90 percent of the shipments or 1150 shipments were shipped by truck. The remaining 10 percent went by rail. So we have some experience with both rail shipment and truck shipment. The total distance traveled for all these shipments approximately 900,000 miles.

However, in terms of the quantity of

spent fuel shipped, 75 percent went by rail because of the much larger capacity of rail cask. During that period a total of eight accidents were reported, and in fact to clarify, one of the accidents is outside of the 1979 to 1997 range. It actually occurred prior to 1979. In four of these accidents, the casks were empty and the remaining accidents, casks had spent fuel in them.

Of the four accidents involving spent fuel, three were by truck, one was by rail. But in all of these accidents there was no release of radioactive material. Now I think it's an important point to bring up at this point what is an accident?

You can tabulate accident rates and accidents in many ways depending on how you define an accident. The definition that we use in counting these accidents is based on the reporting requirements under NRC regulations or DOT regulations. Why do we use that particular measure of accident? Well, number one people are required to report it. So we're fairly certain that we'll get the data. And second it is a concrete definition. When people exceed those limits they need to record it. And those limits are basically loss of life, exceeding a certain amount of property damage or suspected damage or leakage.

Sometimes these, this data collected this way overestimates accidents because there are accidents that cause property damage over the amount that is reportable, but really not severe enough to challenge the cask or truck or route.

I would also like to note that in, and I hope I don't put many people on the spot, but in the report prepared by Mr. Holt, he also reported the experience of the British in which they reported over 8,000 rail shipments without any release of nuclear.

The final point I would like to make in this area is this is an area that the commission monitors very closely. We count shipments and notified of all shipments. We know where they're coming from. We know where they're going. We know when there is an accident and we are looking to see if any difficulties develop. So we monitor this area very closely. We intend to keep this safety record intact.

Next, I would like to begin to discuss safety studies that the NRC has conducted. The NRC has conducted a number of safety studies, some that came into existence in 1974. I will briefly mention two that were done and two that are in the works. But to put it in perspective, what are the things that we look at when we do these studies? How are we attempting to measure this?

First, we look at the likelihood of accidents. How likely is an accident and how severe is it likely to be?

Second, we look at the consequences. What are the consequences that can result in any given type of accidents? You take those two facts and taken together that gives us an estimate of risk. So the studies I'm about to discuss are really based on determining risks using these factors.

To put this meeting in perspective let me try to illustrate where we are. My aim is a little off.

MR. CAMERON: We may need to go to the nontechnological process here and point it out on the view graph itself if you could.

MR. EASTON: If you can move down between 1987 and the year 2000. The study done, and keep your red dot there because that's where we are. The study done in 1977 basically was the first study done by the commission as an overall look at transportation. We followed that up with a specific look at how shipping containers or spent fuel performed in accidents. Those have been published and publicly available for many years and we have gotten comments from many of the experts in the audience already on those and those have been actively under consideration for sometime.

In early 2000 we are going to release

another study that is an attempt to update risk estimates of spent fuel shipments. One of the purposes was to see whether the original study done in 1977 is still valid. The conclusions drawn in that study are still valid. Over and beyond that we try to get a realistic estimate of what the real risk of shipping spent fuel might be.

This study will come out again in February or March of the year 2000. We encourage you to get copies of that study. We will accept comments on that study, the methodologies used, the conclusions drawn, et cetera.

MR. HALSTEAD: Is this a draft that's going to come out in February or March that you are asking for comment on?

MR. CAMERON: Could we -- I know Bob. What I would like to do is let's answer this quickly if we can and then let's come back at the, after Rob Lewis' presentation and go to all of these questions and I thank you all for your patience. We're giving you a lot of background information of which there is not only a lot of questions, but I'm sure a lot of difference of opinion on some of the things that might have been said.

Could you just answer Bob's question quickly for us?

MR. EASTON: Yes, Mr. Halstead. Let me answer your question but bear with me. I'm going to do it within the next couple of sentences.

The purpose of this meeting today is basically to get your concerns on our relook at shipping container response to severe accidents.

Your concerns will again be discussed in public workshops next month. At the same time we anticipate considering comments on the update, the 2000 study, we will consider comments also in workshops during the next summer, but this is a final contractor report submitted to the NRC. But read it. I encourage you to read it. We will accept comments and those comments will be explored and considered in upcoming workshops.

Thank you, Dr. Shankman, she reminded me it will be on the web. So as soon as this study is released it will be made available on the website. Does that answer?

MR. HALSTEAD: I'll save comment. Thank you.

MR. EASTON: Let me just briefly discuss three studies that we either have completed or have in the works. The first we commonly refer to as NUREG 0170, the correct title is given right below that, but this was the first comprehensive look at transportation safety undertaking the NRC after its formation in 1974.

Its objective was to determine whether package performance standards contained in the commission's regulations were adequate to insure public health and safety. As such it addressed all radioactive material. It was not limited to spent fuel. It considered both routine aspects of shipment as well as accidents.

In analyzing the risk for potential accidents, the study made certain assumptions. That was in part because of the analytical capabilities present in 1977 could not model things in detail like you do today. So largely accident analysis were based on good judgment. Accidents were basically grouped into the severities and judgments were made on which severities led to consequences. These were in large part very conservative assumptions. If a package was assumed to be significantly damaged, it is assumed that all of its contents were released.

Given this, the study still concluded that the risk of shipping spent fuel was low, given that the likelihood of severe accidents and the consequences of severe accidents.

As a result, he likes to jump the gun, as a result the commission confirmed that its regulations were adequate and noticed that in the Federal Register and it committed at the same time to keep transportation standards under continuous review.

As part of that continual review, the commission undertook a study about 1985 to do a more detailed look on spent fuel cask response to severe accidents. This is commonly called the modal study. The term modal comes from the fact that it considered both rail and highway modes of transportation that's used as a shortcut in the this area. So when I say modal study I'm referring to the 1987 study on shipping container response to severe accidents.

In this study, computer models were used to predict the behavior of shipping cask response. What was done was generic models were developed for shipping casks. That's an important point because we did not actually look at individual shipping casks. We were looking at a generic cask that minimally met performance standards. That is that they only met the performance standards given in a previous design.

Many cask designs exceeded those, but we were interested in the margins of safety provided by the standards and not any particular package. So this is why we developed generic models and why individual packages do not show up in the study.

Although advances in computer technology allowed us to model casks in greater detail, there were some aspects of the cask that could not be modeled in detail we would have liked. Those dealt with cask closures, impact limiters and fuel behavior. Let me give a few words of explanation on those.

Cask closures typically are bolted with many, many bolts, 40 or so bolts that hold the lid on the cask. The stated computer analysis at that stage was not sufficient to model individual bolts on the lid. Fuel behavior didn't actually model how fuel lines, which contained the fuel, would fracture or break or under severe impacts.

What was done was a number of conservative judgments were made so as to overestimate the actual consequences. This was to compensate for a lack in detail of model. Also the study looked at several real life, but I must emphasize nonspent fuel accidents, to see how casks would perform for those particular type of accidents.

The reason we couldn't use spent fuel accidents is because there weren't any. To give you an example the type of accidents we looked at, there was a pretty extensive tunnel fire which involved a three vehicle collision with a gasoline truck. There was a fire for over three hours at 1900 degrees Fahrenheit and involved about 8800 gallons of gasoline.

There was a bridge collision in which a pickup truck failed, was involved in a collision and fell 64 feet onto soil. Those were the truck accidents looked at.

Two rail accidents that were looked at was a train derailment called the Livingston train derailment, which involved the derailment of petroleum tank cars, large fires over several days and there were two explosives. There was also a derailment on the Alabama River in which the vehicle, the train cars involved plunged 75 feet into the water and mud below.

These real life accidents were translated into the computer modelling and from those simulated various impacts and thermal environment impacts. What the studies show is that for all of these accidents, all four of those accidents, there would not be a release that significantly threatened public health and safety.

In fact the study concluded that the risk of accidents was low and lower than NUREG 0170. It turned out as we were able to more accurately describe accidents, model accidents, the risks were found to be lower.

This slide is concerning the upcoming study that would come out in March of 2000. Why are we doing this? Well, we want to keep up with change. We know that the number of shipments is changing. When the repository opens that will significantly increase shipments. We know that there are new cask designs with much larger capacity. We would like to verify the performance and severe accidents. We verify the performance routinely to our performance standards, but we would like to go over and above that and verify what would happen in severe accidents.

We have enhanced analytical capability that we can do more detail models. We can focus in on areas of the cask that before were not amenable to detail computer models. This study will be published in March 2000. I would again encourage you to read it and comment.

Conclusions. Through a combination of the shipping records, through our knowledge of performance standards and how casks meet those performance standards, our history of doing risk studies, we know that spent fuel can be safely shipped today. But we are not going to rest on that fact.

We are committed to maintaining that safety record completely and that is why we are doing the additional studies. And the last point I cannot overemphasize, is your participation from both expert members of the public is absolutely vital in assuring that we do the best job in understanding this area of transportation safety. Thank you.

MR. CAMERON: Thank you, Earl. I know we're presenting a lot of information to you, but I think it will serve us well as we go into the discussions. We have one final brief presentation that focuses on the new study that is being planned and Mr. Rob Lewis from the NRC staff is going to do that presentation for us.

Rob is a nuclear engineer. Again in the Spent Fuel Project Office and he's been with the NRC since 1992 and has worked on several projects related to high level waste.

His current assignment is the project manager for the package performance study that we're going to be discussing today. He has a master of science in nuclear engineering from the University of Arizona and a bachelor of science degree in physics from State University of New York.

After Rob's presentation we will go to

you for questions in the audience. Rob?

MR. LEWIS: Thank you, Chip. As the NRC staff's project manager for the upcoming package performance study, I did a lot of legwork for today's meeting and along with the help from the technical team and several NRC staff and also the Sandia staff, and I would like to thank you on their behalf and my own thanks for taking your time to be here today. We all believe it means a lot to the success of this study.

There are three points I would like to make during my talk. I would like to build on Earl's talk and describe our starting point both for today as well as for the package performance study. I would like to describe how we will use the package performance study and the approach we are going to use which is a little different than the approaches we used on the past studies that Earl described.

This study that we're embarking upon has been called the modal study two, has been called the package performance study. We're using the term today package performance study throughout the day because there is a lot of confusion when we first started calling it modal study two. A lot of people believed we were starting from scratch and redoing modal study and that's not the case. I will describe a little bit what we are actually doing.

Above all else as every speaker has mentioned, we are here today to listen to and understand any transportation concerns you have regarding accidents, cask performance in those accidents so we can take those concerns and fold them into our study and build the most effective study. We want your ideas on not only the technical approach to the study, which I will describe and Sandia will describe through the rest of the day, but also we want your ideas on our approach we are using to involve the public. I'll discuss that a little more in a second.

If you hear any issues today we're going to present several suggestions. If you don't hear any issues that you believe needs to be part of this project, please mention that. Provide your suggestions if you have any on how you would use analysis or testing to resolve those issues.

Now there are three factors that influenced our approach for the package performance study. These three factors are the way we use accident assessments, the possible role that physical testing might have in this project and the, our desire to use public involvement throughout this project as opposed to after we have performed some analysis and testing, after we have a draft or final report.

Regarding accident assessments, what we're trying to do in the package performance study is to build upon our safety record that we established through the studies through our transportation experience and our starting point is, as it was for the modal study, is casks that meet our standards and Part 71, the four tests that were described by Mr. Easton.

We will update and improve our analysis using modern technologies. We will use assumptions that reflect the newer cask designs and modern technologies and our whole approach is based on our desire to focus on those issues that are most important to safety during accidents.

During the past few years at NRC, there is an initiative to use risk informed techniques. What that means to us we use accident assessments in all the areas we regulate to focus our resources and our licensees' resources on the issues that really affect safety the most. We believe the result of that will be an overall safer system.

We will also build upon the 19, I'm sorry, the 2000 NUREG 0170 update that was mentioned by Mr. Easton. Throughout the day Sandia will describe what they did in the NUREG 0170 update. They're not done yet. We are in the process of reviewing what they're doing.

Their starting point for that update was the 1987 modal study and work that has been done since and each topical area for the rest of the day Dr. Massey from Sandia Labs will provide some information about their methodology.

The second main bullet on the slide shows the methodology that we plan on using to do the package performance study. It's a step-by-step walk through of the way we approach accident assessments in transportation.

This is the same general methodology that appears in the original 0170, the modal study and the 0170 update. The methodology is described much better in this blue brochure that we publish. It's available in the back and I believe that we've mailed it to most everyone in this room.

You will note, by the way, that this methodology, this five steps generally follow today's agenda as well and there is a reason for that. The reason is that once again this is the methodology that we propose to use for the package performance study. We're particularly interested in your thoughts on our continued use of this methodology.

Steps two and four in particular on this slide are some of the more difficult steps. They involve to a greater extent engineering judgment, and conceptualizations of what happens. They involve to a less extent the use of hard data and therefore we're also particularly interested in how we'll approach those two steps for the package performance study.

It's reasonable to assume that physical testing of some sort will have a role in any follow on research to the original modal study. Therefore, we selected Sandia Labs to start a scoping study, if possible, follow on research from the original modal study. They're currently under contract to do that. Today is part of that contract. You heard it mentioned as phase one.

We currently have one project for phase two or any future phases. Those efforts would be decided upon next year once we are through with this phase one. And the end product of phase one of Sandia's contract is issues and resolution options report. That report will recognize any concerns you raise today and it's akin to a proposal for follow on research.

Sandia Labs was selected naturally because of their testing, existing testing facilities and their experience testing packages for radioactive material transport, not only spent fuel packages, they have done a lot of tests in the past on packages for transporting large quantities of radioactive materials.

Because physical testing will have a role, we adopted it in a public involvement approach that's a little different than the public involvement approach we used for the modal study for the 0170 update. The public involvement, of course, is important to us in general. But specifically for this project if we do do testing we need to be very efficient in doing that testing and we need to do it in a way that collects data that is most relevant to safety and most useful to guaranteeing the safety of these shipments during accidents.

Final slide is a type of summation of many of the comments that you have heard today.

I will explain here how we are trying to involve the public for this project. The best way to stay in touch with this project or to be involved is to use our website. The address appears, the URL address appears here. On that website we have several things: background information, there is a form for comments and responses and there is a section in the website where we will provide the comments we receive along with each response.

As the project progresses we will update frequently this website with project status, with new reports as they become available, including the reports from the sister project the NUREG 0170 reevaluation project that you will hear a little more about this afternoon.

The second way we are trying to involve the public throughout this project beginning today is through these workshops in this forum. We will also have a workshop very similar to this in Henderson, Nevada on December 8th. That workshop will be geared more towards western interests; county governments, state and county governments and locals in the West that have a particular interest in spent fuel for reasons that everyone is aware of; the Yucca Mountain project and storage facilities and such.

As Mr. Easton mentioned we will be performing additional workshops next summer. The additional workshops will cover both the NUREG 0170 update and the issues and resolution options report that I mentioned that comes out of the package performance study. That should be available sometime around May and our goal for the 0170 update is sometime around March. So shortly thereafter we will have these workshops to try and merge these two projects and move forward on the package performance study in particular and on all of our work on transportation safety.

We are also in the process of establishing a mailing list. Sandia has produced for us these very nice forms that have name and address information at the bottom. If you would fill that out and leave that with us or mail it in to us we will provide you as the project progresses with updates. If you don't like to use the website in particular, this is a good way to stay involved.

As I mentioned, for the rest of the day Sandia will lead us through a technical discussion of each of the issues that we will look at during the package performance study where potential follow on work, and Dr. Massey will provide a kickoff, five minutes or so kickoff, of each topic to try to stimulate discussion.

We also have a handout in the back that has discussion pointers to stimulate ideas among the audience and the table participants to keep the focus of the discussions to that topic.

I'm looking forward to your input today and in conclusion I would like to thank you once again for being here and I feel that what you have to say will help us design the most effective project. Thank you.

MR. CAMERON: Thank you very much, Rob. That's the last of the presentations and I know there is probably a lot of questions and perhaps even a few comments on those questions and we're going to go first to Marvin Resnikoff and ask everybody to use their name tents to signify if you want to make a comment.

There is a loose wire that will need to be fixed at the break so I'm going to pass this mike to you and if you could use that one to respond. Marvin?

MR. RESNIKOFF: I have a list of questions. I have been involved in transportation issues as you know since, before the NRC for Attorney General Lefwitz (phonetic) involving transportation of plutonium from Kennedy Airport that gave rise to NUREG 170 and we commented on NUREG 170 and I'm interested that you're doing an update on that, but I'm concerned that there is no public input in that update. There should be public input. You should issue as a draft and you should allow the public to comment on that draft. That's not a question but if, you know, if you would like to comment on that.

I'm concerned that the previous authors of the modal study are not here. Larry Fisher, Lawrence Livermore Laboratory -- I'm asking a question about the continuity between the past study and the present study. Are they going to be involved? Is Lawrence Livermore Lab going to be involved with Sandia? I just have a few questions.

That brings me to another issue which involves peer review of this study. Exactly how are you going to do peer review? Who is going to do it? Is Lawrence Livermore going to be involved in doing that?

I have a more general question which is, that's very confusing to me and to some of the states that we work with such as the state of Utah and that is what exactly is the relationship between, I know you touched on the subject, but what exactly is the relationship between this study, modal study, and other studies that you are doing? For instance, you have done NUREG 1437 which is an update of table S3, which depends on, as I recall, on Wash 1238 an AEC publication. You are going to do an EIS for the BFS facility in the State of Utah. How exactly does sabotage fit into this study?

Let me give you a suggestion as to how I think it's going to go and I would sort of like to know your comments on that. This study is going to be input into the computer program which will estimate accident consequences and incident free consequences. And that in turn is fit into the various EISs that you are going to produce in the future. Is that what's going to happen and if that's so, this is my final point, my question is why are you bifurcating the process into little teeny pieces? Why don't you produce a large EIS which addresses all the issues involved in transportation, involves the economic issues, the economic consequences of accidents, involves nonaccident situations.

In other words, a full EIS which investigates the health and economic impact of transporting nuclear fuel.

MR. CAMERON: Thank you very much, Marvin. I'm going to go to Susan Shankman for answers to these and keep in mind that one of the purposes of this meeting is to get input on suggestions such as that and we will be discussing these issues in more detail during the discussion. But Susan if you could provide some answers.

MS SHANKMAN: I just wanted to say that part of today is to get those comments and I agree that as Earl discussed all the studies, there have been many of them and each one has had a particular goal and the integration of those studies is part of this package performance study.

The idea that you suggested about sending out our update of the 0170 assumptions as a public report and putting it out as a contract report which is a final report, the goal is to have comments on that, put into this study so that concerns you have about that contractor report can be worked into the design of the study. We want to integrate it with the work that's been done on severe accidents in modal study. So the idea is to have all that available before we have our public meeting in the spring and at that time we will look at the design of the study and whether it meets the goals that you have discussed.

We have not chosen to do a complete redo of the EIS that serves as the basis for our transport activities. If that's an idea you have I would like you to explain why you think we need to redo the entire EIS. The update on spent fuel transportation has meant and not to redo the EIS, it's not a redo. So the EIS has been publicly available, was commented on and was a final document. What we were looking at is whether we needed to reopen it and that's the update of 0170 is. It's not a redo of EIS.

Does that answer your question? And if

you think we need to redo the EIS I would like you to tell me today as we go through it what parts of the EIS or if you think we need to start all over again.

MR. CAMERON: I'm listing issues that come out of these questions right now on the paddock to make sure as we go to our discussion we come back and make sure there is a full discussion of the, the integration, what I termed the integration issue that Marvin brought up.

Earl, did you want to provide some other information?

MR. EASTON: Yes, I would like to respond to one of the questions raised and that is the role of Lawrence Livermore in peer review. In what we are calling the reevaluation of 0170, it was done by Sandia. That was sent to Lawrence Livermore for peer review. We are just now getting the results of that peer review. So unfortunately they couldn't be with us today but they are involved in that study.

The other study that we're going to do

on the update is still in its early phases. We're not really settled, I guess, on who is going to do the peer review at this point.

MS. SHANKMAN: Lawrence was invited so their absence is not because they were not invited. The other thing is as Earl said the design of the study, what I hear is you're suggesting that when we design this package performance study we should build into the design peer review.

MR. CAMERON: Marvin is nodding affirmatively. I know a lot of you are going to have the same type of comments. We're trying to do some clarifications here. Rest assured that all of these issues which I think relate to process, we will fully explore including peer review and role of the public in this.

What I would like to do now is go to Bob Halstead from the State of Nevada. Bob?

MR. HALSTEAD: Thank you, Chip. The State of Nevada is dependent on the Nuclear Regulatory Commission to carry out its responsibilities. Because as you know we face the prospect over the next five decades of receiving by various estimates under different scenarios up to 100,000 truck shipments of spent nuclear fuel and/or other highly radioactive materials. So under other scenarios up to 20,000 rail shipments and possibly another five to 10,000 truck shipments.

I very much appreciated Earl's comments, general though they were, reminding us that this is a hazardous material. The 26-year-old reactor is a 17 by 17 Westinghouse LOPAR assembly, moderate burn up. Even after 26 years of cooling time we're talking about a bundle of rods that has 80,000 curies total activity.

I very much appreciate the attitude that the NRC is taking. And I especially appreciate this effort because it is something that the State of Nevada has asked for for 10 years, a reassessment of the modal study with the type of stakeholder input that I believe you are making a commitment to here.

I further and especially appreciate the scheduling of the December meeting in Henderson, Nevada which is not only accessible to people of Nevada, but many areas in the west could not be at this meeting today. I further appreciate the fact that an evening session has been scheduled in that meeting which will allow members of the general public who can't come because they're not paid to deal with this issue like most of us are. And because I came here to say these good things, I'm going to try to not be upset if we don't get to review the NUREG 0170 update and I'm going to take you at your word that you are going to give our comments whatever respect they deserve on a final contractor report.

I do have a question because I've looked at the website that you have set up and I think based on our experience a website is an excellent way to handle communications. I would ask that you add a number of materials to the website and I know you are just beginning this. One is there are a number of reference materials in the past that have been critical.

I understand going into this trying to look at the new conditions, but there are some lessons to be learned by rehashing, so we would like to see the materials generated by the Western Interstate Energy Board 1989 workshop which included Larry Fisher and C.K. Chew. There is also a transcript of that meeting.

There have been a number of letters and review comments to the NRC that reference the modal study and I personally have not done this literature search, but I know there are a number of conference proceedings, technical reports, journal articles, many fine pieces of technical literature may disagree with some assumption or results, but nonetheless respect all of the work that people at Sandia and Livermore have done and I would hope that you would put someone to work doing good bibliography survey and having that accessible in a PDF format on the website is important because many of these documents are hard to access. So really I'm asking you to make a commitment to go to what I see as the next extension with your website to allow that to be a one point source of contact for all of us who are going to be involved. And thank you very much allowing me this time.

MR. CAMERON: Thank you, Bob. Let's get some response from NRC staff. Rob Lewis?

MR. LEWIS: Yeah, I just want to say that that's a fine suggestion and we have no problem with putting them on the website and I think all along those documents were intended to be part of this phase one literature search at least in coming up with this issues and resolution options report for May.

MR. CAMERON: Okay. Thank you. We will note various recommendations that we hear throughout the day on these flip carts. I'm going to go to Amy Shollenberger and come back over to Bob Fronczak. Amy?

MS. SHOLLENBERGER: Thank you. It may not be possible to answer my question right now, but I would like to just raise the issue of the

Department of Energy's EIS and how that section of that EIS addresses transportation impacts, or claims to at any rate, and I would like to know how the review of the modal study will play into the final EIS done by the Department of Energy, whether there are plans to incorporate the new information into the EIS and also whether the modal study will be done in time. Looking at your time on it it looks like it's pretty far out there.

MS. SHANKMAN: I appreciate your concern about the timing. We are as a federal agency making comments on the EIS and then we will need to look at that as we license the, whatever is proposed, and in that process we will use whatever information we have.

MR. CAMERON: Janet?

JANET: In the event that the department finds the Yucca Mountain site suitable for development of repository and develops a license application that the Nuclear Regulatory Commission would review, it would be at that time that the commission would have available to the final update of the modal study. You are absolutely correct. It's not possible for us to factor the results of the study that won't be complete until 2003 into our comments early next year on the environmental impact statement, won't be available to others commenting as well.

I would second Chip's request that the Department of Energy representative also speak to that, but clearly in the consideration of a license application, the commission would take into account any additional information that had become available and as I understand it the EIS will be updated in a timely manner over a certain period during a licensing process.

MR. CAMERON: Thank you, Janet. That was very helpful. Dwight Shelor from DOE.

