UNITED STATES

NUCLEAR WASTE TECHNICAL REVIEW BOARD

Meeting of the Panel on the Waste Management System

SPENT FUEL TRANSPORTATION

July 10, 2000

Shilo Inn
780 Lindsay Boulevard
Idaho Falls, Idaho 83402

NWTRB BOARD MEMBERS PRESENT

Mr. John W. Arendt, Panel and Meeting Chair
Dr. Daniel B. Bullen
Dr. Paul P. Craig
Dr. Richard R. Parizek
Dr. Norman Christensen

SENIOR PROFESSIONAL STAFF

Dr. Carl Di Bella
Dr. Daniel Metlay

NWTRB STAFF

Dr. William Barnard, Executive Director
Karyn Severson, Director, External Affairs
Linda Hiatt, Management Analyst
Linda Coultry, Staff Assistant

CONSULTANTS

Robert Luna

I N D E X

PAGE NO.

I N D E X
(Cont.)

P R O C E E D I N G S

ARENDT: I wonder if you could all take a seat, please? And if you will excuse me for not standing, but I can barely hobble around, so I'm going to try to do this sitting down.

I will stand just for a moment, though, just so you can see me.

I'm John Arendt. I'm Chair of the Waste System Management Panel. I'm assisted here this morning, I'm actually a chemical engineering consultant. My major experience has been in the nuclear fuel cycle. I'm assisted here this morning with Dan Bullen. Dan is Director of the Nuclear Reactor Laboratory, and Associate Professor of Mechanical Engineering, Department of Mechanical Engineering at Iowa State University.

Norm Christensen. Norm is Professor of Ecology and Dean of the Nicholas School of the Environment at Duke University.

Paul Craig. Paul is Professor of Engineering Emeritus at the University of California at Davis, and is a member of the University's graduate group in Ecology.

Richard Parizek is a member of the Board, but is not a member of the Panel. Richard is Professor of Geology and Environmental Engineering at Penn State University.

Deborah Knopman is a member of the Panel, but she is unable to be with us this morning.

I'd now like to introduce members of the staff. Carl Di Bella, who has played a key role in setting this meeting up. Linda Hiatt and Linda Coultry, they are in the back. Bill Barnard, who is Executive Director of the NWTRB. Karyn Severson, who also played a role in setting up this meeting. And Dan Metlay from the staff. And Bob Luna is to my left. Bob is a consultant to the NWTRB for this meeting.

A couple items that I'd like to mention. There has been a time set aside, as you'll notice from the agenda, at the end of the day, it starts at 5:10 p.m., and this time of the day has been set aside for public comments. And anyone here desiring to make public comments should register in the rear, either with Linda Hiatt or Linda Coultry, and depending on the number of comments, we may have to set a time limit on the length of the comments, but certainly your entire comment will be included in the record. So we would like to get a copy of it if it takes longer than five minutes. So your comments really can be of any length, but we may only limit them to five minutes oral comments.

We're also going to try to answer questions from the audience, not after each of the speakers, but if you have questions during the day, if you would give me a written copy of the question, and if we have time, we will attempt to have a Board member answer the question. I won't make too many promises, but it will depend on the time that we have available.

So let me repeat the most important thing is if you want to make comments at the end of this meeting at 5:10 p.m., make sure that you register in the rear with one of the Lindas.

I think we've got a very informative meeting today. We have people who are very knowledgeable in the various topics that are going to be discussed.

The first speaker that we have this morning is Jim Carlson, James H. Carlson, who is the Acting Director, Office of Acceptance, Transportation, and Integration with the Office of Civilian Radioactive Waste Management, Department of Energy. Jim?

CARLSON: Good morning, everyone. This is to remind me who I am.

Thank you, John, for the introduction. It's a pleasure to be here today and have the opportunity to talk to the Board about a subject that actually hasn't been covered for several years, since the program's been fairly inactive.

Just by way of background, I have been with the Office of Civilian Radioactive Waste Management since it was formed when the Nuclear Waste Policy Act was passed. Prior to that, I was in the Reactor Development Program within the

AEC. I've got I think it's over 30 years now with the Department of Energy and its predecessor agencies in the nuclear area.

And I guess within RW, I've been involved with the monitored retrieval storage proposal, actually, the original liaison with the Technical Review Board when it was first established, the waste acceptance area, the systems engineering area, and the transportation area.

What I thought I would cover today, just by way of background, is a little bit about update on where the transportation program is, both organizationally within RW, a little bit of the overall program status, where the budget sits, and what the transportation program outlook looks in the near future.

Then the second area, Mr. Arendt asked me to talk about the transportation protocols. I didn't feel I could do that without a little bit of context with regard to a couple other DOE transportation initiatives that have been going on in Washington and with some of the field involvement. This would be what we call the Senior Executive Transportation Forum and the Transportation External Coordination Working Group. But I will be focusing on the protocols.

There have been several, I guess, recent changes within the Office of Civilian Radioactive Waste Management program, particularly with regard to the area that I work in.

The Office of Acceptance, Transportation, and Integration is located in Washington. It is pretty much the technical arm of the program that's located in Washington. It consists of two divisions, Waste Acceptance and Transportation Division, where that's my job that I normally have as the Division Director, and the Systems Engineering and International Programs Division, which is headed up by Jeff Williams.