MR. SHELOR: My main comment is I think the answer you received so far is absolutely correct. The environmental impact, the final environmental impact statement that we will have to accompany the side recommendation report unfortunately will be done prior to this conclusion of this study. If there are at any time after that some license application the EIS will again be reviewed by NRC and if appropriate even updated by the department.

MR. CAMERON: Thank you. Next let's hear from Bob Fronczak and then we will see if there is any clarifying questions out there in the audience before we take a break. Bob?

MR. FRONCZAK: Just two very brief questions. If we would like to supplement our comments today with written comments who do we address those to and what time frame are you looking at for those? Seems like we've got some time.

MS. SHANKMAN: In terms of timing, Sandia will be submitting their report to us in the late spring, early summer. If we could get your comments through the month of January they will be factored in and you can do that through the website or you can write directly to me or to Rob Lewis. All of our address is simple and it's on the sheet of paper. You can call also.

Again, let me just encourage, and I'm glad you asked the question, Bob. Today is not the only chance to talk to us. We will be soliciting input in December and Las Vegas. We have three meetings scheduled there. One similar to this evening meeting and then a follow on meeting on Thursday. So that's where we will physically be present to interact with people. We are all available through e-mail. We are all available through the telephone.

MR. CAMERON: And keep in mind I think the NRC would like to have a specific discussion at some point today about the process for keeping the public involved over the course of this study in whatever ways people have to suggest.

Let's go to the audience and see, does anybody have a clarifying question out here before we take a break on the presentations that you heard this morning? Steve, are you stretching or are you questioning? Anybody?

MR. CRAFT: Steve Craft. I was struck

by the presentations about the historical setting of the regulations and the one question I had I was trying to figure out how to frame it correctly without implying something I didn't mean. Is it safe to say that NRC has confidence in its current set of regulations, that if they are followed they lead to safe transport? Is that an accurate statement?

MS. SHANKMAN: Yes.

MR. CRAFT: So those of us who live near rail lines ought not fear radioactive cargo on these rail lines; is that correct? As long as it's moved according to your regulations; is that correct? I don't live terribly far from the same rail lines, Susan. I'm sort of wondering what you are telling me here.

MS. SHANKMAN: I didn't mean to imply anything. Yes. The answer is yes. We have confidence in our current regulations and in the information that we have. But it would be foolish not to continue to look at things and to see that we maintain that safe record. And as

Rob and Earl pointed out, I believe you know there will be a significant campaign coming up, so we want to make sure that our information is as current as possible.

MR. CRAFT: That's why I hesitated asking the question because I didn't want to imply you didn't need to do the studies, I just wanted to understand as you continue your regulatory programs, there are people who will be seeking cask certifications and there will be people moving these materials while these studies are ongoing. This is not to imply that those shipments are somehow not safe.

MS. SHANKMAN: Right.

MR. CAMERON: Thank you, Steven. That's the type of issue that could spur a lot of discussion at this point and what I suggest doing is we will hear one more comment or question from the table and then let's take a break and come back at 11 o'clock which will put us a half hour behind schedule, but I think we will be able to accommodate that during the day. Kevin?

MR. KAMPS: Thank you. Sorry to delay our break. I would be remiss not to make at least a brief comment at this point. I am from Michigan originally and I've only worked at Nuclear Information and Resource Service for two months. But I've worked near the Palisades in Michigan the last decade and the main point I want to share with everyone in the room is that the casks, the ventilated storage casks at Palisades that have been used since the early '90s, have come with some surprises for everybody including the Nuclear Regulatory Commission.

The generation of hydrogen gas inside these casks was not foreseen by all the experts at the utility, at the NRC, at the gas manufacturer. And so our concern from the public perspective is what surprises are in store with transportation? And so I hear a lot of confidence and I here a lot of congratulations, but there is tremendous concern on the public level.

In Michigan the experience with the dry casks at Palisades has left the public -- I don't think it's an exaggeration to say bitter and very upset at having been locked out of the entire decision making process from the beginning. I have a concern that this process, the transportation process is continuing that same pattern of locking the public out.

And on a related matter of environmental impact statement, the draft from the Department of Energy, again most of the hearings are taking place in Nevada. There is a handful of hearings outside of Nevada and major transportation routes are excluded from the public hearing process: Chicago, which is one of the major transport routes in the country does not have a chance to have a public hearing on that issue.

In Michigan again with the dry casks, the public has felt very excluded from any significant involvement. Another issue I wanted to bring up is the German experience with the transportation of high level waste. Far from being a routine and smooth operation, there have been huge public protests of the transport mostly because the dump site that was selected was selected with total exclusion of the public and the people that lived there were very upset about that, and so when the transports actually began there was tremendous protest that took place.

In 1998 the protest brought out 20,000 people and 30,000 police officers had to be deployed. It was the largest deployment of police since the Nazi regime. There were 500 arrests of people engaging in civil disobedience. There were close to 200 injuries and the total cost for transporting six casks was $100 million dollars mostly because of the police involvement.

That was the next to last shipment that took place. The one that took place after that was speeded up by a week. The date that everyone had been told that it would take place was really a smoke screen. The actual transport took place a week early. Even the police were not told until the very last minute the transport was going to take place so they were deployed in a rush. It was very chaotic transportation that took place and there was even a police officer that was killed. He was struck by a train and I attributed that myself to the chaos that was involved. It wasn't the transport train itself but another train.

There is now tremendous resistance among the police forces in Germany to be involved in this process at all not to mention the public. So I just feel that this issue is a lot more serious and dangerous than has been discussed up to this point and I wanted to put some of the public input in there at this point. Thank you.

MR. CAMERON: Thank you, Kevin, and there will be an opportunity for all of you to put your concerns on the table during the rest of the day. I would just note two things. In terms of what you said is that I think that there are going to be discussion, there is going to be discussion, there are going to be recommendations today from your colleagues around the table to, about the surprises as you called it. Items that should be anticipated when this study is done. So I think we're going to be hearing about those.

And also just note that your point about meetings and transportation impacted cities, I think that that's a recommendation that the NRC should consider and is considering also in terms of this particular study. Let's take a break and be back at 11 o'clock and we'll have working microphones by that time hopefully.

(Pause in the proceedings.)

MR. CAMERON: There is a document that Bob Halstead recommended it be put on the NRC website and it's a critique that the State of Nevada did of the 1987 modal study. Bob has put copies of that out on the table I believe. So if you didn't get a copy of it it's out there.

One of the things that we definitely are going to go back to that is in our paddock list, it was first brought up by Marvin and also was referred to by Bob Halstead, that may be causing a little bit of confusion based on my discussions with people at the break, is what is the relationship between the 0170 study to what's going on now? And I think that we might need to have a more extensive discussion of that issue so that it's clear and I don't really want to do that right now, okay? Because I think we want to get into the first discussion issue here but I just wanted to assure people that we will go back and discuss that in a timing so that it won't interfere with your understanding of the rest of the agenda.

Our first discussion item is highway and railway accidents likelihoods, and for all these discussion items we've asked Dr. Charles Massey of Sandia Labs to do a real brief set up for us in terms of some background information about that particular topic and he's going to do that for each one of these.

By way of introduction, Dr. Massey is the manager of the Transportation Safety and

Security Analysis Department at Sandia National Labs and his groups are responsible for design, testing, analysis of all types of radioactive material, packages and the performance of transportation safety and security assessments.

Dr. Massey has been with Sandia Labs for 10 years. Before he came to Sandia he was with Oak Ridge National Lab, the University of Pittsburg and a ship's officer for the United States Navy. He got his bachelor's degree in marine transportation from the Merchant Marine Academy.

He has a master's of science degree from the School of Engineering from the University of Pittsburg and a second master's degree from the School of Public Health at the University of Pittsburg. And to top it all off his doctorate is in radiation health, again from the University of Pittsburg.

Dr. Massey, would you like to tee this first issue up for us? Thank you.

DR. MASSEY: Thank you, Mr. Cameron. By

way of introduction here, what I'm going to do I really have two functions during the day as we proceed with our discussions on the package performance study.

First is to present a little bit of background. This may help also with these questions of how does the modal study and the NUREG 0170 reevaluation, how do those fit into the package performance study? So I'm going to walk a little bit of the evolution of where we are in essentially our state of knowledge regarding accidents and performance of these casks and their contents during these accidents and give you some suggestions that we have proposed to the NRC as areas that we would suggest be looked at in a package performance study to essentially fill in the rest of the pieces of the puzzle that we believe still may exist.

The second function that I have is to make sure that I understand as you may make comments or suggestions about what should be included in looking at severe accidents involving these packages, I need to make sure that I understand what your comment or concern is by maybe asking you some questions because we want to sort of clarify the types of environments and scenarios and conditions that you would be interested in and I need to understand that so we can incorporate that in our issues that we look at for posing what would be done in the package performance study.

We are going to have six topical areas. The first one that we're going to discuss before lunch is highway and rail accident likelihoods, but before I want to get into that I want to give a little bit of background. Do this quickly since I think most people are fairly familiar with what we are talking about, but just in case I want to make sure everyone has some basic level of understanding.

Next to the individual in the white lab coat here, you can see these are the types of materials that we're looking at transporting into package casks. That's fresh fuel assembly.

Now the cask itself, sort of highlight to you the features. Here you have the spent fuel assembly typically bundled and the size of cask matters how many of the assemblies we can fit inside. The cask walls itself are the main part of the cask. On the ends you have impact absorbers that are sort of made of some sort of material that in the event of an accident hit one of these ends or a side sticking out, these would absorb some of the impact force and then these contents which Mr. Easton mentioned earlier some of the lids and bolts and seals and features to close the cask.

To give a little perspective on the cask we also have, made a cutout. If you were to look at that sort of the circular part of the cask and take a piece of that pie out, we have made a model. This is an actual full size of the cask that's currently going over the road right now and I encourage you at the breaks or at lunchtime to come up and look at this and pick it up if you like, but this demonstrates this outer neutron shield that you have on the cask with the outer wall to contain whatever materials inside here. Then really this inside piece is the cask structure that we're most interested in and how this performs in the event of an accident.

So as I go through I may refer to this cask wall piece here to help give some context of what exactly we're looking at.

To bring us back to where we are in rail and highway likelihood and sequences, in the modal study they used 1985 truck and rail accident data from selected areas to determine on a per mileage basis what is the likelihood that the train or the truck transporting the spent fuel could be involved in some type of event that could possibly lead to release of materials, like a collision or derailment. That's what they used was 1985 data. Modal study as you recall was issued in 1987.

Once they started they -- an assumption there was some derailment or collision. Then they went through a sequence of events: Collision, impact another vehicle, did it impact structure like a bridge? Let's say it did impact a bridge structure, then was there a fire or not? So they went through and developed a sequence of accident events or developing what could be the consequence from the accident.

As a result of their analyses, they essentially determined that there would be 20 accidents in categories where they would put mixes of collisions and thermal environments together to determine what would be the likelihood released from the spent fuel package.

They also developed distribution. They looked at how likely is it to be at certain speeds and forces and temperatures and how long would the fire last as well put into the response of the package.

NUREG 0170 reevaluation that is under review at the moment. We use essentially three year data than the modal study 1988 accident data on much more national average. We did some modification to the accident sequences that were in the modal study. Instead of having the 20 categories where you could essentially bend or place each of these thermal and collision environments, we developed 19 for truck and 21 for rail accidents and we used the modal study collision speed and fire duration distributions. We did not develop new ones in the 0170 evaluation.

Now to stimulate a little bit of thought and discussion on package performance study, here are some of our suggestions of what we would propose to do. First, we would like to update using the latest 1999 accident rate data. We would like to go in, essentially relook at these train and truck accident sequences, how they occur.

One of the things we have now which we would like to take advantage of is with geographic information systems that are out there, ability to much more, more detail look at structures along roads, and roads are very small fine detail. We can look at where bridges exactly are, where are their hard rock outcroppings along routes; where are there bridges that may offer if a truck or train were to fall off a bridge and fall a substantial distance. We now have the capability to get much more route specific information that we would like to incorporate into our accident sequences and also when we start looking at distributions of how these events would take place and the likelihood of them, incorporate that into the package performance study.

Since we do not know yet how these sequences would fall out and what type of potential environments would be seen, the number of accidents or bins accidents could be placed in will really depend on what comes out of the study. With that I'm going to turn back over to Mr. Cameron.

MR. CAMERON: Thanks, Dr. Massey. I think it would be useful to leave this on for the discussion. The objective here is to get your ideas on what should be considered in terms of accident probability sequences and scenarios.

Now Charles has talked about some of their ideas. It would be useful to have comment on those ideas as well as anything else that you think should be considered in the relook, the update of this study and we're going to go to Bob Halstead, State of Nevada for first comment and Bob, they, the microphones are working if you could just press that button. Let's see if they're working.

MR. HALSTEAD: I won't be shy having asked for this opportunity to reopen this discussion. I appreciate your introduction and let me give you a few responses from the State of Nevada's perspective. We have been looking at these issues for a long time and hopefully will prepare an outline briefing paper for you by the Henderson meeting we weren't able to be at because of the EIS hearing schedule.

An observation on accident rates. We have studied average and route specific and link specific accident rates on our own highway and rail system, although unfortunately we haven't had the funding like other organizations to update that analysis for about six years. And one of the things we have found is that the more you go down to a route or link specific effort, the variation from year to year in accident rates is more apparent.

So as an opening thought I think you might want to rethink the notion of using single point accident rates. If you use a single point accident rate you need to put some uncertainty number with it. Our preference is to not try and put out a false sense of specificity that the data won't support. We're more comfortable now to using a bounding approach to accident rates. That's issue number one.

Issue number two, I very much appreciate the comment that you made about GIS technology developments, allowing us to do the finer look at, you know, what planners usually call unique local conditions. Again, we have been doing this along the routes of Nevada partly pause we anticipate a very contentious debate over designation of state preferred alternative routes. Particularly we need to designate a long sequence of two lane highways to avoid the Las Vegas Metro area and exactly the things that you mentioned, identifying the location, the characteristics of rock faces, rock outcrops, drops from bridges, critical side slopes, that's a really important part of this.

That was frankly one of the great limitations of the first modal study, the use of the California I-5 data on bridges, highways, soil types and so forth. We're certainly supportive of that and will assist in that effort.

And thirdly, regarding the impact types. There's a great deal to be said here but in looking at our state and some other western states perhaps peculiar vulnerability to earthquakes and particularly looking at the California system with elevated interstates and in our own case increasing frequency of the need to build overpasses over potential shipping routes, the whole area of crush impacts from falling bridge decks, falling overpasses is an area that needs to be added and a second category again important to us because of in particular if you look at the new construction of these overpasses and bridges in the Las Vegas area, there is some range in the types of support columns that are used. Some are almost diamond shaped on the edge and others are round.

I probably have to give Bill Rhine credit for raising this issue about the center midpoint impact on a support column and a consequent wraparound effect which obviously is equally serious, but different from corn like gamma shields as opposed to machine and weld gamma shields, but in addition to the things we will suggest later, we would like to see those two types of impact accidents specifically addressed.

MR. CAMERON: Thank you very much, Bob.

I would like to see if anybody else around the table wants to add anything to the three issues that Bob brought up. The bounding issue, the specific route information and the example of earthquakes and what that might augur in terms of types of impacts that you would use.

SPEAKER: Would you add midpoint wraparound? Those key words some of us will know.

MR. CAMERON: Midpoint under earthquake?

SPEAKER: No, it's separate. This is an accident not an actual disaster.

MR. CAMERON: Midpoint wraparound. I noticed that Marvin might want to comment on those so let's go to Marvin Resnikoff.

MR. RESNIKOFF: I wanted to add just a few points to what Bob has said. We are interested in information on accident severities, the severity distribution in different locations: urban, suburban and rural setting. In other words, how are accidents distributed in order of severity in these different locations in the United States? Is it all the same? Or does it differ depending on whether you are in urban or rural setting.

For instance, what about location of severe fires? Do they occur more in urban settings or rural settings?

We would like bounding accident. We would like sabotage to be considered as a bounding accident. I don't know if this Sandia study wants to look at sabotage, but it's been suggested by the State of Nevada that -- and they've introduced a petition to the Regulatory Commission that certain antitank missiles be considered as leading to major releases from a cask and we would like that considered as well.

The sequence of accidents concerns us. Generally the kind of accidents that are looked at -- well, just look at puncture, or there is a sequence involving impact and fire. But we would like one of those sequences reversed to see whether that is more important. Namely, whether cask heat up in a fire and then puncture is also a scenario that should be considered seriously. That at least happened in the Sandia test in the sense that there was a fire and then the structure gave way and then the cask fell down. So we would like that kind of puncture accident considered where the containers actually heated first.

We would like seasonal changes considered as well when looking at accident probabilities.

We would like a, how should I say it, a -- confidence intervals considered as well, not just one determined number but actually a range of numbers considered. Those are my points.

MR. CAMERON: Thank you, Marvin. I will put that last point up here. But you can see we are getting a number of specific recommendations and we want to go and find out whether anybody has anything to add to the list, whether they have any comments on this.

I guess at this point I would want to

ask the NRC staff or Sandia if they have any questions on what's been brought up so far and, Susan, you can use your microphone.

MS. SHANKMAN: I just wanted to tell you that we do have a sabotage study that we're working on developing. It is not under the Sandia contract but will be done in conjunction with the work that they're doing and right now we're working with the Germans and with some others who are looking at those issues and one of my staff members who was here earlier is going to an international meeting on that in a couple of months to frame the issues.

MR. RESNIKOFF: Who is doing that study?

MS. SHANKMAN: We will be doing it but in fiscal year 2000.

MR. CAMERON: Can I just remind everybody if you are going to make a reply or comment just turn your mike on and use it. I think it might be useful for everyone if we just provide a little bit more information on something that's been mentioned twice already which is the petition for rule making that the State of Nevada submitted on the sabotage issue.

Is there someone here from the NRC staff that could just sort of give us a quick summary of what what's going on with that petition in terms of what it requested the NRC to do and what the status of the public comment period is. I can try to do a little bit of that if that would be helpful and, Bob, you may want to, Bob Halstead may want to supplement that.

There is a process in NRC regulations that provides for any member of the public to send in a request, a petition to the Nuclear Regulatory Commission that commission regulations be revised and the State of Nevada submitted a petition that called for a change in NRC regulations address sabotage and also for an accompanying risk assessment of the risk of sabotage in terms of spent fuel statements.

That petition was published for public comment. The comment period closes November

29th.

SPEAKER: Just recently been extended to January 29 I believe that is a request from the national, from the transportation research board has a committee and certainly given the work load we have on other things, we are very supportive of that 60 day extension.

I wanted to add that since we filed that petition and then we saw the draft EIS, a couple of different modal issues have come to the floor which we think are important not only in the sabotage rule making but also things I neglected to say. Really a lot of new ideas. One issue in both the sabotage analysis for the petition for rule making and in this study is the potential heavy haul truck transport of large rail casks.

I know that in the Skull Valley proposal there been discussion using casks as large as 140 or 145 tons. I personally would be surprised if we see ones quite that big, but we're looking at the DOE proposal at the possibility of 125 ton rail casks being heavy hauled on the originating end and some cases for distances as short as a couple of miles, but in half a dozen cases maybe up to 50 miles and those have -- again, I don't know how feasible that is, but because it's been identified in the draft EIS we all have to at least evaluate. But having been on the other end and having worked on reactor shipments it's hard enough to do them by truck.

Issue number one is heavy haul truck and we have a clearer sense of how this might happen in Nevada. Again, I don't think if there is no rail spur I don't think there will be a repository, but there is the possibility in Nevada some very tricky long hauls on big rigs, so heavy haul.

Secondly, barge transportation has long had some strong advocates both in the transportation community and in the environmental community. We have had some recent experience with it. There is at least a cursory overview of the issue in the Yucca Mountain draft EIS and I would propose at least for open-end the discussion, there is some literature that goes back to the mid '80s that came out of Argon National Labs where it was a fairly detailed barge in Panama Canal transfer issue for the first repository.

Thirdly, a number of people have been discussing the possibility of running legal weight truck casks on flatbed rail cars. I also think that's not a very good idea, my personal opinion, but it's something that might happen and it's something that we need to at least in a scoping sense identify here.

And certainly there is one other modal scenario that was mentioned to me as recently as last week, although I must tell you it occurred in the Little Alien Cafe, a lot of exotic ideas about aircraft occur, but a person there reminded me there was some experience with air shipment in one of the foreign research reactor movements and I believe it was out of Columbia Venezuela. This person said if we're going to do that, and this was an ex-air force logistics person, well maybe we need to look at air transport in some instances. I think we've generally ruled that out as a, you know, large scale movement technique so I personally would not argue strongly for putting aircraft transport, but I would say those three we need to look at seriously.

MR. CAMERON: Let me clarify something for all of us. Bob, you said -- the petition on sabotage into some other types of transport that you think should be considered.

MR. HALSTEAD: These are issues we are additionally going to raise in the sabotage rule making because, for example, we feel the security issues of a large rail cask on a heavy haul truck are different than the security issues and we have asked for dedicated trains as a condition for rail shipment.

Let me quickly say we identified about eight specific areas in the regulations at 10CFR73 and primarily we focused on expanding existing regulations. For example, we've asked that the route approval process be made mandatory using the criteria identified in the guidance document.

This of course raises some problems with trade-offs between routes. We've suggested upgrading the escort performance for both truck and rail and declined the current guidelines for heavily populated areas to the entire distance of the route.

We've asked for some minor modifications. For example, extending some of the planning requirements for strategic special materials to schedule shipments to avoid civil disorders and natural disasters. Some of these I don't think are going to be real controversial.

Others like the suggestion that dedicated trains should be used for all rail shipments, we do expect to be controversial. So we on the one hand said look at trends and terrorism, look at trends and the capabilities of the weapons available. Look at the way that the larger number of shipments along the routes will create new opportunities and look at the new shipping cask designs which may or may not be more vulnerable to attack and based on what we already know we're asking for immediate relief in the way of changes in the current regulations.

We're also asking for a more detailed assessment because of various uncertainties that we may not have evaluated. So that's the scope.

MR. CAMERON: Thanks, Bob. Let me try to wrap this up a little bit before we go over to Amy and the rest of the panel at this point.

It has been suggested, recommended by Marvin sabotage be considered. Very clearly the sabotage issue is in front of the NRC and keep in mind that the end result of the update of the petition for rule making, all of this funnels into, should there be changes to the regulatory framework at NRC, so that there is a forum a mechanism for sabotage to be considered. If you want to comment the comment period has been extended. The commission will then consider whether to grant or deny or grant in part that particular petition.

Charles, do you have a specific question because I do want to go over to Amy, but go ahead.

DR. MASSEY: For the barge, dedicated train, these other different modes besides just truck cask going down the road, are you suggesting that in the accidents when we look at the overall package performance, that those be issues that we address as well, separate from any kind of be sabotage?

MR. HALSTEAD: Let me answer it this way. For the heavy haul truck I have a specific concern based on knowledge of roadway conditions on certain routes in the Nevada that there are actually greater potential for a fall impact scenario involving a large rail cask in heavy haul transport, than there are on any of the rail conditions that I'm aware of in Nevada. That doesn't mean that there are not conditions outside of Nevada where the rail cask and rail environment is subjected to a greater impact.

Secondly, specific issue for us on the truck cask, the smaller mass of the truck cask in a rail accident fire environment is a big concern to us. We're basically working under the assumption that the regulatory fire has to run about 20 hours to cause large scale fuel degradation in the large rail cask, but only six to eight hours in the truck cask. So putting truck casks in a rail environment may actually raise some different scenarios.

MR. CAMERON: Thank you and a good clarification. Some of these issues that Bob brought up in terms of type of transport also are important outside of the sabotage area. Let's go to Amy Shollenberger.

MS. SHOLLENBERGER: First of all I would like to say that I'm really happy to hear you are planning to use the GIS system to look at route specific data. That was one of the issues I was going to raise today. Along with that I would really be excited that you would actually name those routes and state where they're going to be and say what routes specific data you are looking at with the GIS system.

I know we're in accident likelihood right now and not in public participation but I can't resist saying that I would be even more exited if you would allow the public access to your GIS system to look at those routes. I think that would really show that the NRC is looking for public involvement.

MR. CAMERON: Susan, do you want to just ask a question before you go on, Amy?

MS. SHANKMAN: I'm not clear what you are asking.

MS. SHOLLENBERGER: I think that, first of all, I'm asking for the transportation routes to be named. They are not named in the environmental impact study that the DOE has done. I was in a meeting where the DOE said that they didn't feel they should name the routes because they may change over time. But I think, you know, you could say potential routes or possible routes and still name them.

And as far as access to the system, I think it would be really great if the public could somehow, I'm assuming it would be through your website, get into the GIS system and have access to maps of potential routes.

MR. CAMERON: The question, and I think we should try to clarify that for everybody, is how will, how can the update consider the specific routes that might be taken in terms of accident scenarios and to the extent that it does or through some other mechanism is that information going to be available to the public? Susan?

MS. SHANKMAN: Yeah, I guess I'm having a hard time understanding. Are you speaking about the to the repository only?

MS. SHOLLENBERGER: Not only but yes.

MS. SHANKMAN: Because I think that most of the routes, potential routes of what you asked for are already fairly laid out in terms of where the plants are and where they move to. In terms of rail lines I don't think we're going to have many alternative rail lines. In terms of highway there are routes specific guidelines DOT requires to be followed in selecting the routes.

So it will be part of the proposal of Sandia to tell us the kind of route data that they're going to look at and at that point you can comment on.

MS. SHOLLENBERGER: I would also like to like to follow-up on the earthquake comment that Mr. Halstead made. I would like to see weather related scenarios for all the different areas with that in the study. I think that earthquakes are definitely a major concern.

I think there are some portions of the country that are very prone to flooding. I think there are some portions of the country that are very prone to snowstorms, sudden squalls, ice storms, tornados. I would really like to see that factored into your study of both accident likelihood and the impacts of, for instance, a truck, you know being caught in a flood or something like that.

MR. CAMERON: Note the relationship to Marvin Resnikoff's seasonal point. I think there is a tie in there.

MS. SHOLLENBERGER: Also I would like to see human error factors addressed. I think that looking through the reports of not necessarily technically what you would call accidents, but maybe incidents with casks, there have been situations where a cask wasn't tied down properly and it slid a little bit or whatever happened and even there is -- would even be human error in the creation of the cask which was not addressed in your first study because you were using computer models and now you have actual tests. And so I would like to see human error factored into both accident likelihood and potential impacts.

MR. CAMERON: Not just the human error in terms of the cask construction that's been mentioned, but human error in terms of this particular issue, its application.

MS. SHOLLENBERGER: Right, all kinds of things that could happen.

MR. CAMERON: Go ahead, Susan.

MS. SHANKMAN: Can I frame that a little bit differently and say perhaps we should be looking at the relationship between operational controls and casks. Do you have do rely on some kind of operational control or human activity because of a weakness in the cask? What's the relationship of that?

MS. SHOLLENBERGER: I think I would like you to look at that, but I think I would also like to see outside of that the, you know, you look at the number of accidents and say here's how likely an accident is. You could look at the number of times the cask wasn't tied down properly and then say here's the likelihood of that happening and somehow combine that with the number of accidents and say here is the likelihood that a cask would be involved in an accident and it's not tied down properly.

MR. CAMERON: Charles, is that clear?

DR. MASSEY: Yeah.

MR. CAMERON: Let's go to Felix and then

Eileen and come over to Kevin and then Bob Fronczak.

MR. KILLAR: I just want to make a couple of points along the lines that Bob and Marvin already brought up. I think one of the things we have to be very careful of is that we do do bounding studies. Charlie can retire doing studies but we need to have finite data to say this is the results.

Along those same lines we do have to have sensitivity studies as part of that. If you say the temperature is going to be X and squat, if you go up two more degrees what difference does it make one way or the other? So I think you need to take into consideration sensitivity studies and provide that information.

And the final aspect you have to bring in reality. You have to make sure that when you are done with your studies and come up with the results you have to bring in reality. I think that's the one thing that the modal study particularly was very good at doing because they did look at actual accidents and put the cask in those type of accidents. I think that's one of the things we need to be very careful of.

On the GIS system, I think it's important that you do this. Once again concerned that you get too specific on routes and get too specific because then what happens is you get into a question of sensitivity and bounding what have you, and you say gee on my route that's coming through my area I have a bigger outcrop of rock than you do or the rock that you looked at was shale and I've got granite or vice versa and things on that line.

So I think you have to be very careful that you look at the bounding studies and look at the sensitivities and not get too tied down to the GIS studies.

MR. CAMERON: GIS is geographic information system?

MR. KILLAR: Sounds good to me.

MS. SUPKO: Felix covered a number of points I was going to make.

I would also like to add that while you are looking at this growing laundry list of possible issues to address in the modal study that risk informed analysis take place, that we really look at what increases safety. What can NRC do and assess that will help increase the safety of spent fuel transportation and protect the public. I think that's the bottom line. You did mention that was going to be part of the process and I think it's going to be a difficult exercise on the part of NRC staff to go through all these issues that everyone is bringing up and try to apply those and get a result that everybody is satisfied. But that has to be the end result is what increases safety.

MR. CAMERON: Let me ask you a clarification on that. It may be sort of a chicken and egg situation where the results of the update are going to be looked at by the NRC in terms of whether to increase, in terms of whether to change the regulations.

Were you suggesting that Sandia should

factor into the study in the first place what might decrease risk from a change in regulations?

MS. SUPKO: No. I'm not suggesting that the regulations need to be changed. The issue is there are a lot of public concerns related to spent fuel transportation. What issues either through update of the modal study through testing or through additional analysis can we do to show the level of safety associated with transportation and possibly in Sandia's assessment of all of the things that it might choose to look at, it would probably be useful to try to assess certain pieces will add to the discussion more than others might. There is only going to be a limited amount of time, a limited amount of money available to spend on this project. I'm quite certain it's not unlimited.

So you are going to need to somehow or other address where do you get the most bang for your bucks, so to speak.

MR. CAMERON: What you are suggesting is

that the NRC and Sandia may have to make choices in terms of whether to address certain issues or conduct certain types of tests and that that should be a risk informed decision. All right. Let's go to Kevin.

MR. KAMPS: I just wanted to follow-up on some things that I was hearing about operational controls and cask robustness and it gets back to something I mentioned before and someone asked me during the break what I was referring to about the surprise, the Palisades and other facilities that use the ESE 24 casks. What that was was unforeseen chemical reaction inside the cask, the generation of hydrogen gas which is combustible, highly flammable, explosive and the way that that was discovered was an explosion at the Point Beach Nuclear Plant VSE 24 in 1996. And just the relationship to this discussion of likelihood. I don't think anyone at NRC or the utility or the cask manufacturer would have seen an explosion in a VSE 24 cask as a likely event.

So in the discussion about likelihood about transportation of highly irradiated nuclear fuel, there are so many problems taking place with the casks that are stationary, these casks are going zero miles per hour at Palisades Nuclear Plant and the casks that we're discussing today are going to be on our highways and on our railways going at high speeds and so we're very concerned about the unforeseen problems that will take place with these casks.

Another problem at the Palisades Nuclear Plant has been the manufacturing of the casks. There are a number of defective casks at Palisades and so that needs to be considered in the likelihood of accidents, not only the severity of an accident, but also the likelihood of an accident taking place is how will defective casks enter into that?

Also about the likelihood of events taking place and it's been discussed already, but terrorism -- in their earlier study terrorism was not high on the priority list of considerations, but it's becoming more so unfortunately in this country and around the world. And so I just would like to reemphasize the importance of terrorism as really taking a central place of the discussion of the safety of transporting highly irradiated nuclear fuel across the country.

And just to reemphasize, and I feel a lot of sympathy for the representative from Prairie Island, coming from the Palisades area the closest residents to Palisades in the dry casks are several sand dunes removed from that danger, but at Prairie Island the casks are -- how close are they to residents?

MS. WESTRA: Approximately six hundred yards.

MR. KAMPS: I'm not sure how many hundred yards at Palisades the closest residents are, but I just wanted to reemphasize that the transport of these casks will take the stationary casks at the present time and move them very close to the homes of millions of people in this country and I'm happy that the NRC is saying that there is an interest in involving the public, but I would really urge the NRC to involve the public in very meaningful ways in this process because millions of people being very concerned are going to change the dynamics of the discussion and it will be removed from an academic or theoretical discussion into a very charged one and, yeah.

Another point is a consideration needs to be made of even the safe and smooth transports of these materials and the exposure to workers and to the public of the gamma radiation that will flow out of these casks. That's removed from an accident scenario and hearing that there is not going to be an environmental impact statement involved with this, that concerns me because there are environmental impacts to public health from even the smooth transportation accident free of these casks.

MR. CAMERON: Okay. Thank you Kevin. Susan, did you want to respond.

MS. SHANKMAN: I just wanted to make a clarifying point that the storage casks are not transport casks and even cask designs where there is a system where both the encased or contained spent fuel that has been stored, that container may be transported but it would not be transported in the same configuration as it is stored. So the experience in storage is useful but it is not necessarily the same as transport.

I know your concerns about Palisades but I don't want people in the room to think that the Palisade casks as they stand on the pad will be put on the truck or rail and shipped.

MR. CAMERON: Thank you for that clarification.

MR. KAMPS: I didn't mean to imply that the same casks will be used for transportation, what I was meaning is that the history of our experience shows the problems and the NRC has recently decided to allow cask manufacturers to proceed without a certificate of compliance on cask designs and that was the very problem at Palisades, that the public tried to be involved in the process with those casks that had defects that were not caught by the NRC and so the current policy of NRC is to allow the manufacturer of casks without a certificate of compliance? And so the risks are too great, I think, for those unforeseen problems both transport and with storage.

MR. CAMERON: I don't want to get us off on an extended discussion of this. Susan we may think about you coming back and presenting a clarification on that. I guess what I infer from some of your comments, Kevin, is the idea of unlikely events should be considered throughout all of the issues that are addressed in the study and we hearken back to the hydrogen that you talked about.

MR. KAMPS: And the definition of unlikelihood.

MR. CAMERON: Thank you. We're going to try to get through some other cards here because we do have a little bit of time left here. Bob, why don't you give us what your concerns are and we'll talk to other people.

BOB: First of all, I would like to support some of the previous comments that were made. I think you're going to be looking at a lot less accidents because the accident rate used in the modal study was a 1980 number 11.9 accidents per million train miles.

The other thing I would like to support Bob Halstead's comment about crush loads, train transportation by definition is multiple vehicles traveling together and I don't know if you ever been to a main line train derailment, that is a very real possibility in rail, so we support you looking at that.

Another thing that Bob talked about the collision with structures and falls. In the modal study I think they evaluated highway wayside conditions and rail wayside conditions are very different than highway. You have to go through a lot more cuts and fills because you are very limited by rail transportation and it looks like you are going to look at that and you are going to look at wayside conditions.

A few other things I would like to bring up. We felt that the force estimates that the modal study used were underestimated. We looked at locomotive trains and just the standard rail car has to be able to withstand an impact of a million pounds force without defamation.

A locomotive train can go to 3 million to 10 million pounds so we would like to have you factor that in. We think the frame impacts were underestimated in the modal study. We think you ought to take a look at that.

I don't know if this is the time to bring it up, but we also think that the modal study took a less than considerable approach on thermal frequencies. So we think you ought to take a look at that again. We just had one in 1996 in Wisconsin where we had an 18 day fire and that was done by design.

Twenty years ago those tank cars probably would have exploded and probably would have had some fatalities. Now they're designed to vent and burn. We think you ought to take a look at that too.

MR. CAMERON: Thank you, Bob. I would note that, and this is good, we're getting a list of items that should be considered here and we're not having much dialogue on some of those items which is fine.

We're going to go to the others that have their cards up but one thing for the group to keep in mind, is there anything that you heard in terms of suggestions that, that you have a disagreement with? Not a -- and we're going to get to you right now as a matter of fact, but if there are things that you do disagree with, and I don't mean need to supplement, but if you disagree with that I think that would be useful for the NRC to know and Jack Edlow is going to give us a sample on this, I guess. Go ahead, Jack.

MR. EDLOW: I do wish to disagree with two items that I have heard suggested this morning but I will agree with one other. I want to start first by talking about this issue with, that I've heard discussed as sabotage or terrorism or similar type issues.

This is certainly an issue which needs to be addressed, that the NRC has addressed in the past, Part 73 regulations, which needs in the future to be addressed because sabotage, terrorism is real. However, I don't think it needs to be part of this study. I think it's an apples and oranges type issue. This is my understanding related to accident conditions and the effect on the equipment and the vehicles related to accident conditions. I think that is the specific purpose of it and that sabotage, terrorism are not accidents. Although they do need to be addressed. That's number one.

Secondly, I disagree with Ms. Shollenberger about naming the routes. I think it is counterproductive to name specific routes for a variety of reasons, not the least of which is I can name you a route today and it may not exist in ten years. We don't know where you will live in ten years and it's difficult for us to focus on that.

One should assume under existing DOT NRC regulations that material when properly packaged and when introduced into the transportation system of the United States, it can go on any route because that is the legal situation in this country. So if the public wishes to know where the material can go, the answer should be it can go anywhere when it's properly packaged and licensed and ready for transport.

The fact that states have the right to designate routes for this type of material means that they should discuss the matter with their state authorities or those who are responsible for establishing the route control within those frameworks. Otherwise, assume it can go anywhere because frankly it does.

Now the one thing that I will support and don't fall off your chair, Bob, I'm going to support the idea about the barge because while this is titled highway and rail accident probabilities, and maybe that's what you want to study, I do happen to think there is some reasons for you all to consider barge and even more so dedicated ship transports because it is in fact possible that there could be at some time in the future t he need to move this material coastally via water even using dedicated ships rather than barges which have their own particular reason. So I would support that and there are lots of other things we could get into but it's almost lunch. Good-bye.

MR. CAMERON: I'm going to make an assumption here, open the challenge by anybody to try to maybe close off on one particular point. We talked about the concern over sabotage. We have identified separate mechanism to address that and I'm sort of assuming that the important point is that the issue be addressed somewhere but doesn't necessarily need to be addressed as part of this update.

Jack gave us a contra in terms of the specific routes. Other people may want to chime in on that if we have some time. Let's go to Ed

Pritchard and then we'll go to Heather Westra and come back to Uldis, the State of Maine. Ed?

MR. PRITCHARD: I just wanted to first offer assistance in your studies dealing with any of the data from our accident reporting section and also a review of some of the severe accident derailments that have taken place since the study was done.

Today we did come to an agreement as to some of the things that need to be looked at and there were some severe rail accidents that took place since that study was done. We had a train derailment caused by an earthquake this year which we never had recorded before and it happened to be an Amtrak train.

The other thing I want to make available to you is our safety compliance and oversight plan for rail transportation of high level radioactive waste and spent nuclear fuel. It's a partnership of the Department of Energy and the association of American Railroads and it goes above and beyond 49 CFR for the transportation of hazardous materials. It's a proactive approach that we have taken.

My staff member, Kevin Blackwell, sitting behind me here is the author of it and I want to give him credit for it because he spent quite a bit of time putting it together. In fact, the department has taken this, Department of Transportation has taken it. They have expanded it to include highway and water so we're working on that with the Coast Guard and the Federal Highway Administration. It's a flag ship initiative under Secretary Slater and we also have a dedicated train study report that is due out sometime next year.

MR. CAMERON: There may be information that other agencies have reference to what's being done in other countries before -- this, I imagine, could either be factored into the update or supplemented, supplement the update in terms of what the NRC should do, if anything, in terms of regulatory change, Susan?

MS. SHANKMAN: Right. Part of the phase

one is literature review and to look at expand data that we could use and I'd also offer that as part of the website, although I don't think we can post everything, we certainly can post references to other websites and so that if you can't -- if you have a website where you have this then we can list that and what are our resources that someone can find them.

So I guess I'm agreeing that we're going to try to keep this as our website as informational as possible and Sandia is on the hook to be doing that.

MR. CAMERON: Thanks, Susan. Let's go to Heather Westra and then over to Uldis and then take a final comment from Amy and see if anybody in the audience has anything to say. Heather?

MS. WESTRA: One thing I see related to accident scenarios and I'm not sure whether or not it would be addressed in this study or is available in other studies, and it's regarding emergency response to the various accidents under various conditions under various scenarios. Is any of that information available? The notification time when something occurs. How long it took the responders to get to the site. How many responders per each given type of accident were on the scene? Number of people potentially impacted by the various accidents? And then the total time needed to resolve the accident. Clean it up. That would be something we would be very interested in seeing as a jurisdiction that would be seeing those shipments and would likely have to respond to some kind of accident.

MR. CAMERON: I guess maybe perhaps two questions. One is how is emergency response factored in, if at all, into the update of the modal study? And secondly apart from the modal study, and this is one of those separate transportation concerns, is there a way to provide the type of information that Heather is talking about somehow?

Charles do you want to try to answer the first one? What is the role of emergency response in trying to, in updating the study? How do you treat that, if at all?

DR. MASSEY: Sort of answer with a question. Right now when we developed these accident sequences, we do not take credit in the scenarios for intervention, such as responders come on the scene, put the fire out quickly. That is not in our distributions right now. That is certainly something that could be considered to be incorporated, but we tend to try to look at it, let's assume there is no response? How does the package perform under the conditions evaluated? The whole emergency response once there is an accident, that's a separate issue than what we're planning to look at but we can certainly incorporate that as a suggestion in our accident sequence.

MS. WESTRA: That would certainly be part of what the public want to know. Yeah, these shipments might be safe but how prepared are the jurisdictions to respond to these? There are lessons learned out there that could be argued, incorporated into this analysis.

MR. CAMERON: Let's go to Susan for perhaps an answer or to someone on the NRC staff about the availability of the information apart from the modal study.

MS. SHANKMAN: Heather, I would say that by not taking credit for any emergency response is a conservative way to look at the safety margin. The Department of Transportation will be working with the center on issues related to accident response. Rick, do you want to add? I think that there are local conditions and we could look at whether we can factor it in.

MS. WESTRA: I'm just wondering is that a realistic assumption though. I can understand that it's a conservative approach. Is that a realistic assumption that nobody would respond?

MS. SHANKMAN: No, I agree with you. We'd have to look at how we'd factor that in given the variability of local response. The emergency response system is developed with the Department of Transportation and FEMA and other agencies. NRC is not involved in that specifically.

MR. CAMERON: We may want to talk more about this off-line in terms of the information but I think the point has been made.

Earl, do you want to add something?

MR. EASTON: Just a point of clarification what the NRC's role in emergency response is.

We have a formal policy statement issued by our commission somewhat dated goes back to 1985 on what the NRC's exact role in responding to emergencies. That might be something you want to put on the website also.

Also we did a survey in 1990 on the capabilities of states to respond to emergencies done by the University of Indiana. That might be of interest, but that was basically a survey of states.

The primary response to all accidents lies with the fire department, police department and that varies from locality to locality. I don't know if there is any real comprehensive look at the response time and how it varies from county to county.

I think that a lot of programs related to repository have training funds to actually, in fact, upgrade and train people along proposed routes or suspected routes, and I don't know if it's addressed at that point, but it might be an avenue you might want to pursue.

MR. CAMERON: Final comment, Heather, before we move on.

MS. WESTRA: Sure. I'm just stating that it would be helpful for potential responders to understand more, what all would be involved under these various scenarios.

MS. SHANKMAN: Right, and I take your point. We will look at that.

MR. CAMERON: Thank you. Thank you very much. We're going to take Uldis and Amy and go on to the audience and, Felix, if we have time we will circle back to you. Uldis?

MR. VANAGS: My comment really follows

what Heather was talking about. There really needs to be a reality factor incorporated into the study. It's unrealistic to think that spent fuel for Maine is going to be shipped during a snowstorm or an ice storm. It's just not going to happen. There will be state controls, and emergency planning response. It's going to be monitored and regulated very closely. Somehow those being incorporated, for instance, I'm looking at the accident rate data. I can't help but think we have accidents, tractor trailers on 95 in Maine, I frequently travel that road. I see the tractor trailers all turned over because they just don't want to slow down during the snow and ice. I'm sure those accidents are in that data. That isn't going to happen. They just won't be traveling. We know the weather in New England quite well. We know when it's okay to travel and not okay to travel. So somehow there has to be a reality factor.

MR. CAMERON: That's a good point that I think we've heard from Felix and also it goes back to something that Amy said before and something that Marvin said in terms of, of weather.

Let's go to Amy for a final comment from the table and then see who has something to add from the audience.

MS. WESTRA: I just want to respond to the comment Mr. Vanags just made. Actually it's a question that I have. If I understand it correctly the states don't have any control over when the shipments happen. That's not true?

SPEAKER: The states do have some control.

MS. WESTRA: What is that?

SPEAKER: There is a cooperation with the DOE. Right now the North East Regional Transportation Task Force is having discussions now about these issues, about weather related issues and so forth. All these factors will have to be taken into account. They are big state concerns. The DOE is being responsive to these concerns.

MR. CAMERON: Thanks for that clarification, Uldis. Amy, the rest of your comment?

MS. WESTRA: I just have one other thing but I just want to mention it quickly. I would like to see you all look at the likelihood of accidents after the loading and unloading of both the shipping casks especially at places like Palisades where they have problems with the casks and also just in general what's the likelihood of an accident when you are taking the cask off of the train onto a heavy haul truck or off of the truck onto a train or from a barge or whatever.

It seems like in my reading of the modal study I didn't see that addressed anywhere and I think that there probably is some likelihood of that happening.

MR. CAMERON: Quick clarification on that from either NRC or Sandia in terms of how the point of transfer, the unloading point has been or is going to be or might be considered. Charles?

DR. MASSEY: No. I think that's one of the things we want to look at that we have in our proposal is considering looking at especially transfer points, that's one of the issues of concern. And are there environments that could be present that we'll need to analyze. That's a good point to consider.

If you have specific issues at the loading facility or at an unloading facility or some set of circumstances that you can envision that you would like us to specifically consider then I would like to get some more detail about that.

MS. SHOLLENBERGER: I think it would be really important to look at, Dr. Shankman had mentioned the storage casks are not the transportation casks and so you have situations around the country where there are storage casks that are having problems and it's not at all clear that anybody knows how to get the rods out of those casks into the transportation casks and I would like to see you address that.

MR. CAMERON: Thank you very much, Amy. How about those of you in the audience? Does anybody have a comment?

MR. HANNON: my name is Dick Hannon. I'm with U.S. DOT. Continuing the reality theme, I think the reality is that I don't believe shipments would be dispatched in the teeth of a blizzard and so forth, but that's not to say that shipments if they went from say Maine to a far west state to be named later, that there wouldn't be some inclement weather somewhere along the line. I think steps would be taken for safe havens. This would be part of normal planning, but shipments don't just stop because of the inclement weather, but by regulation we don't ban clear precise thought. People will not dispatch that way, but I wouldn't want to think that a state as far as the origin. I think further down the line you could run into bad weather as defined by whatever the state wants to define it.

Another question or response to Heather, there is a large activity of emergency response training that's done year in, year out. Section 180 in the NWPA Act to provide emergency preparedness training along the routes.

I'm with DOT. We have a grants program that is available to all states. There is -- always use more money. There is an attempt we're making now to triple the amount of monies that are available to train the emergency response community. But as Earl Easton pointed out it's essentially a local response, be it the federal level provided to the extent that it can to make them prepared at the various levels.

There is a comprehensive federal response plan that is coordinated by FEMA, but there are steps that have been taken previously and they would be implemented again I believe.

MR. CAMERON: Thank you very much, Mr. Hannon. Yes, sir. Please state your name and affiliation, if appropriate, for the transcript.

MR. HANSON: My name is Allen Hanson. I'm with a company Trans Nuclear. Trans Nuclear has been involved in the transport of radioactive materials for more than 35 years. I just feel I need to make a comment in order the keep the record straight and this would be far more appropriate coming from Dr. Shankman but she hasn't had the opportunity to fully respond.

As a company that is deeply involved in the fabrication of casks for storage and for transportation, I think the court would recognize two fundamental regulations. First of all, no one is allowed to fabricate casks for transportation until they have the NRC approved quality assurance program and the NRC verifies that in fact they are using that program appropriately.

Secondly, no cask is put into service until it has issued a valid certificate of compliance by the NRC and the fabricators are responsible for building that cask in exact accordance with that certificate of compliance and the NRC is also very aggressive in making sure they inspect and enforce that part of the regulations.

I would not want to leave the impression in anyone's mind that fabricators or designers are in any case running off and building things without first getting all necessary approvals from at least the Regulatory Commission.

MR. CAMERON: I'm sorry. I'm glad you added that and I know there may be other comments on that that I think we're going to have to deal with perhaps off-line and we'll talk about that.

Is there anybody else in the audience who would like to say something at this point about the issue of accident possibilities sequences scenarios? Okay. We need to take a lunch break. And I will talk to Kevin and Felix about their comments and how we might get that in.

(Luncheon recess.)

MR. CAMERON: I think during our first discussion period we developed a lot of good ideas with NRC and Sandia to think about for incorporation into the study methodology. There will be time during our final session, it's sort of an open session for us to revisit some, any lingering comments that we might have from earlier sessions.

What I would suggest that we do during this session after Dr. Massey, after Charles tees the subject up for us, is we'll go to our first discussant for an idea and let's see if we can test that idea or thought out among the rest of you before we go to another concept the danger of trying to do that is perhaps that there will be a whole lot of ideas at the end that we'll sort of have to rush to get them on to the transcript. Charles?

DR. MASSEY: Good afternoon. We're going to start off the afternoon with talking about container performance during collisions. And to sort of get you up to speed on our knowledge base to date where we would propose areas of investigation for the package performance study, we'll start off with the original modal study, what it did and how it analyzed the performance of the spent fuel cask during collision environments.

First, it looked at a generic steel lead steel. I will try to use my usual displayer as much as I can. You have a stainless steel lead steel essentially intercast. This is the structural strength of the cask. It modelled that on a generic basis did not have a particular cask design we looked at. Just looked at essentially a cask completely constructed that looked like this. They did not take into account the impact limiters on the cask when they did their analysis. They did not look at, this is probably a function of our computer capabilities after the time, did not take into account the cask closure mechanisms and design on the cask.

To make up for that they made conservative assumptions about how much material could be released. They did not model the cask closure system. And finally for how much material could actually escape from the cask, what they looked at was the inner strain or the strain on this inner cask wall and by looking at how much strain was on this piece, hard to hold up, this is heavy. But this inner wall is how they determined the leakage, properties of the cask in collision events. They looked at how much strain was put on that piece.

In the 0170 reevaluation we looked at the effects of essentially collision and chemical type loads on four different cask, generic cask designs and we started to look at in some detail cask closure mechanisms. One thing I will point out on this one, so I remember to do it on our proposed suggestions, is that the bolts when we did the study we essentially modelled those as square bolts, not the round bolt that you would see in reality. But that was partly a function of our computation capabilities at the time. So again we had to make some conservative assumptions about how that square bolt was attached to the cask and help secure the lid.

We looked at collision forces on the cask hitting an unyielding surface. A hard unyielding surface is a, typically some type of a design or a feature that all of the impact when the cask would hit that is put onto the cask. Whatever it hits doesn't absorb any of the forces from the collision. That's an unyielding surface. So we looked at collision of other casks onto these hard unyielding surfaces.

We looked at forced speeds, 30, 60, 90 and 120 miles per hour onto these hard and unyielding surfaces and looked at three orientations for each of those speeds: a side, corner and an end. We also took into account for weight purposes that there were impact limiters on the cask, but we assumed those were already crushed. There was no absorbent fact or features left in the impact limiters so they could not take any of the crush force off of the package and finally we modelled that without this neutron shield. This outer piece here, we did not model this on the cask at all. This was considered structurally unimportant for us in the collision environment. That's what happened in our 0170 update that's under review.

Based on our examination of that's been done today and our analysis in the 0170 update, what we're suggesting for the package performance study is that now we have even the increases in ins computer capabilities are amazing from point of view of how well we can do analyses now. We would like to take some of that into account and do a much more detailed look at the cask closure system.

For one, we can model the bolts now almost as they're exactly designed and how they fit into the cask. Another thing we want to look at is if one bolt starts to fail, how does that impact other bolts that might be in the series, sort of like a zipper effect start to go down. How does that impact the rest of the bolts in the system?

Little more detail look at the closure. One of the things we're proposing to do is do an analysis again looking at a corner impact. We want to explain something here, maybe use another slide. When we talk about trying to do a test, an analysis of having the center of gravity of the package so essentially the weight in this test, the weight is centered over this point and what we'd like to do is look at a crash or drop test of the package that would be testing to compare with analysis, but have it over in the corner so we could inspect the most damage to the cask as possible.

So when we get into the collision area we like to do this analysis of what we predict would happen in this type of environment and compare that with the test. We're looking at some speed greater than 60 miles an hour and get some suggestions on. What sort of speeds are people interested in and how can we get to those speeds? And then again finally would like to do a pretest prediction, make that publicly available somehow so people can see how the models, how the accuracy, how that is in comparison to a test results.

With that I'm going to turn back to you.

MR. CAMERON: Okay. Thank you very

much, Charles. There is a number of suggestions that Sandia is proposed to do in the study and I would open it up for comment either on those suggestions or on new items and we'll go first to Bob Halstead and, Bob, when you have your one major point on, let me see if I can get some reaction to it also. Go ahead.

DR. MASSEY: Can I interrupt one second for one thing I forgot to add on? In the collision analyses I forgot one thing. We would also look at having simulated fuel weight inside the cask during these collision events to take into account the momentum, forces caused by addition of fuel inside the cask.

MR. HALSTEAD: There were three things that I wanted to speak to so I will do them one at a time.

MR. CAMERON: I'll tell you what to be a little bit more efficient. Why don't you put the three on the table and let's go get some discussion on that and then we'll come over to Marvin and Felix. Do you still have your card up? We'll go to Felix. Go ahead, Bob.

MR. HALSTEAD: First of all, we endorse more attention to modelling the bolts. Everyone knew that was a problem with the first modal study. Consequently discussions particularly we had with people from BNFL, based on their testing results led them to believe, and this is, you know, anecdotal that I'm passing on, that inner strain, inner shell strain as low as one percent might cause bolt failure based on analyses that they had done. That's certainly an area we would endorse paying attention to.

Secondly, the speed issue is complicated by first looking at the speed of the transport vehicle and secondly the issue of whether you also want to consider speed as a factor for other vehicles being involved in a multivehicle collision.

As probably everyone around the table who has got an anecdotal experience with driving on the interstate these days can tell you, at least there seem to be and I haven't kept a hard count, but I seem to see a lot of big rigs passing me at over 75 miles an hour and I have seen fully placarded 1203 gasoline tankers and exotic loads with liquid hydrogen passing me at over 75 miles an hour. So in terms of other vehicles that might complicate the highway crash, I certainly think you need to look at the 75 mile per hour range.

With rail, and Bob I don't mean this to be taken as an aspersion on operating practices, but we have looked at a couple of runaway accidents. I'd like to think through a combination of good operating protocols, administrative controls imposed by regulations as well as the common sense of the railroads that we wouldn't have any runaway trains, but we do have some experience in this country with runaway trains derailing and in some cases colliding with nearby objects at speeds in excess of 90 miles per hour. I would certainly argue that something in the range of 85 to 90 ought to be looked at. And again I'm assuming that we would operate under train operations that are about 55 miles per hour in the western part of the country.

The third issue is the issue of multiple bolt failure. I hadn't heard the word zipper effect before, but that actually captures an issue that we've been thinking about in the context of attempting to model human error. There are all kinds of other ways to get at the human error issue, but I can think of about 20 different types of human error that might result in improper unexpected performance of the lid closure in an accident. And so a question I pose to you, because I'm not sure whether this can be modelled in the cost effective way, but one way to approach the impact of human error in cask performance would be to look at a specific consequence of any number of human errors that might result in a condition like zipper effect around 50 percent of the closure creating a gap say of a half inch to an inch that would effect the block regions above 35 or 40 miles per hour or some -- obviously there is a certain amount of arbitrary judgment call in this. But those are the three things I want to throw on the table but focus on bolts is good. We'd like to see 75 miles per hour for truck and 90 mile per hour for rail speeds and also looking at the speeds of other vehicles impacting them and we'd like to look at some discrete ways of modelling the implications of human error for cask performance under absolute conditions.

MR. CAMERON: Thanks a lot, Bob. Let's see if we can take the bolts and human error together and then go to speed. I realize people have their cards up to throw other ideas on the table, but to sort of discuss this at one time, is there any gloss that anyone wants to add to the -- while it's a good idea we're modelling bolts issue? How about this idea of human error?

Ed, did you want to say something about that or are you waiting for the speed?

MR. PRITCHARD: I'm waiting for speed.

MR. CAMERON: Anything on the human

error? We heard Amy bring this up before. Let's go to -- Susan, do you want do make a clarification?

MS. SHANKMAN: Can we frame that as human performance rather than human error?

MR. HALSTEAD: Human factors make it a little broader. You're right. I stand corrected. I'm trying to learn to communicate better, Susan.

MR. CAMERON: Rick, you want to talk to human performance?

MR. BOYLE: Thanks, Chip. Just to make one point which I think one of the speakers made earlier about the requirement for NRC approved quality assurance programs for design, fabrication, maintenance, use, reuse, all of those aspects of cask utilization. So that looking at human performance you should be done in a context of human performance under a rather rigorous quality assurance program.

MR. CAMERON: This is an interesting point even on emergency response that we had.

Should human performance be factored in assuming that there is an a rigorous and rigorously enforced quality assurance program is the question. Do we have any thoughts on that particular issue? Susan, do you want to say something about that before, for the group?

MS. SHANKMAN: I think we will look at it. I guess I want to couch it in clarification that human performance and most other risk assessments that we've done has been shown to be as much a contributor as a savior, and in many ways it's human performance that has prevented an area and there are only maybe three ways to standardize human performance. One of which is to engineer it, most expensive and most successful. And the other is to proceduralize it which is less expensive and medium in success and training which the least expensive overall and the least likely to predict human behavior. So we can look at it but I think that this is not, unfortunately my personal sense, that this is not so significantly different than any other activity in which humans perform a safety function.

I think we can use some of those insides from other venues and see whether they speak to us here and so I think we should include it in the study. But I don't think we have any clearer sense of what somebody else does of danger that speaks to this particular activity.

We have some in nuclear power plants because it's recorded by procedural personnel in other ways, so if you know of the database I think we really need to know where that is.

MR. CAMERON: Let's explore this a little bit further. The issue is is should the study be done with the assumption that rigorous QA program is in place? Kevin, you want to add something on that particular issue?

MR. KAMPS: Yeah, just the experience of Palisades bears on this again in that I've heard said that quality assurance was in place with the casks of Palisades and that certificates of compliance was in place, but there have been breakdowns at both of those at Palisades.

The quality assurance at CR Nuclear, Incorporation which manufactured the cask system was found to be very shoddy years after the fact upon going back and looking locking at it, inspecting it. Yeah. Just again a three year cessation in the loading of casks because of the explosion in Wisconsin and this summer, the summer of '99, in June Palisades went to load the first VST 24 cask in three years and the whole idea for the three year suspension was to get everything in order and again there were inadvertent hydrogen burns with the casks and this was due to a breakdown in the administrative controls.

So definitely human error and breakdowns in these in these procedures and regulations are contributing factors to something that is unprecedented which is the consequence of an accident that releases radioactivity into the environment of this intensity that any mistakes that occur are long lasting permanent damage to communities and to the land. So that is unprecedented the nature of the material we're talking about.

MR. CAMERON: All right. Thank you. Anybody else on the QA issue? Go to Felix and then Amy.

MR. KILLAR: I think what you have to do when you start looking at things like this is you have to include this with other type things that could occur. You can't single out human error. Certainly we have very extensive quality assurance programs. We have very extensive training programs to minimize human errors, but human are humans and things happen. So I don't think you can avoid it. But at the same time I don't think you need to single it out. I think you can include human error such as other type errors or problems such as you get a bad set of bolts. You have a straight spec maybe as far as a bolt but it wasn't tightened correctly or it was tightened correctly but it's the wrong bolt. I think things like that have to be grouped into a category of others or other impacts or what have you because I think if you try to focus on human error, it's going to be a continuum to where you will never come up with an answer that is satisfactory to all people. Assuming human errors will occur and that's what we do in our industry, we assume human errors occur and so therefore we try to have back up systems and we try to have other things. But when you're doing your study and designs you've got to look at what type of errors can occur whether it's welding deficiency, a wrong bolt, wrong torque or the operator for whatever reason forgot to the put the seal in or whatever could have happened happened and see what impact it has and it's really the consequences of that action not the action itself.

MR. CAMERON: Thanks, Felix. Amy, quality assurance?

MS. SHOLLENBERGER: I just wanted to say that it seems to me like all the other factors that we've discussed, we talked about conservative approach where Dr. Massey has suggested that the impact limiters weren't considered in a crash test because that was the conservative approach. And it seems like this question is the same type of question. So it seems like in order to take the conservative approach you would not consider the quality assurance program because it's like impact limiters, it limits the impact of human error just like the impact limiters limits the impact of a collision.

So I think that in order to do a correct study, a conservative study, you should say yes there is a quality assurance program and yes there is an impact limiter but we're not going to consider those things in our test.

MR. CAMERON: Thank you, Amy. Let's go to the speed issue and then we're going to ask Marvin to put some of his issues on the table. Yes, Bob.

BOB: Before you close that human error discussion, Felix did a really good job of stating some things that I didn't state very well. I just want to clarify. I just want to make two points. One is you have to look at human error in spite of the fact that you assume that you have rigorous NRC approved QA QC programs.

And secondly, as a modelling proposition I'd like to try and sum up a range of human errors, equipment problems, and focus on maybe one, two or three conditions that could result from any number of causes and then try to assess so that we have some quantitative handle on how those effect cask performance.

Felix, I really like the way you -- when I said human error I was covering the whole broad range of things you wouldn't technically classify as human performance. Thing like counterfeit parts.

MR. CAMERON: Thanks, Bob, for that clarification. We're going to go to the points Bob made on speed.

One is don't just look at the speed of

the transport vehicle, but consider the speed of other vehicles. As speed figures to use 75 miles per hour truck, 85 to 90 miles per hour train. I think that that got, Ed wanted -- did you want to say something about that? Go ahead Ed Pritchard and Bob Fronczak.

MR. PRITCHARD: Just want to respond back to the about regulatory and runaway trains. The federal railway administration did take regulatory action after those accidents.

What the train device does for those nonrailroaders in the room, there's quite a few that are not railroaders here, it permits the engineer to apply the brakes from the back as well as the front of the train. And it's done electronically and it's required on freight trains over a certain size and weight and going over certain grade. So we do have those regulations in place right now as a clarification.

MR. FRONCZAK: One of the advantages assuming, or with the use of dedicated trains, would be you could use electronic brakes and apply the brakes much more quickly at the speed of light instead of speed of sound and do that instantaneously you decrease your stopping distances or increase them by like 30 to 50 percent.

As far as the speeds go you recommended 90 miles per hour. I don't know if that's the right speed or not. I think you are right. I think we would like to see track speeds, normal track speeds for freighter approaching 70 miles an hour out west and you could have two trains doing that or you could look at 55 miles an hour for this shipment assuming that spent nuclear fuel would be transported at two trains speed and then another train coming in at 70 miles an hour.

MR. CAMERON: Thanks, Bob. That goes to a couple of issues. One is the speed not only of the transport vehicle but the speed of the other vehicle and you said normal track speed in the west, so I guess that's a regional variation. Much has been suggested along those lines looking at regional and seasonal variations.

Let's go to Dr. Lee for a comment. We're on speed, Henry.

DR. LEE: I have a comment on speed because the study we are performing and also in the regulation is the impact and of course you know considering the two vehicles hit each other and the both have speed, but then this is a more realistic situation in the real world, but I think that the unyielding surface is not a realistic assumption and if we're going to look at this very severe impact with such a high speed, then we will really have to consider real objects and we'll have to -- impact energy has been shared by both objects and not just by one alone.

MR. CAMERON: Thank you, Henry. Do we have other comments on speed before we go to Marvin? One final or perhaps two. Go ahead, Felix.

MR. KILLAR: I just want to say on speed we agreed that I don't think we need to go any more than 90 or 100 miles an hour for speed on the rail lines. The other thing I think we need to be careful of is you talk about head-on impacts either by trailers or head-on impact by trains. While you don't want to see that happen they have happened from time to time. But if you start looking at those type of scenarios you need to put them in realistic scenarios and that that cask is not out of the head of the cab of the train or out of the head of the cab of the truck and so you do have quote unquote impact limiters whether it be the locomotive or the cab.

You need to make these things realistic as you start looking at these analysis and don't go off on a wonderful analysis that don't make sense to life.

MR. CAMERON: I think that that's a point we're going to come back to as a general point. How are these various accidents, other things that are being considered, how is the analysis supposed to be bounded?

Eileen was talking this morning about

the risk in forming the setting of priorities. That can be looked at and studied. I think it's an important issue and I believe later on in the day Mike Wangler and others may have something to say to that. Let's have one final comment on the speed issue then I want to go to Marvin Resnikoff. Rick?

MR. BOYLE: Thanks Chip. Having just come back from four years in the international arena, I can tell you that the issue of something like test speeds probably get more attention than any other issue by all modes of transport. The international maritime organization, the international aviation organization are all interested in package performance for their mode of transport. There are studies underway for air transport, for example, to look at what are the forces transmitted to a package. And so you end up recognizing that one has to consider impact velocity, angle, orientation, crush of the conveyance, softness of the target, and the relative stiffness of the package on the target.

So it's a very complicated and complex modelling and undertaking. But I think as it's been said the important thing is using real world speeds to use real world targets and real world crash scenarios.

The British, for example, crashed a locomotive at 100 miles per hour. That's a real world speed in a real world scenario and the damage was minimal because there was nothing behind the cask so it went bouncing down the tracks. So there are many different analytical techniques that can be used to predict performance, but in both cases you have to use apples and oranges if it's an unyielding target then the speed has to be modified to reflect what a real world target will be like.

MR. CAMERON: Okay. Thank you very much for that, Rick. Marvin, would you like to put some issues on the table for us for discussion?

MR. RESNIKOFF: Yes, I have three more issues I want to put on the table but this relates to what was just raised about realism, but it goes in the other direction.

First, there is the issue of how heavy these containers are. Do you just take into account the cask? Do you take into account the cask plus the fuel plus the impact limiters? Yes. Or do you also take into account the rail carriage? Does that also have to be taken into account?

For instance, if you have a high star one hundred cask you're talking about the impact limiters 145 tons. But if you include the entire carriage including the, what do I want to call it, the skiff that holds the cask itself it goes up to 211 tons. Is that the weight you should look at when you look at a collision? I would argue that it is. I would have that entire package in a sideways impact to a hard rock surface and that would be one of my bounding accidents. Because it's a credible accident.

I want to bring up another issue which was raised at the National Technical Waste Board, a Nuclear Technical Waste Board meeting and that is the issue of where are these casks actually sitting in the train? Are we having a dedicated train or are we having a heavy cask sitting next to the locomotive or are we having the heavy cask sitting at the end of the train with a bunch of light cars in between?

It's important to have the actual model of how the train is designed. Because if you have a heavy car at the end of the train and there is a, you know, derailment, then the whole cask can go flying if there are a bunch of light cars in between.

Finally, I want to raise an issue that was raised earlier which is cask wrap around an abutment. The modal study looked at casks wrapped around an abutment and also more recent versions of the modal study, which should come out by Lawrence Livermore, which looked at a truck cask. But they did not, they looked at the effect on strain, but they did not look at the effect on welds and bolts. That's an important issue when you are looking at casks wrapped around an abutment. What is the effect of that on that on the welds and the bolts?

MR. CAMERON: Great. Thank you, Marvin. And let's explore that first issue. What weight is considered in the collision and Marvin was suggesting that the weight of the container should be considered, the weight of the under carriage or skiff, I'm not sure what the correct terminology of that is. Are there comments on what weight should be used?

Charles, do you want to give us -- is there a usual assumption that is used in this case?

DR. MASSEY: As Marvin noted there have been differences in what they have assumed is the weight. What we are suggesting for the package performance study is that we assume or take into account the weight of the impact limiters, weight of the contents inside the package and then the package.

We'll certainly explore your comment of whatever the transport vehicle is either for the truck or rail car, that additional weight. Then we also have to balance that against too in the consideration of now that cask may also be protected somewhat by the undercarriage. It's not always cask is flying off, has all that weight of everything behind it if it's still attached to the rail car or to the --

If your suggestion is that we look at that whole envelope of activities, I think that's certainly something we'll take a look at.

MR. CAMERON: Other comments on what weight should be considered? Rick?

MR. RAWL: Thanks, Chip. Just a consideration that the tie downs would play an important point because as the dynamics of the accident progress, the cask in all likelihood will be removed from the rail car because of failure of tie down and it would be relatively low G forces that would happen. So considering whether to take the weight of the rail car into account is you know depended on the dynamics one is considering. The skid that it's mounted on most likely is going to stay with the cask because it's typically very securely mounted in the skid, but that the skid is tied down to the rail car in a different way.

MR. CAMERON: Thank you. I think Jack Edlow has a comment on that. Go ahead, Jack.

MR. EDLOW: Is it not considered the design that the cask should break away from the car to move elsewhere as it's done in other packages that are supposed to eject from the vehicle so that they're removed from the accident. Is this not necessarily a design feature?

MR. RAWL: It ends up being that way because the tie down attachments on the package itself has to meet the NRC requirements. Whereas, the tie down to the rail car meets the DOT requirements which are not that stringent. And you are right, in the end it's a good design approach because that avoids having the tie downs causing failure to the package.

MR. CAMERON: Thank you. Henry, do you

want to give us a little comment?

DR. LEE: Yes. Regarding the weight of the cask, the content of the cask, and the impact limiters, they are all considered as part of the package so it's always considered. Actually it may be a secret but most casks that were reviewed and certified was tested, at least simulated test.

Rick just said that the tie downs, the NRC requirement really is very stringent and actually probably is more stringent than any country in the world because this is one part we are not completely in compliance with. So most likely it's going to break away from the vehicle in a severe accident.

About those shipping skids, these things probably if it's attached towards the package probably will act as additional impact limiters and absorbing energy.

MR. CAMERON: And thank you. Everyone keep in mind that the suggestion that Marvin and others are making, although there may be opinions around the table on this, that suggestion, those suggestions will ultimately be considered by the NRC and Sandia in formulating phase two of this project. Let's not lose sight of that.

Marvin, do you have a follow up on your weight issues?

MR. RESNIKOFF: Actually I was hoping the moderator would be Jerry Springer and not you so we could just have it out.

MR. CAMERON: I'll try to create some hostility here. I though you people would create it yourself.

MR. RESNIKOFF: You're calming everyone down and we want to get at it.

I wanted to respond to what Dr. Lee said. The whole tech design that I have looked at, the one that has 145 ton cask and 211 ton package, are you telling me that it's only a 2G tie down? Is that your knowledge, yes or no?

DR. LEE: No.

MR. RESNIKOFF: What is the force? Is it 2G or more? It's more is the answer.

MR. CAMERON: Is that the answer, it is more?

DR. LEE: Yes, it is more than 2G.

MR. RESNIKOFF: So why did you tell everyone it's 2G force, it's all going to break away? That's not true.

DR. LEE: As you know I am NRC and I don't know exactly what is the tie down of requirements for rail cars or highway trailers. I think they are more 2 Gs. NRC tie down requirements is 10 Gs in the direction of travel, 5 Gs transverse the direction of travel and the 2 Gs in the vertical direction and all these three component of forces apply the same time simultaneously. So at least to the attachment point of the package is this 10, 5, 2 G. So these think about the weight of the package. These tie down forces are very, very large and we have been criticized by many people that this 10, 5, 2 Gs regulation is not developed when we have such a big heavy cask, packages in mind.

MR. CAMERON: Let me just -- Marvin, did

you get, did we get the correct answer out on the table for you?

MR. RESNIKOFF: No. The regulations are one thing but actually how the design is is another thing. I've looked at a design and I'm going to go back and look at the SAR and actually get the number and I'm going to send it to Dr. Lee.

MR. CAMERON: Thank you. Thank you very much. Let's go to the next issue that Marvin brought up which is, I take it, a recommendation that the study should consider where the cask is cask located on a train. I would imagine that the answer would be different for a dedicated train, obviously I suppose, versus an undedicated train if I could use that term.

Ed and Bob, do you want do talk about that? Go ahead.

MR. PRITCHARD: The requirements on train placement are the same for dedicated train and regular freight train service. It's a one car train placement for an occupied caboose or locomotive.

MR. CAMERON: And, Bob, do you want to add to that?

MR. FRONCZAK: I think in practice what we have seen is a buffer car between locomotive and first cask that's usually a gondola or flat car. We think there are some things you can do. First of all that buffer car ought to be a similarly weighted vehicle and if it was a gondola let's say with some stone in it, it could actually act to absorb energy in case of a derailment.

MR. CAMERON: Okay. Thank you. Anybody else on the -- Bob Halstead?

MR. HALSTEAD: Two aspects of this issue are -- again I hate to think of these casks being transported on general freight trains, but to the extent that that's still possible, even with buffer cars properly placed you still have to consider the possibility of interaction in a derailment with other hazardous materials.

We ship a lot of mining explosives out

west. We ship, and I've had some experience, one horrific one in Roseville, California, humongous military shipment accident, bombs in this case.

There are other kinds of complicating hazardous materials. They fall in a number of categories. Ones people usually think about are flammables or explosives but you also have to look at cargoes like PVC chips that can fuel a long sustained high temperature fire and chemicals like acids that might both complicate the response which I know in this exercise maybe we're not looking at it, but may also have an impact for example on cask components themselves. The last and probably less important but certainly the flammables and explosives need to be considered. I would argue that you have to look at these mixed loads two ways.

One, the interaction between these other cargoes and cask car if the cask is being shipped in a mixed freight train, but you also have to look at the possibility of a two train collision even if you are using the dedicated train for the spent fuel cask and the possible interaction and I'm particularly concerned about mining explosives and military weapons being shipped by rail also.

MR. CAMERON: That's the similar point that you made in our first discussion about what accident scenarios should be considered. We're going to talk about Marvin's last point and then we're going to go over to Amy Shollenberger for her general comments on this.

Marvin's last point cask wrap around an abutment, don't just look at the impact on -- look at the impact on welds and bolts. I see Bob Halstead is definitely shaking his head.

MR. HALSTEAD: A minor clarification since that was my point. Yes, when I brought it up earlier we were talking about looking at the wraparound on different cask designs and materials, but Marvin is absolutely correct. It might even be more important to look at the impact of the wraparound on the performance of the bolts, closures and seals.

MR. CAMERON: Anybody have any other comment on that particular issue? Let's go to Bob Fronczak and then Ed Pritchard.

MR. FRONCZAK: These are a few points I wanted to make anyway, but we do think that the original study focused too much on relating accidents to the regulatory test conditions and not enough going to real accidents. So we do think you ought to spend some time and look at what can happen. And we already talked about what our real surfaces, rock surfaces, bridge abutments or whatever. I'm sure you will address that.

The other thing is a locomotive sill. A locomotive sill is a very strong structure. It's going to be in every train that is transporting spent nuclear fuel, so it does have a real possibility of impacting a cask. And I think the modal study looked at that not on a point basis but on more of a distributed load basis. We think you ought to look at it on point of impact.

MR. CAMERON: Could you just say that

term again? A locomotive --

MR. FRONCZAK: Sill?

MR. CAMERON: S I L L?

MR. FRONCZAK: S I L L, yes.

MR. CAMERON: What is that for those of us who don't know?

MR. FRONCZAK: It is the structure of the locomotive. It is the mainframe of the locomotive.

MR. CAMERON: Thank you very much. Ed, do you want to add on the --

MR. PRITCHARD: I just want to remind NRC to look at our Part 174 for train placement requirements that covers not only the radioactive material next to locomotives and occupied cabooses but also next to explosives and other hazardous materials. That's all.

MR. CAMERON: Okay, thank you very much. Eileen do you have a point on the wrap around?

MS. SUPKO: I think in trying to assess what have been termed real world accidents, whether it be the wraparound type conditions or others, the difficulty is going to be in saying what's a real world accident? Where do you set your bounds? What are the limits? You can keep adding condition, upon condition, upon condition until you have something that is no longer real world but is extraordinary and isn't an accident that could happen. I think you need to be very careful about defining what those real world accidents might be.

MR. CAMERON: Again, I think that underscores the need to perhaps have a specific discussion of this whole idea of bounding real world conservatism that we've been talking about. There is a tension there and I think we need to have a discussion on that.

Henry, do you have a quick comment on the wraparound issue?

DR. LEE: I think the impact wraparound accidents are very import. We should look into it, but I would like to point out that the cask has many layers of protection. We have inner shell one and a half inch thick and we have gamma shell several inches and then we have outer shell two and-a-half inches thick and then outside of that we have absorbing materials. All these things in the real world will absorb energy and even hit the real hard object.

The weight of the package is so great and it's hard to think that the object will stay stationary or no damage or no yielding. But like I say you know this is a good comment and we will look into it. Besides the material we use to construct these packages very ductile and it can subject to a large deformation without breaking. So I think we have adequate protection.

MR. CAMERON: Okay. Final comment on this before we go to Amy? Go ahead, Bob Fronczak.

MR. FRONCZAK: Follow-up to you, Eileen. There is a database, fairly comprehensive database that we've got that's got tank accident data for years and that's one of the ways we have improved tank cars significantly over the years. So that might be a place to look at what are real forces that are experienced in accidents.

MR. CAMERON: Thank you. What we're going to do is go to Amy for her issues and then I want to quickly go to the audience and then I want to go into collision by fire so that we can collision by fire. You know what I mean. Go ahead, Amy.

MS. SHOLLENBERGER: I will be quick. I just have a few points. First of all, I just want to reiterate as often as possible that public citizens would like to see full scale testing done with real casks. Just to make sure that's on the record.

MS. SHANKMAN: Full scale testing with real cask. Can you just say a little bit more about real casks?

MS. SHOLLENBERGER: What I mean by real cask is one that has been constructed not a computer simulated model. I know you all say you plan on doing that.

MS. SHANKMAN: So you mean a physical test?

MS. SHOLLENBERGER: Yes.

MS. SHANKMAN: As opposed to a computer model?

MR. CAMERON: We have a whole discussion area on this issue so we'll bring it back then.

MS. SHOLLENBERGER: I'm not advocating putting fuel rods in your -- also I would like to again say I think we mentioned route specific data but I would like to bring it up again in collision data.

Also I have two questions and these are questions about whether this is a good idea or not because I'm not sure. I would like to see what would be, if it could be in the study what could cause the cask to create a release? Rather than trying to think of accident scenarios and then testing those scenarios, can you say here is what would compromise the cask. This would have to happen.

And then the other question I have is I

know that on the trains buffer cars are required in between the casks and I know in the study you have a picture where if the train crashes there is a thing with the couplers that makes it stop before the casks run into each other. My question is if the train derails and there is more than one cask on the train, can we look at likelihoods and impacts of cask-to-cask collisions? Because as you said these casks are the various things that we make and maybe if they run into a bridge abutment it's not going to compromise it, but what's going to happen if two casks collide with each other and is that possible?

MR. CAMERON: I want to get the answer to the first question which I believe Charles could probably give us an answer to. In other words, in the study Amy is suggesting look at those accident scenarios that would create a release and this may get us back into the bounding issue again, but if you could just briefly give her some information on that and then we'll hear something about the multiple casks colliding. Do you want Jerry to answer that?

DR. MASSEY: I think one of the things that will come out of the study is we look at these severe accident regimes, unyielding surfaces and go to some yielding surfaces of two trains colliding. One of the things that we will be able to tell is get better models that can predict cask performance and then we can start to get some feeling for where in these regimes might we see the releases of material from the package. Something we can vision as coming out of the package performance study.

MR. CAMERON: Thank you. Bob, you want to talk about the multiple train derailment, multiple cask.

BOB: One piece of technology that we use all the time, and this is primarily on hazardous materials transportation, it's what's called shelf couplers where you have something restraining the couples from becoming uncoupled so the cars stay coupled in a derailment and that eliminates or greatly reduces the possibilities of the vehicles impacting each other. You see that commonly in an Amtrak derailment where the cars don't come apart because you don't want the cars impacting each other.

You bring up a good point and it goes back to the tie down requirements. If you have lose tie downs where the casks come off, then the casks can impact each other. We think that it's probably a better idea to keep the casks on the car and then keep the car parked.

MR. CAMERON: Okay, thank you very much. We're going to have one last comment at the table in regard to your first point. Amy and then I want to see if anybody in the audience has anything to say. Go ahead, Eileen.

MS. SUPKO: While I think that the exercise of attempting to test to destruction a cask might be interesting academically. I don't see the point of it under real life circumstances and I think that as, I mentioned earlier, we need to keep this study focussed on what is real, what are the bounding conditions that a cask might actually meet under real transportation conditions and use that to frame the study.

Academics aside, yes, it would be interesting what would we have to do to this cask in order to destroy it and cause a leak, but I think everyone agrees as I mentioned earlier, the current regulatory framework exists that makes these casks safe for transport and we don't need to push things to the limit in terms of trying to see where the pie in the sky accident, it's not going to occur, what that might result in.

MR. HALSTEAD: I don't necessarily disagree on testing a failure mostly because it's difficult to do that in the real world. But I think modelling the failure, and I'm familiar with some of the work that the mechanical engineering group at the University of Reno did, University of Nevada at Reno did under DOE funding to determine failure thresholds by say running the regulatory fire. Actually I should say that, make the general point here that determining failure thresholds, some of us feel is very valuable, but it doesn't necessarily have to be done through full scale testing. I like full scale testing for other purposes but it isn't necessarily, I think, just an academic exercise, because in public meetings with people when you tell them how robust the casks are the question always comes up just how good are they? Where is the failure point? Some studies already tell us where that probably is for thermal. I don't know where those points are for impact.

MR. CAMERON: Thank you, Bob. Anybody in the audience who wants to comment on the container performance collision issue before we go on to the container performance and fire? Bob just talked about a failure threshold there so we're going to get into that.

Charles, would you set up the next topic for us and I believe that we're also going to have another member, an expert from the NRC staff come up who we will introduce as soon as Charles is done with his set up. Go ahead, Charles.

DR. MASSEY: The next topic is the container performance during the fires. In modal study there was a 1B (phonetic) analysis of cask response. They looked at two fires, an 800 degrees centigrade fire which is the regulatory standard and a 1,000 degree C fire, very simplified version of cask response to the thermal environment.

On the outer edge of these casks where they have the neutron shielding material with some stainless steel layer on the outside, this was modelled as having this outer stainless steel wall in place. Nothing inside here. There was no water under -- neutron absorbing material. But the existence of this couple inches of air gap, stainless steel does act as an insulator to decrease the heating of the cask in a fire. But that was essentially modelled on the cask.

They did look at, during thermal events, that this lead layer inside the structural strength of the cask, that there was some deformation of melting, movement of the this lead which would increase the gamma dose, two people near the cask. Really they focussed on response of the cask not so much of the contents to the thermal environment.

In the NUREG 0170 reevaluation, we looked at the fully engulfing chromium fuel fire. Essentially a fully engulfing fire as we look at a cask suspended in air, completely engulfed by the fire, so there's no heat loss or shielding or offset distance that would pass from the fire to try to get the maximum heat meet load that we could into the cask.

We looked at that thermal environment on the ordinary cask that we remodelled. Again, we assumed that there was a neutron shield still on the container, but that it does not contain any water or other shielding material. We again modelled, tried to calculate loss of gamma shielding and the impact of that on personnel around the cask and we did take some steps in looking at inside thermal environment. What happens to the contents inside the cask? A little more expiration of rod performance under thermal conditions.

For the package performance study, what we're proposing to do is use a fairly new three-dimensional thermal model that can go into much more detail looking at the thermal response of the cask and its contents to any fire scenario.

We're proposing to model optically dense. What that means there is no heat loss from the fire. Essentially all that heat from the fire is put into the cask a thousand degree centigrade fire. Again, an empty undamaged neutron shield tank so there is some insulating effect of having an outer shield.

One of the things we would like to explore because we don't have a pretty good handle on what the impact of this is on a cask is have the cask lying on the ground. So it has a fire but there is some contact with the cask on the ground because most situations the cask is going to end up lying on the ground to be involved with fires. We want to have a better idea of how the cask responds and is there really any impact of having it on the ground? Any loss of heat to the ground? Those sort of issues.

We also want to take into account that there is spent fuel inside the package and there's been some criticisms in the past that we haven't taken into account that there is heat generated by that spent fuel. That's something we should also take into account as we look at the temperature of the fuel as a result of a fire. We'd like to do those calculations then actually perform a full fire test and prepare model predictions to the test results.

MR. CAMERON: Thank you very much, Charles.

I would like to introduce Mr. Ron Parkhill who is with the NRC staff, Spent Fuel Project Office. Ron has a bachelors of science in mechanical engineering. He's a professional engineer. Before he joined the NRC he was with the Commercial Nuclear Power Plant Industry and also an architect engineer for the industry. He's been at the NRC 15 years and he's the expert on thermal. It's on the team for this particular project.

Let's do what we did the last time and go to those of you around the table who have either comments on the Sandia suggestions. We're going to keep going this, but I will let you do it or other things that they think that the study should address in terms of container performance during fires and, Bob, can I turn to you again to put a couple issues on the table for us?

MR. HALSTEAD: Yes, umh-humh. One category of fire impacts in addition to the engulfing fire that we continue to have some concern about and particularly this is, we have a heightened awareness of this as a result of the potential for propane fires and also one of the Montana rail accidents is the potential for a torch impact.

Generally speaking, we would assume that

that's more of a high temperature short duration and I'm not really ready to give you the full -- this is one of the things I hope to address in more detail in Henderson. One area we'd like to add to this is the torch fire impact.

Secondly, we will be looking at the thousand degree C fire. Again, I can't give you an alternative value right now. And thirdly, I can tell you that we think much longer duration fires, particularly for the rail environment, need to be considered and I'm in the process now of looking at a select group of very severe rail accidents involving fires that have occurred between 1982 and 1988 and we'll be trying to give you some more specific guidance on that.

Finally, I wanted to mention that the thermal testing that I referred to earlier, which for the benefit of the court reporter the principal investigators are Miles Greiner, G-R-E-I-N-E-R and Richard Wirtz, W-I-R-T-Z, at the Department of Chemical Engineering, University of Nevada, Reno. Their primary interest was in looking at fire impacts on fuel integrity. I may mix that issue up. They did some work on fire impacts on seal integrity, but looking at the thermal impact it's hard to separate some of these issues, cask performance from fuel, and if I confuse that issue I hope I clarified it some.

MR. CAMERON: Three good issues for discussion.

Could you explain a torch fire as opposed to other types of fire?

MR. HALSTEAD: Fire resulting from a puncture of a propane tanker or I'm not familiar with the full range of other materials that might be involved in that kind of fire a fire in which a short duration, but very intense flame is applied to a very limited region of a cask and so you are not looking at the distribution of that thermal input of the entire mass of the cask because of the limited region of it.

MR. CAMERON: Marvin, do you want to comment? Anybody have anything to say? Bob, on torch fire? Some facts for the NCR team to consider in thinking about torch fires.

ED: We do have requirements for tank cars on transporting PIH materials and flammable gases. There is a 30 minute torch fire requirement and 100 minute pool fire requirement so it's something you should take a look at and that will also go with the information I gave you this morning on the fire test studies that we did.

MR. CAMERON: Amy did you want to comment on the torch fire.

MS. SHOLLENBERGER: No.

MR. CAMERON: Second issue that Bob raised was the 1,000 degree centigrade value. Does anybody have anything to offer on whether it should be -- yes, Marvin.

MR. RESNIKOFF: I wanted to just generalize that a little. I think the study should look at real materials that are being transported on rail and the flame temperatures for those materials. You should look at profane. You should look at materials that are really traveling the rails not just petroleum and look at the flame temperatures of those.

DR. MASSEY: Also take into account the inventories or assume different inventories of material and if you look at the higher temperature burn for exotic chemicals and also get some idea on the amount of those materials that are shipped. We have inventory that will help us determine fire duration.

MR. RESNIKOFF: If you're looking at probabilities too, you might want to look at what materials would be transported; the amounts, yes.

MR. CAMERON: Okay. Good. Thank you. Felix, you have a comment on the 1,000 degrees and then we'll go over to Bob.

MR. KILLAR: The point I was going to make on what Marvin just brought up, it's important to look at the flame temperature of the various chemicals that's being transported, but it's also very important to look at the temperatures of vaporization to see how much of that is going to evaporate rather than burn or can this stay in a liquid form or gassy state? That makes a lot of difference how long your fire lasts.

MR. CAMERON: Thank you. Bob?

BOB: I just want to follow-up on the probability deal. You could look at a lot of different materials and I think if you look at fuel oil and LP gas you are going to get 90 percent or better of the fires that actually occur. So you ought to focus your look at all these different chemicals.

MR. CAMERON: Thanks, Bob. Rick, Rick Rawls.

MR. RAWLS: Thanks, Chip. In the same way that speed is one aspect of mechanical insult, flame temperature is the one aspect of thermal insult. The NRC regulations specify the emissivity, coefficients and also some other coefficients that go into defining the thermal flux.

In real world accidents you may have a

large pool which is going to be cooler in the center than if you have a small pool because the flame is oxygen starved. So there are many different real world considerations that go into trying to determine the thermal flux to the package, other than just the maximum flame temperature, much less the average flame temperature in other phenomena that go on.

Again, I guess it's just a matter of if the studies look at real world accidents it should look at it in the real world situation as well.

MR. CAMERON: Look at the entire context I think is something that Felix was saying too. Bob?

BOB: Quick add-on and point others have raised. In looking at those real world fire environments, it's also important to look at environments that may affect fire one way or another such as presence of a fire occurring in a tunnel, fire occurring under a interstate overpass where there may be an depression underneath that contributes to a pooling and also in terms of the way that the fire is fueled. It's important to consider a variety of sources.

It's possible that you could capture this or envelope all these in the construction of the pool fire, but it's important to remember different sources of flammables which could be a tanker travelling either by rail or by highway. It could also be a stationary storage force like a petroleum storage tank located near a highway. Very common, for example, with liquefied petroleum gases and also you have to look at the potential of fire being fed by a pipeline and you have some experience with accidents that have occurred on top of pipelines co-located right of ways and other cases where trains derail on top of pipelines. One famous one in Las Vegas and fortunately there was just enough soil to prevent rupture of a pipeline. So endorse the concept at looking at real world but look at that broadly both in terms of sources of sources of the fuel for the fire and then the environment that actually contributes to the duration and of temperature of the fire.

MR. CAMERON: I was going to add this not only refers to temperature but also duration. Bob, you said particularly for rail. I think you are going to be developing some more information on this. Do other participants around the table have comments on the duration of the fire, types of fires that should be considered or effects of fire by the NRC and Sandia? Kevin Kamps.

MR. KAMPS: Just a quick comment that came up when emergency response discussions took place earlier and that is talking about combinations of real world things that no one would think of. If there is a material on the train, there may be different materials, some that are explosive in the presence of water where the emergency responders try to put out a fire with water and cause a worse condition. So these are the complications that need to be looked at.

MR. CAMERON: That's an interesting

one. Felix, do you have one comment here on duration?

MR. KILLAR: Well, actually mine is on responders which goes a little bit to duration. I think what you have to do is assume that the responders will not be there for a number of reasons. As pointed out earlier in the current situation they vent the fires and therefore don't try and put the fires out. If you look at the forest fires in the West now, the idea is to possibly not put the fires out.

I did want to point out a little bit on responders and that when you started looking at these instances, you can't look at responders as completely separate study, things on that line. Responders can either be a help or hinderance. So clearly the responders in trying to help or not make things worse best thing is not to consider responders in this particular analysis.

MR. CAMERON: Is that the point that you were going to make previously? Okay. Great.

Amy do you have one point to add on what

Felix just said or a question for him?

MS. SHOLLENBERGER: One.

MR. CAMERON: Okay.

MS. SHOLLENBERGER: Well, first of all I'd like to say that it seems like the venting only is true on the trains. It seems like if there is a truck accident where there is a fire, emergency responders are not going to get it. Just burn out. Especially if it's on a highway where there are other people around that they're going to come and put out the fire.

What Felix said also got to the point and again this is just a question because I don't really know the answer not being a scientist.

In the study I remember reading that even if the cask was compromised and rods exposed, they wouldn't go critical unless there was some material present such as water to allow the neutrons to interact with each other and it seems like that could be a really important question around emergency response. If something happens to the cask and it's compromised and a fire truck comes up and sprays water on it and water goes in and the rods go critical and that could be a major thing. I think it's something that's worth looking at.

I would like to make one more quick comment and that is this is a public involvement question. I think one way to involve the public is to really make sure all the information is easily understood. You are trying very hard to do that, but I would like to point out that both in the study and in the summary all of the temperatures were in Fahrenheit.

MR. CAMERON: That's a point well taken is to do a better job of communication of this information.

MS. SHANKMAN: Particularly 0170 update, we're going to have a summary like we did for the past modal study and the agency editors hopefully will do what they have done in the past which is insist that we give both values and more familiar values, so familiar to you and me.

MS. SHOLLENBERGER: The question is moot

to me because I don't know what it is.

DR. MASSEY: 1,000 degree centigrade is about 1850 degrees Fahrenheit. The 800 degrees centigrade is 1,475 degrees Fahrenheit.

MR. CAMERON: Thank you. Let's go to Jack, do you have comments on these?

MR. EDLOW: Yes. Thank you. I guess I have a general comment about many of these points that have been discussed over the last hour or so. I think the current standards that have been developed and have been accepted by the United States and the international community, were not arbitrarily selected. And the United States is part of a new national regime that has agreed on certain standards by which packaging is designed and tested and that accident conditions are applied for purposes of the package criteria.

I'm not prepared to sit here today and urge you to redevelop the international standards and I think that you have to bear in mind that the U.S. standards and international standards are set on a basis that are used to qualify existing packages. Any discussion that these would be inadequate or that somehow we have to test at a higher level, we have to design at a higher level, I think under cuts, potentially undercuts international standards and U.S. regulatory situations. So I would urge you to be very careful how you go forward with this process because this can be misconstrued in some ways by not just the public but by U.S. government officials that somehow what's been done up to now is inadequate, which I think it is not based on NRC policy at this time. Thank you.

MR. CAMERON: Thank you, and we're going to go to Felix and then we're coming back over the Marvin. But the point you raised not only in terms of undermining the standard point, but I guess it is a legitimate question in terms of how you bound the feasibility of what happens.

Discussion, thread that's been running through these discussions is how do you consider the existing regulatory structure including QA, etc., etc., in deciding what accidents you are going to look at. I think we will revisit that. Felix?

MR. KILLAR: I just wanted to bring up two points. As far as use of water putting out fires, whether it be train or truck, the fire departments use their discretion. We had a very good instance in Springfield, Massachusetts a number of years ago where we had a new fuel shipment that was on a truck involved in an accident on the interstate. The fire department elected not to put out the fire but it was their concern that the run off could cause contamination and what have you, which ended up being a worse fire for the container although it came out fine, but as a result of it they burned up a truck. So whether they use water or not is certainly at the discretion of the fire department particularly chemicals we're carrying like PCPs. The fire department will not use water or foam on PCPs because they're afraid the run offs will cause more of an environmental impact and would rather let the stuff burn up.

Assumption that you won't use or will use water is not, I think, a good assumption. You're just looking for the worse situation.

Similarly with water and criticality for a fuel cask, whether it be new fuel or spent fuel, that is taken into consideration of design and the assumption is that in the event of an accident that the fuel will reconfigure into its most reactive form will be with water and it has to be assured it will not go critical under those circumstances. So once again water is not an issue as far as criticality of a cask in an accident.

MR. CAMERON: I guess Amy's point really went to the criticality issue which is our next topic of discussion.

MR. RESNIKOFF: Two quick points I wanted to make. With regard to this new study that you are suggesting, and the neutron shield tank, I note that the old modal study had used the neutron shield tank or water tank and assume that water was not in the tank. The effect is that it served as an insulator in a fire and essentially reduced the effect of what the fire would be.

Similarly, you are going to take an undamaged neutron shield tank and I think rather than that I will take a damaged neutron shield tank and in other words I would see exactly how the shield tank decreases the heat input into the cask and see whether if there were not, if the shield tank were damaged how that would effect the heat input to the cask.

The second point I want to make also concerns fire, but it involves how one evaluates the consequences. In some of these older studies they assume that deficient products that might get out of the cask plate out on the cask wall and it accounts for reduction in the amount of material that can get out of the cask. I don't think that's proper in case of a fire. When you have hot walls, hot cask walls, whether the material will actually plate out on those walls.

That's an issue that I would also like

you to look into whether there will be plate out of fission products on the cask's walls.

MR. CAMERON: That term was plate out.

MR. RESNIKOFF: Yes.

MR. CAMERON: Charles, do you have a question for Marvin?

DR. MASSEY: I just want to follow-up with Marvin for a minute. When you're talking about the damaged neutron tanker, are you looking at, consider it being crushed so it's flat up against the inner container?

MR. RESNIKOFF: Precisely.

MR. CAMERON: Ask the audience if there are any questions or comments on container performance in the fire area before we go to a break? Okay, let's take a break. It's about 3:19 by my watch. Let's be back and we'll start at 3:45 with the spent fuel criticality issue. Thank you.

(Pause in the proceedings.)

MR. CAMERON: Can we have two more substantive topics, so to speak, before we revisit some issues from this morning on process, the whole relationship of the 0170 update to what's going on here suggestions from all of you on how the NRC can keep the public involved in this process.

The whole issue of what I'm calling the bounding issue that we mentioned and I'll talk to someone about trying to put that into perspective for us for discussion. You will note that these two topics, the next two topics spent nuclear fuel assembly behavior in accidents, physical testing and computer simulation that we already had a number of comments on, are shorter on the agenda and maybe even shorter in real life perhaps, because I do want to get you out of here by 6 o'clock. We will finish at 6:00 and note that you can submit written comments. Rest assured, though, that the comments that you gave to the NRC today are just as good as written comments. In other words, unless you have something to add, a finer point to make, don't worry that you need to follow them up with written comments because the staff will consider the comments that have been made today. I want to do assure everybody of that.

Rob Lewis, who we introduced earlier today, he is the expert on criticality who is going to be sitting at the table with us to offer any information that's needed. I'm going to ask Charles to set it up for us again.

DR. MASSEY: Thank you, Chip. Before I even get started I would be remiss, I want to make sure I point out so after this meeting if you like you can talk to them, there are two other individuals from Sandia with me here today Dr. Ruth Weiner and Dr. Jeremy Sprung, so if you do have other questions or clarifications or comments please feel free to see them after the meeting as well.

What I want to very briefly introduce is a little topic session on the spent fuel assembly behavior itself in the event of collision or fire. The modal study estimated the number of rods that could be damaged in a collision or a fire based on one more collision essentially the -- how much damage did they expect on the inner cask wall and then they related that to some estimation of the number of fuel rods that would be damaged.

Then once they assumed that they had some fuel rod damage they made assumptions based on some previous studies not particular to transportation to see how much material in the fuel rod could get out into the cask. Once the material was in the cask they assumed that all of that would be released into the environment.

In the 0170 reevaluation under -- Sandia calculated looking at the impact and thermal forces calculated the fraction of the fuel rods inside the cask that would be damaged. Then once we had some damaged fuel rods we then calculated how much material inside the fuel rod could be released to the inside the cask. Then once we had the material inside the cask we did calculations on how much of that material would be deposited inside the cask and depending on the thermal or environment and then how much could be released in the environment. So much more detailed calculations on fuel response in the event of a severe accident condition.

For the package performance study we'd really like to get into, instead of using some of our best engineering judgement and calculations do some laboratory skilled experiments to get a much better handle on the fuel behavior itself in the event of structural and thermal forces.

One thing we'd like to look at is the rod failure. Try to get some better handle on how many of those could be expected to fail in collision and thermal environments. Also, look at inside the fuel assemblies themselves. Inside the fuel rods are ceramic pellets. What we'd like to look at is how did those pellets also perform? How much breakup could you get in those pellets particularly in a collision type environment, so we have some idea how many very small particles could be produced -- one could partially get outside the cask.

Breakup of deposits on fuel rods, another criticism has been when the fuel rods are in the reactor in the storage pool, we get deposits on the outside, the CRUD. In a collision environment or thermal how much of that CRUD that was on the fuel assembly, how much of that would come off? So we'd like to get a much better definition on how much of that material would be available for potential release.

Also have on there the particle beds. There's been a lot of talk on if you have a fracture of the fuel rods and small particles build up, how much of that could come out, but also realizing that there's other material at the bottom that has to be essentially filtered through that bed of material. So we'd like to get some data on the effect of particle beds.

Then I guess really the overall is to get a much better definition of how much material that's inside the rods in the cask is available in the release mechanisms for a damaged cask under thermal and structural conditions? So with that I will give it back to Chip.

MR. CAMERON: Thank you, Charles. Does anybody have anything to add to what Sandia is proposing to do in the study in regard to spent nuclear fuel assembly behavior? And let's go to Marvin.

MR. RESNIKOFF: We've been considering these issues because they've have been concerns to us in the PFS proceeding in Utah. So I have four different points I wanted to raise concerning them.

One is Sandia should look at higher burn on fuel than the standard 33,000 per metric ton fuel. It can be cooled for five years but it should be higher burn on fuel than previously considered and more representative of fuel that may be shipped.

We're particularly concerned about the cladding. You actually look at cladding which has been irradiated. It has been in the reactor, you know, for the appropriate length of time rather than just to take unirradiated cladding.

We would want you to faithfully consider the properties of irradiated claddings when you do the studies.

We looked at the analysis that has been done previously by Lawrence Livermore Lab concerning breakup of cladding. There is a paper that was done in 1987 which is inconsistent with the modal study and shows that cladding is damaged when the G forces on the order of 60, 60 G., not 100s of Gs but a much lower amount. You should look at that study. I'm sure you are allowed to look at Lawrence Livermore work even if they don't have the funding for this project.

Finally, there are two other points. We would like you to do a dynamic analysis of what happens if cask is dropped sideways. In other words, you ever cladding and then you have fuel pellets inside the cladding and when the entire rod drops, the cladding, the pellets inside may act as, I don't know how else to describe it, but a hammer force. An additional -- rather than consider simply the cladding weighing an additional amount to account for the fuel pellets inside the cladding, actually consider the cladding as a separate rod. Actually consider the pellets as a separate rod inside the cladding and consider what would happen dynamically when the entire rod falls sideways.

Finally, the radionuclides that you consider inside the fuel assembly should include, and they weren't included in the original modal study, should include americium 241. That wasn't included in the original study and chlorine 36. That also needs to be included.

DR. MASSEY: Look at really a much more representative inventory inside the spent fuel assemblies representative of the higher burn up and higher enrichment fuels that we expect would be shipped. Does that pretty much get to the point?

MR. RESNIKOFF: Yes.

MR. CAMERON: Let's go around to others to examine that point to see if anybody else has anything to say. Bob Halstead?

MR. HALSTEAD: I know probably everyone is getting fatigued like I am, but we have two specific values. I'm sorry we have two specific types of spent fuel that we'd like to suggest for evaluation purposes.

While we have a lot of questions about the selection of the typical fuels that DOE has identified in the draft EIS, if we use a bounding approach to this we're comfortable saying that one of the spent fuel types should be the spent fuel that DOE has identified as the quote unquote typical spent fuel to be shipped to the repository. That fuel would be, and I'm trying to make this less difficult for the court reporter, Westinghouse 17 by 17 Lopar, L O P A R assembly, that has been cooled 26 years after withdrawal from the reactor that has a burn up history of about 40,000 megawatt days thermal. It has an initial enrichment of about 3.7 percent. Now that's one fuel type that you should use that all other things being equal may end up being typical of the fuel that is the predominate fuel shipped over the next 40 years or so if the Yucca Mountain goes forward.

On the other side, we would suggest as an upper bound the fuel characteristics that the commission accepted in NUREG 1437, which is a comparable type of PWR fuel, but in this case it's only been cooled out of reactor for five years, it has an extremely high initial enrichment by current practices of five percent and a very high burn up by current practices, 62,000 megawatt days thermal.

Again, going back to the very earliest point that I made, we're uneasy about single value analyses and document like this and we may not always agree, Felix and I or Eileen and I, on the particular values on a bound, but I do think the issue we brought up we do want to try and take some kind of a bounding approach here because there is a lot of uncertainty about what will actually be shipped and the uncertainty has to reflect the utilities need to manage the fuel in their pools.

There are some utilities that are going to exercise their contract rights possibly and ship very hot out of reactor fuel as opposed to shipping fuel from dry storage. DOE may decide that it wants to receive some hotter fuel because they haven't decided on their thermal loading strategy. And on the other hand, we all know that a lot of the fuel in the inventory is very old and less radioactive and less hazardous than the fuels I've just described that indeed it may turn out that the oldest fuel first philosophy is shipped, that fuel that's been cooled 30 years may be early in the queue. So a bounding approach to the characteristics of the fuel that you select for analysis is absolutely important.

I'm going to waive the other comments that I have because it's late in the day and I will get more into the subject in detail when we meet again in Henderson, Nevada. Thank you.

MR. CAMERON: Thank you, Bob. Kevin, do you have a point on the type of fuel?

MR. KAMPS: Yeah. I just wanted to also

address that point that what actually is going to be shipped needs to be taken into consideration. At the Big Rock Plant in Michigan that being an experimental reactor, there were fuel claddings that were experimented there, that were tested there; fuel rod types; plutonium fuels that were tested there. And again with the Palisades cask defects, the deterioration of the fuel in those casks, what will the fuel be like that's actually transported? If it is deteriorated to a significant extent, how will it behave in an accident? So just to reemphasize that.

MR. CAMERON: Thank you, Kevin. Amy, do you have a separate point?

MS. SHOLLENBERGER: Separate.

MR. CAMERON: Rick, are you on type of fuel or kind of? Go ahead.

MR. RAWL: In looking at some of the information that's presented to us, one of the things that always comes out first in an analysis of cask response are those radionuclides which are first available for release, the volatile radionuclides. Those are the ones that will come out when the cask is damaged minimally. They will come out when the cask is damaged more severely. So the calculations of release are always building on the number or the amount of those volatile nuclides that come out.

So in the bounding scenarios that have been set, I just wanted to point out how important it is to have good numbers for the volatile radionuclides in order to ensure that all the other radionuclides that come out as particulates are being added to an accurate base.

MR. CAMERON: Thank you very much, Rick. Bob, do you want to comment on the type of fuel or you have a separate point? Let's go to Marvin's second point and, Marvin, I'm not sure I captured this one. You were talking about consider the properties of irradiated cladding and you were talking about use the 60 G force. I'm sure others understand what this means and I guess I would ask them if they had any questions about it or -- does everybody understand what Marvin's point is there? I don't need to understand. But is there anybody else who could use an explanation of it?

Marvin, could you just explain that, that one what you are trying to get to there?

MR. RESNIKOFF: Some of the studies I have seen and I think it's the modal study, too, look at the damage done to fuel assemblies, to fuel cladding in particular and they have forces that are up in the hundreds of Gs before cladding is damaged. On the other hand, there is a Lawrence Livermore study that we have looked at which looks at cladding and looks at this particular fuel assembly that Bob mentioned, the Westinghouse 17 by 17 fuel assembly and does a static analysis. In other words, drop it and look at where the spacers are in the fuel assembly and look at the length between spacers and see what the force will be when you drop it, how much it will bend.

Those show damage for forces on the

order of 60 G. In other words you only have to drop the cask on the order of a couple feet to get that kind of damage level. Even those studies concerned us because we were concerned that the cladding itself may not have all the properties of irradiated cladding. So we wanted Sandia in particular to particularly test cladding which has been irradiated to see if it becomes more brittle when it's irradiated particularly to higher levels and whether it would shatter more easily, you know, with a lower force.

MR. CAMERON: Okay. I thank you for that. I think that that's clear and I would just ask if anybody around the table who has any comments on that recommendation? We do understand it. All right.

Marvin's third point was do a dynamic analysis of a cask that is dropped sideways. Treat the pellets as a separate rod inside the cladding. Now Charles, Rob, do you understand the nature of Marvin's suggestion? Okay. Does anybody else have a comment on that particular point.

The last one goes to the elements americium and forget what the number was and chlorine but those should also be considered. Do you want to give me those numbers again and I'll put it up for people to see.

MR. RESNIKOFF: Americium 241 and chlorine 36. Americium 241 was not considered in the modal study. They looked at fuel essentially that came out of the reactor and americium 241 builds up over time. So in the decay of plutonium 241, americium 241 builds up and so if you can have fuel that's aged five years or longer you need to look at the build up of americium 241 and fuel.

Chlorine 36 behaves similarly to iodine 129 and that's why it's important because it is a volatile material. It's important to look at that in accident situation.

MR. CAMERON: Okay. Thank you. Bob Halstead, comment?

MR. HALSTEAD: At this hour I'm not going to belabor this by fishing the number out of my briefcase, but I remember reviewing particularly older fuel in the 20 to 30 year range. Marvin is right, americium becomes one of the top six or eight of radionuclides in terms of securing concentration.

MR. CAMERON: Thank you for that clarification. Any other comments on the americium, of chlorine or related radionuclides?

MR. KAMPS: Just one I forgot before. The Department of Energy's proposal to burn mox fuel in U.S. reactors also introduces different quality of highly irradiated nuclear fuel that would be transported. That needs to be considered.

MR. CAMERON: Thank you. Let's go to Bob Fronczak for some points on criticality.

MR. FRONCZAK: Actually my points aren't as far as criticality. It's the response of the cask including the contents. Our understanding is that the modal study didn't consider the contents of the cask or said that they would have little effect and it wasn't explained very well because there weren't a lot of details provided so we'd just like that that be clarified.

The other thing is that we felt the contents of the cask could also add stiffness to the cask that wasn't considered in certain impact scenarios. So we'd like you to consider that too.

MR. CAMERON: Any comments on Bob's suggestions? Felix?

MR. KILLAR: Just a clarification. When you are looking at the contents of the reaction of the fuel, I assume you are going to take into consideration the space and the bundle containers as far as adding to the weight of the cask but also adding to the structural strength and stability of the fuel itself.

I also want to point out that americium 241 is very important because that's what you use in your smoke detectors at home.

MR. CAMERON: Bob, you have a comment?

MR. HALSTEAD: I found that value. It's 1,700 curies of americium 241 per pressurized water reactor of the reference type so while it has many, many good uses, Felix, this is one we could do without.

MR. CAMERON: Thanks, Bob. Amy? I think we're ready for a different comment.

MS. SHOLLENBERGER: Again I have a question about whether this is viable for the study or not. My question is if there are accident scenarios where fuel rods get jostled where pellets come off, I wonder if the study could somehow consider then what happens after that. It seems like all of the scenarios in the study ended with the accident. Here's what happened. This much came out or this much didn't come out, but it seems to me that at some point after the cask has fallen off the train or the truck has fallen off the bridge and you have to fish the cask out of the river and you have to put it on another truck and you have to still take it to some point in the West yet to be named, and get it into the mountain which will be in a different container so it's got to come out of the cask and into another container and I'm wondering if somehow the effects of that could be looked at in this study or if not in this study in another one.

MR. CAMERON: The point is, and it may not be a point for this study, but nevertheless an important point is if a cask is involved in an accident how is that cask, if there is no I guess apparent damage or whatever, how is that cask treated when it gets to the repository? Maybe the NRC could answer question although there may not be a lot of experience with this is what would happen if a cask was damaged en route to the repository or if there was somewhere else.

Rod, do you want to do that or Susan?

MS.SHANKMAN: I think the point of the study is to look at the dynamics that would create that accident and the recovery from it has to take into account what would happen if there is no release and the cask is undamaged then you have a physically large heavy object that has to be resited on its vehicle and moved exactly, but I don't think that that would be any different from another heavy object that has to be reaffixed to whatever it's transporting.

If there is damage to the cask there are ways to recover from that and we have to figure out whether the probability is so high that we needed to change the training of the emergency responders. I think that's where it leads us and why we're doing the study.

MR. CAMERON: Rick, you wanted to say something?

MR. BOYLE: I think it's safer to say if a cask is involved in an accident, even if it does not appear to be damaged, I'm sure the cask will be inspected greatly. In this case or in that transportation case the first thing the Department of Transportation is going to look for is to go to the NRC and say is that cask still as described in your certificate? If they verify that it is then that it could continue on more than likely than an different carriage, probably, whatever rail, vehicle or truck that it was on is no longer serviceable so it would be off loaded onto a different one.

If it is not as described in the certificate, then whoever the shipper is is going to have to come into the Department of Transportation and get a special approval we call it an exemption, from the regulations, because if it's not approved by the NRC it's not allowed to be transported domestically under the regulations which will kick in a whole application process and a whole review process and consulting with NRC and in this case it would be the Department of Energy to say if it's not in accordance with the regulations, what special precautions are you going to take? And I think the Department of Transportation's view there is you will be better to move it to a safe location. That wouldn't be a siding on the road, it might not be the final repository. It may be the closest reactor to repackage it, but you are going to have to get it out of the community and the transport approval will take all that into account as to how it should be moved.

MR. CAMERON: Thank you for that information, Rick. Let's hear from Jack and then Marvin. Jack Edlow.

MR. EDLOW: That's a very good question I appreciate your question about what would happen in the case of an accident afterwards. I would like to say that there are thousands of shipments of radioactive material every year and millions of shipments of hazardous materials every year. Of course there are accidents involving various materials hazardous and radioactives not necessarily spent fuel all that often, but other types of materials as well. So that clearly industry has already faced this kind of situation before both haz mats and for radioactives.

These kinds of procedures have been looked at and have been dealt with in accordance with the way that Rick has said in the past. For spent fuel shipment it would be effectively no different in the process. It's just that this particular type of material is viewed by some as more hazardous and more heavier and somehow it's special, but in any case it would be dealt with in the same way. But thank you very much. It's very thoughtful.

MS. SHOLLENBERGER: I just wanted to clarify I wasn't suggesting you didn't have a way to do it I was just asking if the study could address what the effects of it would be. I wasn't saying you didn't know how. I don't know if you know how or not. What I was asking, since this is a study about the transportation of spent fuel, and so it should address the scenarios that can occur because of the transportation of spent fuels.

MS. SHANKMAN: The study is meant to look at some of the factors that would be involved in the stresses that might lead to damage of the container or the contents. It's not a definitive study of the transportation of spent fuel. But it isn't, I mean may be another way in which we consider that and so I'm glad you bring it up. But I'm not sure how we work that into this knowing what stresses we created and what we would have at the end would help us understand what kind of response we have to prepare for.

MR. CAMERON: Thank you, Susan. Marvin?

MR. RESNIKOFF: I think the point is well taken for a more a couple of reasons. One is my experience that in reviewing the BFSSAR in Utah, we've raised the issue what happens if a cask has surface contamination on it. And the answer to that, which is in the SAR, is that cask is shipped back to the reactor. No matter with the levels of contamination, the SAR says that cask goes back to the reactor. Even if it's above DOT regs, there is no provision that the BFS facility for actually cleaning the cask.

So the issue is I think well taken at least in that situation where a cask is contaminated. You know, somebody has an idea how that's going to be handled, some private contractor coming in, I don't know, but BFS says it's not going to be their job.

The second reason I think the point is well taken is that there actually was an accident. Which isn't listed in one of the six or eight accidents that were listed previously, which involved the shipment fuel to the Patelle, Columbus facility in 1980 in Ohio in which a fuel assembly was put in that was too hot. Contrary to the certificate of compliance, the workers put a fuel assembly in that was too hot and the effect of that is the fuel oxidized and when they opened up the cask under water large amount of radioactive contamination came out of the cask and into the pool. Of course it was evacuated, but workers were contaminated, workers were exposed in the process of decontaminating the entire pool.

I think the NRC also, I should say, has taken steps so that won't happen again and since they now inert the cask, they have helium inside the cask rather than oxygen as they had before or water, but I think point is well taken because there is one specific example that there was something that was shipped contrary to regulations and it led to certain consequences at Patelle, Columbus.

MR. CAMERON: I think we had some reaction to that, Marvin.

Before we go to Rick Boyle, PFS stands for private fuel storage and that is a licensing hearing before the NRC to approve a spent fuel storage facility in the State of Utah and I hope that that provides enough information on that. Rick?

MR. BOYLE: Thank you. I completely disagree. The packages that are not in compliance with DOT regulations are transported anyway, be that for contamination, labelling, anything else. And it doesn't matter if the safety analysis report for the package does not address what would happen in this case.

I think if you are looking at that, customs has stopped packages because they're hot and then we have to deal with it from there. If you go to any scrap metal facility they have meters going in and when the rail car comes in and its hot, it's sent off to the side. That scrap metal facility has no license to possess and we have to work out an exemption so it can be sent back. The same is true of landfills.

It's just not true that if a violation is found it's marked return to sender and sent back. That's no way. No how. I'm sorry, we just have to correct an inaccuracy in that matter.

MR. CAMERON: Marvin?

MR. RESNIKOFF: I suggest that he direct his anger toward the Nuclear Regulatory Commission, that he respond to the EIS and the SAR. They come out as a cooperating federal agency. You tell PFS, you tell the NRC that that's wrong. I suggest you submit comments as a cooperating federal agency. I encourage that.

MR. CAMERON: Apparently maybe there needs to be more exploration of this particular point that we don't necessarily have to explore it at this point. But thank you for those comments and I would ask if there is anybody in the audience who wants to make a comment on spent nuclear fuel assembly behavior in accidents and then we'll come back up to the front.

Final comment on this from Kevin and, Rick, I didn't know whether you wanted to say anything else at this point on this issue but you can if you want after we go to Kevin.

MR. KAMPS: Just wanted to bring up the German experience again. A transport of highly irradiated nuclear fuel returning from France was found to be 3,000 times the appropriate level or the acceptable level and so this is a very significant issue that needs to be addressed. And again that contamination event and the locking out of the public in Germany have led to a situation where the transport of highly irradiated fuel has been stopped for political reasons in Germany. So it's a very significant issue.

MR. CAMERON: Thank you, Kevin. Rick?

MR. BOYLE: I think that point is well taken because Kevin is completely correct that there were high contamination shipments made in Europe and it highlights the point that once they were identified shipments stopped. They didn't continue and say we know they're hot and we shipped them anyway. And I think you would see in several European countries they aren't making shipments today because once the problem was identified, shipments were stopped.

MR. CAMERON: Thank you. Are we ready to move on to the next discussion point? Yes?

MR. KAMPS: Just that it took years for that information to come out to the public the cover-up involved is a pretty significant issue.

MR. EDLOW: That's ludicrous.

MR. CAMERON: There's some disagreement here about whether was a quote "cover-up" unquote and I think we're just going to move on to the next discussion area which is the whole testing computer simulation methodology. Go ahead, Charles. And I don't mean that I want to stop anybody from getting into these issues. We can do that if that's what people want to do, but I think at this point it's most profitable to move on. Go ahead and we're bringing our NRC expert up to the table who we'll introduce in a few minutes. Charles?

DR. MASSEY: Thank you, Chip. The next topic area is physical testing simulation and here I just want to give a little background, I think a lot of this we covered earlier, a little bit of background on the progression and the study regarding severe accidents and how we have calculated and predicted response to the cask.

The modal study was all computer simulation, mathematical models developed to permit cask response and collisions and fires. There was no testing done specifically for the modal study. The models were based on test data from other experiments and test that were done, but there was nothing specifically done for modal studies.

For the NUREG 0170 update that we recently submitted to NRC for review, we've used improved computer models based on data that we've gotten from other test and experiments have been conducted, but again there was no testing specifically conducted for NUREG 0170 reevaluation.

Where we sort of differ from that past history in the package performance study, we would suggest that simulation and testing be done of some representative cask and we actually take a cask design, looking for comments on this, what that would exactly be, but use our models that we have developed, thermal and structural models, look at the collision and thermal scenarios that we have discussed, but do that sort of pretest prediction on the cask response, then actually do the test. And then compare that and see how well you can predict performance of the cask. And with that I'm going to turn back to Chip and get moving.

MR. CAMERON: Thank you, Charles. I just wanted to introduce Jeffrey Hornseth who is a materials engineer, an expert in metallurgy and is involved in this issue as are expert on physical testing. He's been with the NRC since 1991. He has a master's of science degree from George Washington University. Let's go right into this for comments.

Bob, you have your card up. Do you have some points on the physical testing computer simulation issue?

MR. HALSTEAD: Yes. As a person who has pursued this issue for 20 years, I'll give you a short version and this is one the issues that we plan to discuss in detail at the meeting at Henderson.

First point, I think it would be a good ground rule to say in this discussion that we separate the issue of cask testing for the purposes of this modal study update from the larger issue of whether full scale testing should be required as a condition of certification. I think we'll eat up all the time we'd like to talk about if we try to resolve that larger issue about the desirability of testing, for licensing.

I would restate briefly the arguments for that larger testing issue. The State of Nevada has argued in favor of full scale testing as a condition of certification which it requires full scale testing of a prototype of every cask that goes to the NRC. We have developed cost estimates on it. We have developed an outline of what the testing protocols would be. We published a report by Dave Snediker (phonetic) who many of you know worked as a cask designer for many years, looking at some of the pros and cons of full scale testing, documenting the past experience with it.

We are also cognizant of the improvements in the codes that allow us to address some of these questions through computer simulations and we're certainly open to a discussion of a combination of something less than -- let me say before I say this -- we are not satisfied with the current test requirements which allow one tenth and one quarter scale modeling and generally combine simulations to provide the information required in the safety analysis report and constitute a basis for certification.

The question for us is given the inadequacy of the system, do we need full scale testing and a lot of additional simulations or is it possible at least with some package designs that have scale model testing allows us to capture small details like performance of bolts, for example. So we're open to a discussion there.

For technical validation purposes. In terms of public confidence we would argue that (A) there is probably no substitute for full scale testing; and (B) the full scale testing must be the boring, repetitive, laboratory condition testing that was conducted with the true pack two container rather than the kind of dramatic public demonstration testing which is what I would argue the Sandia test in the '70s constitute. I would even argue the testing in the U.K. of the mox fuel flask falls into that category because when they did the drop test, they actually found that the drop test did greater damage to cask integrity than the locomotive hitting the cask test.

In terms of what you do for this particular effort, I'm just going to throw an issue out that I think as much as I would like to see you take a particular design that we think is likely to be used, someone would have to pay to have GA4 constructed, for example, so that you could test it. I hesitate to say this, but I'm not sure it's a good idea for you to take on physical testing of a cask as part of this effort if you think it's going to address the criticisms that those of us who believe there should be full scale testing have raised.

I don't think it's possible within the

context of this study to take that issue on and walk away leaving anyone satisfied. And my primary concern is that the package that I think is most in need of testing in terms of meeting the concerns of most of the effective stakeholders have is a GA4 cask, which is probably, if anyone wants to pony up the money to have say 10 or 15 of them constructed, the cask that would be used for early shipments to a repository for truck shipments to a storage facility.

It is true that there are some casks, multi-canister and dual purpose canister that are certified like the GA4, and I'm not sure Marvin may know or someone from the NRC may know, if there is going to be one of those casks out. I think it is an incredibly bad idea to test a cask which is not one of the actual casts that will be used in the largest upcoming shipping campaign, i.e., Yucca Mountain, if the department decides to go forward and submit a license application.

And so I think you really want to think

very carefully about how you want to pose the cask testing question and I will certainly try to give you a little more guidance of our thinking about it when we meet in Henderson.

MR. CAMERON: Thanks, Bob. You made a number of points there including the one that, there is separate issue here on cask testing in terms of the actual certification. I think that you said that this mix of scale model computer simulation full scale testing would depend on the type of package, but you gave us a caution on the, what the potential value might be of doing a full scale test for this study on a cask that's not going to be representative of the major cask that's going to be used in shipping.

MR. HALSTEAD: Slight clarification. You amazingly managed to get most of it pretty accurately. In terms of Nevada's position right now the current requirements are inadequate. That is the combination of scale models less than half scale plus simulations constituting sufficient evidence that the cask performance criteria are met for certifications purposes, that to us is unacceptable.

The question of whether we would accept something less than full scale testing, and I suggested half scale testing, we're willing to consider that which frankly has not been our position for most of the last 10 years, but I think I captured the other points very carefully.

MR. CAMERON: Thank you very much. Susan, do you have a question?

MS. SHANKMAN: Little clarification. I'm interested in what other setting full scale testing is done of every design where you feel that it's been beneficial. I'm not familiar with another industry that does that and if you know of another industry we could look at that and how it's proved its efficacy for safety if you know of one.

MR. HALSTEAD: I'm not going to address that larger issue right now because frankly I can tell from the last discussion that a lot of people's tempers and attention spans are perhaps getting to a point where we need to wrap this day up and I think you need to consider planning for Henderson how you want to pace the day.

I think what we learned this is a very intense topic and since I just had a cappuccino I'd probably run for another 30 minutes, so I think we want to make sure if you have a real important question, I will pose it to you another way: The only truly acceptable, politically and technically in my mind shipping campaign that's currently in progress is the Transranic (phonetic) shipping campaign to WIEB.

You may wonder how it is that states like Nevada that have very little good to say about the Department of Energy, sometimes about the NRC and sometimes about the industry, have generally accepted the WIEB program (phonetic) for transportation.

One issue is the operation of protocols for accident prevention and emergency response. That's an important part of it. Those were jointly developed by the states in DOE.

Another part has to do with routing. I don't want to reopen that issue, but the bottom line is a different approach was used there. The routes were identified in the EIS. It took 10 years to work them all out and it was a consensus that the safest roads and routes were chosen.

Third issue, for a variety of reasons, not this one, the NRC decided to require full scale testing of the true pack two and indeed in the testing we found that things that hadn't been anticipated. I can tell you that without making this a largely theoretical issue, the very fact that those tests were subjected to rigorous full scale testing is (A) a major reason why governors of the western states based on the advice of their technical advisors, have all signed off on protocols in support of this shipping campaign. (B) It is a major reason why people like myself are willing to stand in front of a sometimes incredulous public, who is used to hearing us do nothing but criticize the NRC and DOE industry, and say look you can like it or not like it. I'm giving you my best judgment as a person who has worked on these issues for 20 years.

The bottom line is I can stand up there with confidence and say not only on the technical issue, but on the institutional issue the NRC and DOE were willing to demonstrate that. That's not the best answer I would like to give to you, but it's the only example I can give you where both the people who give technical advice to political decision makers and the political decision makers have said okay we are satisfied with the safety of this program. It's not all about full scale testing, but I'm willing to bet you that if there had not been full scale testing to true pack two, there would still be enormous state government opposition in at least half of the western states.

The thing I want you to think about at the NRC is whether you want to risk hanging the validity of this modal study update on an issue as volatile and difficult to predict the outcome of as full scale cask testing, unless you are willing to go to the great lengths of testing one of the casks that's going to be used for the future shipments.

So I'm trying as a person who is a long time advocate of full scale testing, and I remain an advocate of full scale testing, I really want you to seriously rethink whether you want to tie that issue to this particular undertaking which I think is very valuable and something that we're fully supportive of. I just don't know that you want to tie full scale testing into it. I think that's the issue today, not whether full scale testing is necessarily a good idea.

MR. CAMERON: Thank you, Bob, for both drawing the distinction between full scale testing and also for that caution for the NRC to consider. Let's go to Eileen and to Felix. Eileen?

MS. SUPKO: I had a different reaction to the possibility of testing than whether or not we were testing, proposing full scale cask testing or something else. What I thought I heard earlier in the day as part of the purpose of physical testing is the fact that there are new cask designs that are coming out that may not be accurately reflected in the computer models and part of the testing program would be to benchmark your models, which is basically what you said you would run the predictive models first, do the testing and find out how those components behave compared to what you predicted.

One of the things I would encourage in doing that is laying out very clearly prior to embarking on the testing program and whether it be individual components or scale models of casks, the stated purpose of your tests, what do you hope to accomplish, are you testing an individual component, is it a seal, is it a bolt, is it the behavior -- the fact that you have canistered fuel now instead of fuel sitting in an basket. What the are the acceptable testing requirements that would yield the results that you want? If it's a bolt do you need to do a full scale test on a bolt? What analytical codes are you planning to use and is one of the end results possible changes to your analytical codes? Because we have do have different designs that are potentially going to be used in the future. And then basically identifying the testing parameters that you are planning on doing. You may not need to go through the thermal tests for all of the different parameters, it may be drop tests, it may be something different, but laying all that out with what your stated objectives are and again I'll go back to my initial statement about getting the most bang for your buck and looking at what it is you are trying to achieve by doing the study.

I think that it may be that the issue isn't we're going -- trying to address the concerns of groups, full scale cask testing, but your purpose is something different.

MR. CAMERON: Thank you very much for that, Eileen. Let's hear from Felix and then let's hear from Mike Wangler over here on this end.

MR. KILLAR: My comments are along the same line as Eileen and also on the same lines as Bob.

I think if you are looking at testing for this program you have to be very careful what you use in testing because I think what the question will come up is that you tested this why didn't you test that? And then you end up in an infinite dooloop and you're never solving and come to a final answer to the question.

I think what you have to do is identify where you have questions and where you need testing to validate your computer codes and computer models and then do the testing appropriately, but not just do testing for the sake of testing because what's happening you will never get to the end of your testing.

MR. CAMERON: Your message, Felix, the NRC is to be very cautious about getting into the full scale testing area. Mike?

MR. WANGLER: I think I might be the

fourth person to kind of support that idea. I think that you do have to be careful in how the test data is used.

On the question of full scale testing I'm neither an opponent or proponent of full scale testing. I'm one of the three groups within DOE that's authorized to approve radioactive materials packaging for the type A, type B. For my type A packages I require full scale testing before approval.

MR. CAMERON: Mike, could I just stop you right there and just tell people what type A packages include so there's no confusion?

MR. WANGLER: Type A packages are the much lesser quantities of radioactive materials that you might find being transported in the U.S. Spent fuel falls in a very, has a lot of radioactive material and falls into the so-called type B category. Some medical isotopes and things of that nature fall in the type A category. Again, my point is for those type of packages I require full scale testing. However, for the type B packages, I think full scale testing is one method of getting to the answer that you need or get to the answer that I need to certify a package.

I generally rely on engineering analyses to help me understand whether the package will meet the regulatory requirements. The use of the engineer analysis means I use analytical tools for any confirmatory analysis. These tools facilitate my review especially on large packages. What these analytical codes allow me to do is to look at multiple scenarios that one can't do with drop tests.

A drop tests generally can do at least one scenario. Let me back up. I wouldn't even call them scenarios. I'm looking for data points. The drop test can be used to get you -- we have some data points. Engineering analyses will let you run a series of analyses to see how the codes will tell you that package would perform under various scenarios.

Now being part of the Office of

Environmental Management that appeals to me because using computer codes means I don't have to worry about any environmental impacts from having to deal with fires or even some impacts. So the engineering analyses gets me some of the answers that I need.

Where I find testing would be more helpful to me is if the testing was done to give me data points to insure that my analytical codes do what they say that they're supposed to do. A drop test, for example, at the regulatory test doesn't really -- it's one point. It doesn't tell me how my code is going to perform either beyond that range or within that range. I'd like to know what my margins of safety are. The analytical codes can help me determine what those margins of safety would be.

If Sandia is going to be testing, what I would rather see is that the testing be used to support validation of the computer code or computer codes that we all use in this business to try to insure the performance of these large packages.

MR. CAMERON: Thanks, Mike, for that comment. Earl Easton has a comment on that.

MR. EASTON: I couldn't resist. Having been around long enough I happen to have been the project manager for true pack two certifications for the NRC and very instrumental in the decision to go ahead with the full scale test. The reason we did so for true pack two was because we did not have faith in the existing computer codes to model that type of closure. That type of closure was radically different than what we had seen, for example, in spent fuel where you had a bolted lid and we felt that that was well understood and that we could rely on analytical tools.

True pack two had a large lid that had a closure around the outside much like an aspirin bottle. We had an absolutely no confidence that we could really model that by computer. So I agree with Mr. Wangler from DOE. One of the good uses of testing is to validate tools. Because when you do tests you can usually only afford to do full scale testing in one or two different orientations. Whereas, if you have some sort of reliable code, like Mike said, do very different tests and perhaps get a better insight where the real safety points are on that cask.

I just wanted to make that comment based on the experience why it was that we did choose true pack two as a candidate for full scale testing.

MR. CAMERON: It confirms what Mike Wangler was suggesting then. Let's go to Bob Fronczak and then we'll come over to Amy. Bob, I don't know if you have something else to say? Let's go to Bob Fronczak.

MR. FRONCZAK: Unlike Bob Halstead, I didn't have cappuccino so I'm wearing out. I'll be very brief.

MR. CAMERON: He's a strategic thinker. The rest of us failed.

MR. FRONCZAK: All I have to say is the computing capability has increased since the study was done and I'm sure you are going to incorporate that in the work that you are going to do. There is all kinds of things you can model that we have already discussed. I'll follow-up with some written comments.

MS. SHOLLENBERGER: I have a question. My question is, if I understand it correctly, and this question is sort of directed at Mr. Edlow because I think he'll know the answer, if I understand it correctly there is a possibility that the transportation cask can be used more than once to transport fuel rods. You know, come from the reactor to the repository and go back, and if that's true I'm wondering if the study is in any way planning to take into account sort of normal wear and tear on a cask and look at how many times can a cask be used before it gets to a certain level or if the cask has been used say five dimes and bounced around on a train, does that have any effect, for instance, on the bolts and how tight they are.

MR. CAMERON: Those are good questions are the casks used multiple time us and is that something that should be factored into the study.

JEFFREY: The transportation casks are designed to be used multiple times. Part of the certification process is a review of the in-service inspection program that must be developed for each cask where all the components are routinely inspected before the cask can be either on a periodic basis or a time scheduled basis or on a per shipment basis so that each time the thing goes out, it goes out in acceptable condition; in condition that's up to compliance with the certificate.

MR. CAMERON: Did we get to the point about whether that should be considered in the new study? All right. Good.

I think Bob Halstead is correct in the sense that we have been at this for a while and it's been pretty intense and I think maybe we should switch gears a little bit and talk about process.

One of the things that Dr. Shankman, Rob Lewis, a number of people have talked about is how does NRC keep people involved in this process, this study update? And of course there is going to be many different milestones along the way and we've heard peer review mentioned. That's one aspect.

I just wanted to open it up to people around the table to see if there is any suggestions about how the NRC should keep the public involved through the course of this study and at what points that should occur an how. Does anybody have any suggestions to start us off with? Heather?

MS. WESTRA: Just a question regarding tribes. How do you anticipate involving Indian tribes beyond this meeting? I understand you have the meeting out in Nevada and I anticipate that more tribes would be at that one, but often times tribes are kind of left out of the loop and don't have access to the internet, federal register, all these other publications. So that piece is also lacking.

MR. CAMERON: Thank you. I don't know

if we have any answers to that at this point but we need to consider that. Does anybody from the NRC want to say anything?

MR. LEWIS: One thing we can say we will have the mailing list in addition to the website. Both have very similar functions and if you could help us identify names for the mailing list that would be very useful.

SPEAKER: Be glad to.

MR. CAMERON: I guess there were some other ideas. Susan?

MS. SHANKMAN: We've spoken about the fact that once we have phase one of this project completed by Sandia, they have given us the recommendation about the scope of the study and potential methodology and we've also talked about the fact that that point the Sandia contractor report will be issued on 0170 with its peer review by Lawrence Livermore. And so we're planning on having another series of meetings. What I would like is if somebody could speak to whether this format would be useful and whether the sites that we choose for those meetings, particularly in response to what you are saying, perhaps we should be in -- thought about Atlanta, we thought about Chicago, Minneapolis. There are other places that we could hold the meetings.

The NRC has been holding meetings in Nevada because it is an area where there are a lot of concerns about this, if that's appropriate. The meeting in Washington allows people who are involved in the policy setting to also be part of it, but we're open to other venues an other formats.

MR. CAMERON: Let me just make sure that we all understand. The phase one recommendations -- in other words, Sandia is going to and the NRC are going to take the comments that come out of this meeting and the meetings in Nevada, as well as any written comments we have, and they're going to put together a recommendation for how to proceed. Will that be the subject? Is that what you are referring, to the subject of future meetings?

Future public comments?

MS. SHANKMAN: Yeah, along with having the information that is coming out of the contractor report that we have been talking about, the update of the assumptions in 0170. So you will have two new pieces of information before we go ahead and contract or spend more money in this area because we don't want to say okay we've heard you, we're going to design a study and we're going to do it. We want to have another point where we get public comment and that will be after the study and designed but before we do it.

MR. CAMERON: Does that perhaps explain the relationship between the 0170 study and this study is that they will be both looked at together. I'm going to go to Robert Holden now before we come over to this side to Bob Halstead. Robert?

MR. HOLDEN: I just want to go back for a second to a point Heather brought up and I guess from a policy standpoint Nevada is microcosm of this national meeting here and that's that tribes in that area have very little resources to come to Washington, DC. Even Las Vegas can be a burden. We have held meetings in Reno and we have held meetings, there is a town halfway in between Vegas -- I can't remember what the name of it is -- but there are several options there and there are several tribes that will be impacted by rail shipments up in the northern part and you might even touch base with Bob Halstead because he's quite familiar with the area and the tribes and the locations as well. But that also, to pick up on a policy point, that's some of the things I plan to be doing, talking with commissioners in terms of the outreach that NRC does on notice, on consultation as well as the technical assistance that you have to offer in terms of breaking the issues down and providing that type of technical assistance to help them better understand that that's part of NRC's duty as the tribes see it as those governments see it.

MR. CAMERON: Thank you, Robert. Susan?

MS. SHANKMAN: I was just going to say we'll be glad to work with you and we'll talk afterwards. I'm sure you are familiar with the staff and our office and I agree that the outreach may need to be different and we are willing to work with you.

MR. HOLDEN: That changes from time to time. I'm not sure whose is on first at this point.

MR. CAMERON: Bob Halstead.

MR. HALSTEAD: On the issue of Nevada Indian tribe participation representation, that's a very difficult issue as Robert said. First of all, the distances involved; travel just within our state is very difficult. And secondly, as many of you know there is both an income and a telephone connection issue in internet connection and this is now a larger issue of isolation of many people on the reservation.

Without belaboring the point you are

going to have to make special efforts to get the Nevada tribes involved and frankly you are also going to have to struggle as I have and many people working for the State of Nevada struggled with to develop a sufficient cultural sensitivity to know that when tribal representatives come to a meeting and they may be spiritual leaders, may be political leaders, they may be both, they may not feel comfortable fitting themselves in to the tightly scripted meeting agenda which I think has worked very well in this meeting, but may be considered offensive by many of them.

We don't need to belabor, but there are a number of things you can do and I appreciate your expressing sensitivity. I don't want to bog us down on that issue it's very important, but I don't think we can resolve it around this table. I do think you have to show the same type of sensitivity you're showing today in dealing with the counties in Nevada who have a very peculiar legal status because of their effective county status under the NWPAA and the litigation that enforced that.

And again I've spoken with many of the county representatives and most of them know Chip by name and you'll probably see most of them involved in Henderson. So I ask that in addition to your continued sensitivity to the tribal participation issue, that you keep in mind the nine Nevada California counties that are involved.

I don't want to belabor this issue again, but I will raise two points. I think at the end of this meeting or the next meeting you have some serious stakeholders who will be following the peer review issue as well as the conduct of the study. One of the lessons learned from the modal study and some of the other studies that have been done over the last 20 years the practice is that the peer review has not always been very impressive, to put it bluntly, and as a stakeholder I don't believe at least involved in reviewing what's going on in peer review.

Secondly, while there are a number of mechanisms you have used and other agencies have used to continue participation by those stakeholders who will choose to be deeply involved, one mechanism might be a standard advisory group on the study in addition to whatever public meetings you might want to have to take input from the general public, but I'm sure there are a number of us around this table who are intimately interested in this.

I imagine the modal study two being as central to discussions of container safety as the modal safety one has been, or the last 13, 14 years, and so I even though that three year time period is something that makes a lot of us gulp, I know half of Nevada would like to be involved in an ongoing way. Thank you.

MR. CAMERON: Thank you, Bob. I would ask you if there were standing advisory committee on this, I suppose the standing advisory committee could sponsor public meetings, also. Thank you.

Let's go to Felix and Amy and I want to make sure that I get Marvin's input on some of these issues particularly the review of the peer review that you brought up, Bob and advisory committee. Felix?

MR. KILLAR: I think the NRC has done an exceptional job of getting the information out to people making them aware of the meetings. I've been involved with the NRC for 25 years and I feel that the last five to eight years the NRC has bent over backwards to try to get information out.

Now being a governed bureaucracy is hard because sometimes understand how the public works versus not everybody reads the Federal Register over their coffee in the morning. I think the idea they go on through with the idea of the postcards, the mailing lists, the internet, things on that line, I think the NRC needs to be applauded for their efforts.

The NRC is now having a tendency to beat up itself because it doesn't feel it's doing enough. I think there is only so much the NRC can do in order to get the word out.

I think it's incumbent for people around this table -- I know that Sierra Club does it and I'm sure the Indian Federations do it as well and we certainly do it because we put information out on our internet, our members' website. We also put information out on our publications and stuff about upcoming NRC meetings, location, contacts, things along that line. You have got to rely on word of mouth to some extent because you can't rely on every system there is because you will never be able to reach everybody.

MR. CAMERON: Okay. Thank you very much. Amy?

MS. SHOLLENBERGER: First, I think the advisory committee is a great idea. I think that would probably allow you to reach a broader ripple effect of people because people sitting at this table represent a lot more people behind them so I think that would be a good idea.

Second, I'm glad to hear there is a

mailing list because I think the tendency with all federal agencies now is to rely on their websites a lot and I think that's very dangerous. Native Americans are mentioned as people who don't have access to internet and I think that lots of people don't have access to the internet.

I was at a meeting last week where I was told you can just go to the library and then you will have access which is true in most communities. However, I have printed this modal study out at work where we have a really nice big server and dedicated printer that's a really nice printer and it took me two days. It's a huge PF file and PF files take a long time to print and you can't do that at a library plus the cost is a whole new factor. So I just caution you to look for ways other than the web. I fully enforce using the web.

Lastly, I would just like to say I think it's really great following up on what Felix said. I think it's great that you are making this effort. You know, definitely you are doing better than you have in the past.

I think the number one way that you can encourage public participation is to show that it has an effect and I think that really what you could do is you could take the comments that are here today and comments that you will receive in the future, and you can do a modal study that addresses the public's concerns. Then you can take that modal study and do meetings like this. I think if we had to choose between Washington and Chicago that would be great, but if we could have it in both Washington and Chicago that would be wonderful.

I think one more thing would really show in a big way that you are really committed and that is this summary is nice, it's a good summary and then I read the summary and I read the study and I felt like the summary did a pretty good job of summarizing the study. However, this is still written to a certain level of education and certain level of knowledge about high level waste and transportation.

I think you need to go one step further if you really want the general public to participate. Either you can do another study. I think there are technical communicators out there that could write a summary from this one that would still be technically accurate.

I think also a week before the hearing, two weeks before the hearing you could have or whatever you are calling this round table discussion, you could have a work sheet where schedule it in the evening, two or three hours, people can come and you do a presentation and you say here is what the study says. Here's what we did. Here's what the results were now you have two weeks or a week or however long to think about it. Here are the questions we'd like you to address. Please come back in two weeks and talk to us. So that people aren't walking in, picked this up when they walked in today. I was lucky. Mailed it to me a couple weeks ago. A lot of people only get it when they come to a meeting and to try and sit there and listen to the discussion, figure out what an irradiated cladding is and have a comment that's at all worthwhile is really difficult.

MR. CAMERON: Thank you very much for those thoughtful comments.

I want to allow Dr. Shankman, the top manager from the NRC today to just close the meeting for us. Marvin, how about process issues?

MR. RESNIKOFF: I want to say a word about this advisory committee suggestion. You stay around these issues long enough everything comes around again and I was involved in one of these advisory committees between 1978 and 1980 when the Regulatory Commission had Sandia do this TRUE study, Transportation of Radionuclides through Urban Environments advisory committee for that. And from that I have a couple of suggestions that may be helpful.

You get out of the advisory committee as much information as you give them. So the better advice you'll get is if you give the advisory committee a lot of information and then they can give you better advice. If you give the advisory committee nothing, you get nothing back. It would be a useless committee.

Secondly, it would be important to have the advisory committee write up their own report and have that attached to the modal study report. And furthermore that advisory committee report should allow for minority opinions not just have a majority review.

MR. CAMERON: Thanks, Marvin. I should mention in this regard that any on the advisory committee, the NRC as well as any other federal agency that wants to establish an advisory committee must meet the requirements the federal advisory committee act, which are all good requirements in terms of open meetings and minutes of the meetings and although it doesn't specifically flow from the Act, reports, minority reports, all of this, the one requirement that sometimes can be daunting but not insurmountable is the fact that the committee needs to be chartered and the charter has to be approved by, I think, GAO as well as O and B, which doesn't mean that it's an impossibility by any means, but it just means that there is a certain amount of time involved in that and I'm not trying to spread any skepticism about that, I just wanted people to understand what the regulatory framework was for that. Thank you for those comments on the advisory committee.

Eileen, do you have a comment?

MS. SUPKO: I just wanted to follow-up on what Amy said. I think that in putting together the modal study obviously there were different audiences for different documents. The audience for this is probably a technical audience. This was written for more of a nontechnical audience, but probably could be worded a bit better and one of the things that I found talking about nuclear waste transportation to the general public, there is not a good understanding, for example, the hypothetical accident tests that are done. What do they mean physically? What is a 30-foot drop to an unyielding surface? I think there's not a good understanding of what an unyielding surface is.

And to the extent, not necessarily in the updated modal study itself, but maybe a public document to try to put some of those things in perspective.

Also use of cask testing and computer simulation. Mr. Wangler mentioned earlier the benefits that he sees from being able to use computer simulation in certifying the package and I think that the general public would probably benefit from understanding what those benefits are. Keep all those things in mind and who your audience is for the different products that you put together.

MR. CAMERON: Thank you very much, Eileen. Bob Fronczak?

MR. FRONCZAK: This is a real good opportunity to discuss the issues. The question is is Henderson -- you asked me if I would participate. Are we going to try to recreate what we did here today or do you want to address all new questions in Henderson?

MR. CAMERON: Maybe I should leap into that one and be corrected by the staff if necessary.

The idea was is that we would put together a similar format for one of the meetings in Henderson all day format and that we would have mostly different people around the table in order to get their take on these same agenda items. It may be that the take we got here is going to be the same that we get in Henderson particularly if some of the people are similar.

But we also wanted to allow the people of Nevada the opportunity to see an exchange among knowledgeable people in the area on this issue including their county representative, their state representative, their tribal representatives. So there is going to be that same format.

We're also going to do a nighttime

public meeting after the round table that will be a simpler format in terms of the information that's presented by the NRC and an open question and comment period from the public. We're also going to do that same type of meeting on December 9th from 10 to 12 which is more information than you needed, I think.

But, yeah, we were going to do this same format for a couple of different reasons in Nevada. Susan, do you want to add anything to that?

MS. SHANKMAN: Not a great deal just that the idea was to have a different mix of people, some of the same because of, because they're unique or they represent a particular organization that doesn't have a representative in Nevada, but to expand and have a significantly different group that could speak to the issues and maybe have different issues.

As Chip said the idea was to recreate this same format in the all day meeting which I think we'll have to shorten the NRC talking a little and make that a briefer introduction and so we'll have more time to talk about the issues. We were already thinking about that, so we are learning from this. The other meetings will be more informational and less round table.

MR. CAMERON: Susan highlighted an extremely important point which is that although we use this same format for one of the meetings in Nevada, we do want to learn from what happened here. And we know that, for example, Bob Halstead has already told us that he will have some more detailed information on a couple of topics for discussion there. So I think we're going to hear different types of information and we need to plan for that also and how we do the agenda. Bob?

MR. HALSTEAD: A couple of things. First of all, without at all being critical of the people who gave the opening presentations, who I think did a nice job, I think if you can shorten those to no more than 20 and preferably shoot for 15 minutes and have handouts for people and handle some of that information in question and answer thing you will be well served by that.

Secondly, I think you should inform all of us who are participants today if you don't expect us to be at the table, at that meeting very shortly. I made a commitment to be at this meeting because I think this is absolutely critical, but, for example, that means I will not be providing technical assistance to people in the central part of the state the day before when there is Department of Energy all day EIS hearing in Austin and that's caused some people to be angry. Why did you have to schedule? I understand. I'm not trying to beat you up. I'm just trying to explain while you were in the southern part of the state, on the 7th DOE has a major all-day meeting in Austin, and the 9th a major all-day meeting in Crescent Valley both of which are on a high priority rail corridor and also are the areas that people of the northern part of the state would go to and concerned about truck transportation. You just need to know that for purposes. I have to go to the airport and I'm sorry I can't stay.

I would like to thank you for the way this meeting was organized and conducted. It's a particularly important thing for me personally and for the State of Nevada generally that you have approached this the way you have. Because as I said I don't want to belabor the negative, there has been a lot of bad feeling in the State of Nevada over the way another part of the NRC handled the transportation issue; such bad feeling that there has been lots of talk about litigation and so I'm not saying this completely eases the situation, but it's a very important thing for you to demonstrate to people in Nevada who rightly or wrongly feel themselves more affected by this issue than all the other folks that are affected by it.

And so I appreciate the way you set up the table. At first I couldn't imagine this agenda was going to work and the way you set the agenda was good. I want to thank you Susan because I know the way the federal system works that people take some political risks to even get involved in meetings like this. Particularly Mr. Massey, I don't think I have ever seen anybody who had technical responsibilities to do as good a job of standing in and dealing with technical and nontechnical fire from all directions.

While many people deserve congratulations on this meeting, you have certainly handled yourself today in a way that enhances the credibility of the study. With that said, I hope nobody will succumb to the atrophy of organizational vigilance, because the way you dealt with things today is the way we have to deal with things for the rest of us. I'm very sorry I can't stay. Thank you very much.

MR. CAMERON: Thank you, Bob, for your comments and participation and I have already talked to a number of people about the issue you raised about Nevada and I will be in touch with all. Amy, do you have one more?

MS. SHOLLENBERGER: It's a procedural question. We check the box if we wanted a hard copy of the meeting transcript from this meeting. I'm just wondering will we also receive transcripts December 8 and 9th meetings since most of us will not be at those meetings?

MR. LEWIS: Yes.

MR. CAMERON: That was the longest yes I ever heard. Let me just ask if anything in the audience has a comment on process?

MR. HOLDEN: If I could I just want to revisit one particular point and ordinarily there are some things you say you don't want to belabor but I find myself having to belabor, belabor, belabor this particular point. I appreciate that suggestions, you know, that the word of mouth is going to get things out to Indian country which we do and we do what we can to provide that type of outreach, but I guess the point is that not everyone may be, totally understand, maybe not giving everyone their due credit, not everyone may understand this tribal federal relationship.

And what the basis of that is and what's required in that context and that's to do that government to government protocol outreach. It's mandatory. It's something that is incumbent upon them and it has to be done regardless of how many numbers there are out there, how many tribes there are, regardless of how much it costs them, that's what is requisite, long standing and that's also the reason why Department of Defense has developed an Indian policy, which this organizational board helped with. That's why FEMA developed their Indian policy. That's why in almost every major, almost every agency under the administration has developed an Indian policy. NRC is the exception. They have not gone the distance on that matter yet, but something I think they will embark on and that's why the organization I work with is redeveloping, reviewing, revisiting the DUE policy. So there is a basis for this and it's quite important. I don't think anyone was trying to belittle it but, I'm just trying to clarify what I was trying to say a while ago.

MR. CAMERON: Thank you, Robert. That's a significant specific item to achieve what you are talking about.

Charles, can you talk to this and then we'll see if there is anything on this as well as this bounding issue and then have give, see if we can give people an opportunity to have final comment.

DR. MASSEY: There are a few things we just wanted to use as discussion stimulators if they hadn't come up during the meeting today. Nuclear criticality was brought up a couple times by Amy. That was something that we were considering for including as suggested areas for inclusion in the performance study.

What happens after these collisions and thermal environments, how does that impact criticality of considerations and also get into an area that really hasn't been explored that well in the previous studies, look at sensitivity of results of the analyses so we'd have some idea of the thermal conditions were a little different than what we looked at, how much of a difference does that make? What's the impact? Sort of go through the analysis that we will conduct and look at the sensitivity of the results to the different scenarios and parameters that we would put into that analysis.

With that I just want to stress if you do have other thoughts on this or other issues either now or after the meeting, if you want to put them on the card or e-mail them or write into Rob or Dr. Shankman, please do that.

MR. CAMERON: Thanks, Charles. I wanted to do give everybody a chance to respond on these issues, but we talked in a number of segments today about what some call bounding; what Eileen called best bang for your buck point. Amy mentioned conservatism.

I just want to do give Mike Wangler and Mark Holt a chance to say a few words on that so that people can understand what that's all about, because there's been a lot of I credibly good suggestions that have come out of this meeting. But when the NRC and Sandia go to integrate that and consider it, there may come a point where not all things can be done. So how do you work with this?

Mike you had a comment that you made. You keep pointing at Mark Holt, but we're not going to let you do that. Mike, how about a comment on the issue of bounding? We'll go to Mark Holt and then open it up for everybody else to comment on bounding or these issues.

MR. WANGLER: I'm not sure I remember any more what I was thinking about whenever I made the comment.

I guess reminds me a little bit of a story. When I started out in this business as a health physicist some 28 years ago ICRP2 was the predominant publication on the, that provided those conversion factors that relate to various environmental or radioactive pollutants as it got into the body converted that quantity into dose.

Some years later ended up with ICRP2 26

and 30 where we made some changes but what we generally got was more decimal places behind the numbers that we already had. Then five years ago, six years ago, we ended up with the ICRP 50 and 51 which basically just reaffirmed everything that has been done for the last 30 years. There were some changes in that one kind of went, kind of overturned what was done in ICRP 26 and went back to ICRP 2.

It's not really related to bounding per se. What I want to express a concern about is that we have the NUREG 0170, we have the Lawrence Livermore NCR Modal Study. We have some good information there that I hope we don't throw out for the sake of a new study. I suspect that what we're going to find is that we've sharpened our pencil. We've taken out our data which is going to go from four decimal places. We can now take that out to eight or ten decimal places and find out we're probably in the same ballpark and here we've just spent a lot of effort to reaffirm what we've already done.

What concerned me about the Livermore report concerns me about this one. Someone brought it up a little bit earlier was the uncertainty in the data that's used to generate our final numbers. The Livermore report had three significant figures. Had one plus I think three decimal places, had three significant figures probably with data that was no better than one significant digit. Yet there were no error bars, no uncertainties that were identified in the report as showing where that number fit. Was that number good to five percent, 10 percent? I suspect it's was probably good maybe 100 percent, but there was no analysis that was done. I'm hoping that perhaps in this report we can get a little better sense of where these numbers fit. And in that sense I will use the term bounding, in that if we know where the number is plus the margins that we have on either side, we kind of know where our number lies. We can have a little bit more -- we I guess in the scientific field can have a little bit more confidence in the numbers that we get.

I realize that probably the general public likes a single number that they can work with. Unfortunately when you have systems with significant uncertainties and data, it's hard to rely on just a single number.

I like the idea of looking at numbers that are risk informed so that you can kind of figure out where you want to be. You can do screening methods much like Livermore did in their report to kind of say we've considered these numbers but they fall outside of where we think they should be. We're going to consider this subset.

It's still not clear to me from listening to the Sandia discussion how their going to actually present the data. I realize there is some criticism in the way Livermore did their number of looking at strain at a certain point and temperature at a certain point. But in that regime they came up with a grid that had a, had some logic to it.

With the discussions that have been done here, we talk about using analytical models and we can do some precise calculations on the responsive things, but it's not clear to me how we're going to put this thing in an order so that we can determine where the bounds are that we want to, we want to look at the transportation of spent nuclear fuel. Thank you, Chip.

MR. CAMERON: Thank you, Mike. Mark, let's go to you for some comments. Mark, in case we didn't mention it earlier, is the author of the congressional research service report on spent fuel transportation which I think was very helpful to a lot of people in terms of putting this into an understandable perspective.

MR. HOLT: From my perspective is certainly the perspective of trying to help inform the congressional debates. This has been a very useful exercise, particularly because I would presume a lot of the issues were raised today, if not all of them, would be issues that you would see when the nuclear waste bills come to the floors of the House and the Senate probably next session. So I would I wouldn't expect to see a lot of results from the study in time for that, but certainly for my own purposes and for purposes of Congressional policy makers, the more answers to these questions we can get or at least the more analysis you can see, everybody will accept the answers would be very valuable. But, of course, as was mentioned can every one of these issues be fully analyzed in the study and should there be some rebounding on some of them? Obviously you got to make the decision on how much time and money you have available to do that, but the more you can do the better it would be in my opinion.

MR. CAMERON: Thank you very much for that. Bob, do you have a comment on this?

MR. FRONCZAK: We can throw a lot of money at it and we're trying to figure out what really makes a difference before we decide where to throw our money, so we encourage that.

MR. CAMERON: Okay. Thank you. I see

Halstead's cappuccino is still working. His name tent is still up with us.

Why don't we start Rick Boyle and I want to give all of you an opportunity who want to, you are not required to, to offer any final thoughts for us before we close. Rick?

MR. BOYLE: Thank you. The one comment I'd make and it is a little bit on the bounding issue, I will be interested either off-line or later on on a comment that I would submit to the NRC, but it may be to Sandia, we have had a lot of ideas in today but at what point do they become such low probability events or the sequence becomes such low probability that, I don't want to say they're discarded, they have been studied and they've been determined to be such low consequence that they're discarded. Will we go in before we even start and stay if they are one in a million or less in probability they would be discarded? Should we do that up front and possibly with public input or will we do this after the fact and say we can only do the top 10, so our probability becomes maybe 50 percent.

I wonder what the thought of both Sandia and the NRC are on such, where do you draw that cut off and do you do it before you start the study or as you get into it and do it based on your funding? Thank you.

MR. CAMERON: I think that's an important point to consider and maybe that will be something that's in the phase one recommendations and analysis.

Mike, do want to say anything more than you already have?

MR. WANGLER: I want to support Rick on his comment on looking at low probability sequences. I guess the parting comment I would like to make is that in the study we need to be very careful that the studies don't do anything to undermine the regulations that we currently have.

We are operating under 30, 40 years of excellence, excellent transportation under very similar regulations. I'd hate to see that we'd have to revisit everything that we have done in those regulations. Some of the impacts that would have is these regulations are worked through with the international community. Congress even binds the U.S. to be generally compatible with international regulations so that we can insure commerce and be able to move things back and forth between the countries.

Along those lines it troubles me a bit I think that Jack Edlow made the comment earlier about Sandia looking at a thousand degree C fire for the duration of one hour. This is certainly extra regulatory and it makes one wonder that if we pass that, are we now going to ratchet the regulations toward a different number and if we fail that are we going to have to look at higher numbers? So I think we need to be very careful in what we look at and officially propose for these studies. Thanks.

MR. CAMERON: Thanks, mike. Tracy?

MS. MUSTIN: I'd would like to thank you

for including me an a learning experience. I thought it was very valuable. I think I agreed to what Rick and Mike said. I think the real challenge is going to be over the next few months perhaps in the next series of meetings, how all this input, there was a lot of interesting and valuable input provided today, but how this input is sort of collated and then a study is proposed that allows us to, whether the right term is address in a bounding way all the things that were said, all the input that was provided today, suggestions that were made. I think we all have a vested interest in the study and the results will be used for years to come.

We'll see that the study does validate a system and a process that is conservative, and has provided safe transport for years. But it's also a tool that we can use, hopefully help build confidence.

The suggestions that were made about taking the opportunity to explain to the public what some of these things mean and what the system is about is going to be very useful.

MR. CAMERON: Thanks. I think we should all pay attention to the fact just what the importance of this particular study is.

Dwight, do you want to say something?

MR. SHELOR: I certainly agree that there are, there is a cutoff on the low probability of that. Need look at very carefully. It would save you a lot of money when you scope it.

I commend NRC, particularly Susan for starting this effort and getting involved in it. I personally believe that as Tracy said we will use this for years to come, but the real value in this study is going to be the public involvement and personally I encourage you to go all over the country and talk to everyone because for the general public and those that are particularly interested to understand the safety case is really important. That's our biggest struggle when we talk to the public and we want to convince them this is safe enough. You have the burden and I think you are doing a great job.

MR. CAMERON: Thank you very much. Jack Edlow?

MR. EDLOW: Three points. First of all, I'd like to thank the Regulatory Commission for the really superb job they've done today. There's a sense of openness in this meeting and the sense of decorum, and I think the term decorum is appropriate because I have been to many hearings and I've been subjected to many hearings in the past and things where decorum was certainly not the issue. I want to applaud everybody for the way they worked on this today. I hope that it can continue especially at Henderson. That's the first point.

The second point is I would like to thank the Nuclear Regulatory Commission for their statement of confidence they made this morning in the existing regulatory framework. I think it's very important that the public continue to get that sense from you and I hope that you will continue to make that point everywhere you go.

Things are good and this is just a question of continuing your analysis of the circumstances.

Thirdly, I would like to make the point that many people are saying let's keep it real, deal with issues that can be dealt with and should be dealt with. Let's try to do scenarios that are meaningful and not get hooked into all the what ifs that you can get into because even though Chuck would like to spend your money in looking at all those things, I don't think the taxpayers should have to fund so many things that are on the outside bounds. Thank you very much. On to you.

MR. CAMERON: Marvin Resnikoff.

MR. RESNIKOFF: I would also like to thank the NRC for doing this and for your openness. I want to think about the question that Susan Shankman asked. This happened so long ago this morning which was why should we do an environmental impact statement? I'm going to think about that question because I'm comfortable with these technical issues and technical proceedings, but I'm a little uncomfortable in sort of excluding the public in holding sort of these what I think of as more back room meetings involving a much larger constituency out there and the EIS allows certain legal safeguards which we don't really have sort of in this kind of setting. And also allows more political element to enter and this is, after all is a democracy, it's not being run by technical people in the back room. It's being run by people who are elected. So I have some concern about this aspect of it. And so I'm going to think about why an EIS -- the question you asked -- and I will send you a letter about that.

MR. CAMERON: Thank you very much, Marvin. Let's go to Bob Fronczak.

MR. FRONCZAK: I think NRC did a great job. Chip, I thought you handled the meeting real well.

MR. CAMERON: Thank you.

MR. FRONCZAK: One thing I would like to follow-up on Mike's comments is that I think you said that the regulations that we have now are good. We all believe that. The only thing I would change about that is if something in the analysis, let us look to a point where the regulations needed to be changed, and I think that ought to be done.

MR. CAMERON: Thank you, Bob. Ed Pritchard.

MR. PRITCHARD: Thank you, Chip. I also want to thank the NRC. I echo what's been said by the other speakers here. I would also like to again make the Federal Railroad Administration available to you and I hope you do utilize us and our concerns about fire tests, crashes and what have you. We will start gathering information on some of the more serious accidents as of tomorrow. So I again thank you.

MR. CAMERON: Thank you, Ed, and thank you for that offer of assistance too. Kevin.

MR. KAMPS: I would just like to thank you for the invitation to be here today. I would just like to echo the importance of an environmental impact statement process to give the public meaningful and legally binding part in the decision making process. It's ironic that the spokesman from the Department of Energy, Mr. Shelor, said that these meetings should happen all over the country because there is growing, there is a growing feeling along the transportation routes that they have not had, well, they're not getting public hearings along major transport routes in the draft environmental impact statement process.

For the Yucca Mountain repository places like Chicago, do not have a public hearing and so there is efforts on the grass roots level to try to get public hearings on the draft environmental impact statement from DOE. So I fully support that idea that the NRC should take this to the places that are most impacted by the study. Thank you.

MR. CAMERON: Thanks, Kevin. We're going to come back to Susan for last words. So we're going to go over to Mark Holt. Mark?

MR. HOLT: Thanks again for inviting me today. I think this will definitely be helpful for me in helping to inform the Congressional Debate.

I just once again I'd reiterate that these issues that were raised today will be issues in the debate and any analysis that can be directed at them will be extremely valuable.

MR. CAMERON: Okay. Thank you. Do you want do say something since you are the project manager? I think you probably should.

MR. LEWIS: I just want to say that these discussions have been very useful to me same thing and I think those from Sandia will say the same thing. For this issue report that we're going to produce next May or so, what I have learned today is we need to be very clear in our message and in particular regarding whether we want to use bounding, but still representative assumptions in approach or whether we want to use these more realistic assumptions and for both of those cases we need to think about how we're going to use sensitivity analysis to support these approaches.

We need to be very clear in this issues report about how we will use testing in this project and what we intend the testing to show. I think we need to be very clear in this issues report regarding whether or not we want to use some sort of risk to address lower probability accidents below some probability threshold where the consequences may be great but the risk is small because probability is so small.

MR. CAMERON: Thank you much, Rob. Rick?

RICK: . Well, it's always good to see the regulators are vigilant and interested in continuing to evaluate the level of performance. This is provided by compliance with the regulations. I think that's been going on since 1961 when the first regulations were set up and it's something that needs to continue because every year we get smarter concerning accidents that have happened and understanding frequencies and forces involved in accidents and keeping that sort of information up to date is a necessary part of being rigorous regulators.

On another point, what I think really it comes down to is an explanation to all involved of the system performance of the spent fuel cask. It has contents inside of it, a lot of details about the pins, pallets, the cladding, cask, the seals, impact limiters.

In the end it's a system that performs and understanding how that performs in a deterministic sense where the regulations have said you must be able to withstand an accident up to this particular point, I think explains to people what they can expect, the level of safety they should be confident in each and every cask having.

The next step then is the performance when it exceeds the regulatory requirements and in some cases it's been called graceful failure and other cases it's the so-called graceful failure depending on how you view what the cask is going to do when it exceeds what it was designed to do. If the study can explain how the system performs in the deterministic range and problemistic range, up to the point where you have drawn the bounds of it on a basis of probability perhaps, then that in the end will help everyone, I think, leave with a better and more comfortable understanding of just what the safety is and transport spent fuel.

MR. CAMERON: Thank you very much, Rick. Amy Shollenberger.

MS. SHOLLENBERGER: Thank you for having this meeting and I particularly appreciate it because it's not often that I get to ask questions and have request access to the people who actually know the answers to those questions.

I think it's one thing being a member of the public as opposed to the industry. That's a real handicap because it's hard to get the answers to questions. I appreciate a forum where I can get those answers. I would also just like to follow-up on a couple things and just add my two cents.

First, I would like to thank Eileen for asking you to consider your audience, I think that was a really good point and I'm glad to agree with you. I think it's really crucial that you consider your audience and you think about how to explain this stuff to people who are going to be watching the cask driving by their houses every day. And so I just like to say I would also like to follow-up on what Kevin said and I was going to bring up the same point of I thought it was very ironic that the DOE was encouraging the NRC to hold meetings like this all across the nations when the DOE is refusing to do the same thing, even though we are requesting it. We being American citizens, taxpayers.

So I'd like to urge the NRC to encourage the DOE to do the same thing being partners and all. And just one last comment that I would like to make, and I hate to end on this kind of a note, one thing that kind of made me sad in the meeting is several people said we all agreed that the regulations are good enough and I'm not sure that's true. I think that, I know public citizens -- the regulations aren't good enough until they say zero release is acceptable. Thanks for having us.

MR. CAMERON: Thank you, Amy. Felix, go ahead.

MR. KILLAR: I would be remiss if I didn't thank the NRC because everybody else did. But I do, I think these are helpful for the industry to also hear the issues that people who obviously share our view of perspectives have and help us understand this perspective so that we can help provide additional information and maybe address some of those concerns and certainly make changes where changes are needed.

The one issue that wasn't discussed, the one issue that's near and dear to our hearts is that this program is basically funded from our fees we pay the NRC. I know this morning Susan mentioned that she wants to do this thing effective and efficiently and we certainly endorse that. There are limited resources out there and there are limited resources at the NRC and so I think one of the things is very incumbent upon the study is to find out where are the big issues? What are the issue that need to be studied in-depth and what have you, and spend the resources where you get the most benefit because you do have limited resources and it's our resources you're spending and we want you to spend them wisely.

MR. CAMERON: Thanks, Felix. Eileen Supko.

MS. SUPKO: I think building on what Felix just said would be beneficial for the NRC and Sandia to focus on what's new and what's changed since the last modal study. Talk about some of the things that have changed. Cask designs have changed, some of the accident statistics have changed. They may have improved or degraded. Also put in place the process such that the study doesn't necessarily get redone every 10 years just because 10 years have passed, but because something new that's significant has occurred. I think that's an important thing to keep in mind and also the fact that you have enhanced analytical capability now and how does that factor in.

One of the things that I think everybody in this room agrees is that spent fuel transportation is an issue more important both to nuclear industry, to members of the public, to different groups and this type of a meeting where you get everybody's opinions and perspectives, I think is very important. This has been less painful than I thought it was going to be spending the whole day here. The last comment is is I would love to know what they're doing next door.

HEATHER: Thank you, Chip, and members of the NRC staff for organizing this meeting. As usual I got a lot out of it. Like many tribal environmental or technical staff, I deal with many issues, not just this one. I appreciate all

I heard today and take that information back and help the people that I'm here to represent. Thanks.

MR. CAMERON: Thanks, Heather. Robert Holden.

MR. HOLDEN: Thanks to the NRC staff and Chip Springer for ramrodding the session, and keeping us all awake. But just in closing just to say that, you know, the folks I represent they're impacted by a lot of things in this program area. The cask integrity can be important to cultural integrity. In the event of an accident consequences are great, probability is small. However, that one consequence is, it's -- do tremendous, harmful everlasting damage to tribal lands and some of those folks live in areas where there is cultural sensitive matters where the things that set them apart and distinct from other folks, this being their homelands, is an integral to their culture. These same scientist who have worked in these areas have a tendency to dispute the fact that there may exist phenomenon, that there may exist spiritual beings that exist there in which those native peoples communicate with.

It's my understanding that scientists aren't supposed to disprove anything or they can't disprove they can eliminate certain possibilities. However, you know, they discredit and discount many of the things that tribal people try to share with them.

In terms of sharing this information and developing the outreach materials, remember that a lot of these folks may be second generation English speaking people so this is entirely a foreign language to them, not the mention the technical jargon that they will be hearing. Just quite difficult for them to comprehend particularly when -- and to understand that this material that's traveling through their homelands, which they have no place else to go if something happens there, that they set up these lands in reserve for them a long time ago in exchange for other lands.

Not only that, the resources that -- this uranium came from their lands, extracted from their lands and those places were not cleaned up in that mining and so forth and now it's coming back through their corridors and homelands, so be mindful of that and be respectful of that and I'm sure they will be respectful as you go down this path. Thank you.

MR. CAMERON: Thank you very much, Robert.

Before I turn it over to Susan for closing, I would just like to thank the group. You have been a very thoughtful group and constructive and courteous. Thank you very much. Susan I will give it to you to close.

MS. SHANKMAN: I want to thank you all for being here, for your patience, for your perseverance and I'm not going to get into any issues. We're going to look at the transcript. When we go to Nevada I'm sure we will get other comments.

The one thing I wanted to say is that we brought all the staff who are working on this project with us. People from Sandia, people from my office. Janet came who is with the division of waste management.

The reason we are here is because we sincerely wanted to do this -- I won't say right -- because we can all define it differently. But we certainly want to do it in a in which people with different issues are fully considered and fully explored. I told at the beginning of the meeting we will do that.

We will come back with the design for our study. We will get other comments. I thank you very much. I imagine we all want to go home and if you have any ideas, I get my best ideas when I'm driving home. Please send them in to us. There is a lot of information we talked about today. I hope maybe you don't go away with the sense we have any answers, but I hope you have a feeling that we have listened to the questions. Thank you.

(Whereupon, at 6:15 p.m., the conference was concluded.)

CERTIFICATE OF REPORTER

I hereby certify that the foregoing is a true and accurate transcript of the proceedings in the aforementioned matter this _____ day of __________.

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DONNA M. HALL, Court Reporter