Dwight Shelor, who was the Director of the Office of Acceptance, Transportation, and Integration, retired about a month and a half ago, and I've been acting since then. Within my division, there are two teams, the Transportation Team, which the team leader, who is Bill Lemischewski, retired about two and a half months ago, so we're down to a two person staff, and I'm also acting as the team leader in that capacity. We don't have a lot of quantity, but we do have quality.

The Waste Acceptance Team is headed up by David Zebranski. They're responsible for administering the standard contract that we have with the utilities, with managing the interface with the external parties whose waste we need to receive. They're also very busy these days doing litigation technical support, since we do have all the ongoing lawsuits with the utilities.

I will mention one other individual that you haven't met, Sandra Waisley. She's up in the front office now as the Associate Chief Operating Officer. She's come over from Fossil Programs in the Department of Energy.

And I also, although Cory will shoot me for it, one of the Transportation Team, Corrine Manacaluso, who is actually doing most of the work on the protocols effort for RW, is with me here today.

Now, this is simply to illustrate where we are and where it looks like we're headed with the transportation at this time. Right now, and I'll mention it in a few minutes, we've published a draft request for proposals for Waste Acceptance and Transportation Services, in fact, we've published two drafts. We expect once we know where we're going, to reissue the draft for one more round to address a few areas that are still open in it, and to solicit another round of comments to make sure we've got something that we think will work.

We expect to reissue, I'm not certain whether we'll go out with another draft on our 180(c) notice of policy and procedures. Section 180(c) is the requirement in the Nuclear Waste Policy Act which directs the Department of Energy to provide technical assistance and funds to states and tribes for training public safety official in whose jurisdictions we will be shipping. We've gone out with several draft policies and procedures on how we plan to implement that. We now have one that I think is reasonably well received by the external community.

It provides for a planning grant roughly five years before we ship to the states of a fixed amount, so they can actually do their planning and determine what they need in the way of technical assistance and funds, and then individual grants with a base amount to support state level staff, and a variable amount to pay for the actual costs of training along the routes. So that would go out in a final form after we have a site to ship to, and we can start working directly with the potentially impacted states from a transportation perspective.

One other one that I will mention, since we're out in Idaho, the Dry Transfer System Topical Safety Analysis Report went to NRC a number of years ago. This was a cooperative agreement that the Department got into with the Sacramento Municipal Utility District to develop a dry transfer capability to allow them to move spent fuel from a dry storage cask into a transport cask without a pool to do the transfer.

They did a cold mock-up here in Idaho of this. This was done with SMUD and with EPRI. I don't know whether that will be on your site tour, but it may be, so I just thought I'd mention that one.

I think I've covered most of this. As I said, we issued a revised draft request for proposals in end of fiscal year '98. This is for waste acceptance and transportation services.

I could describe a little bit the structure of that proposal. We probably do have enough time. The actual proposal divides the country into four regions that correspond to the NRC regions, and requests bidders to provide us bids to actually take care of all the waste acceptance and transportation services within each region. And this was structured this way to put in place and almost create a competitive market to give the Department--basically trying to capture the values of a competitive marketplace where you don't really have a major competitive market for transportation of spent fuel.

The proposal is set up in three phases. The first phase would be a fixed price where the proposers would have two years to prepare a proposal. Then there's a five year period for the acquisition of equipment.

During the planning phase, they would also work with the utilities to come to agreement on which type of equipment they would need, and to pin down a schedule within the agreements and the contracts that the Department has with the utilities. Then the actual operations would start in 2010. It would be done consistently with all of the regulatory requirements to ensure that we did achieve safe shipments.

Also, the Department has identified within the proposal that we would continue to be responsible for the interactions with state and tribal governments, and that we would retain the final approval of routing decisions after working with the states.

So we've tried to combine what we are hearing back from the states and tribes in our external relations with trying to set up a market-based acquisition to give the government the advantages that come with that sort of an approach.

I mentioned the Section 180(c) policy and procedures. That was also issued in late '98. Both of these documents are on the RW Home Page and on the website.

As I said previously, we will begin continue working on those once we have a destination defined. And in the meantime, we've limited our transportation activities to the work being done on the Yucca Mountain EIS, which is run out of the Yucca Mountain project office in Las Vegas.

Participation in DOE transportation policy development and protocols basically fits within that area. Transfer existing canister and cask information, that would include the dry storage technology that I mentioned, also the burnup credit work that was being done, we've basically turned that over to the private sector for them to pursue actual applications for burnup credit within their transportation cask designs. And to the extent feasible, continuing to work with external groups, as we can, with our staff and limited resources.

The 2001 budget, the Department requested, or the Administration requested 437 million, which had a sharp increase in the Waste Acceptance, Storage, and Transportation area. I'll get into more detail on that in a minute. Otherwise, the highest priority work and the bulk of the funds continue to be allocated to the site evaluations going out in Nevada, preparation of the site recommendation and considerations report, site recommendation and planning for the license application.

The four areas in the Waste Acceptance, Storage and Transportation project, which is one part of the Office of Acceptance, Transportation and Integration, has three areas in our work break-down structures. We have had no funds and no work going on in spent fuel storage for several years. Transportation, we've request 1.8 million to restart planning, and what we would probably do in that area, although there isn't agreement on it, would be to re-look at the acquisition strategy in light of the experience at Hanford with the vitrification plant cost overruns, or the difference between the estimates and what they came in with, and the pit mine experience here in Idaho.

I personally would like to re-look at some of the institutional provisions, the way we've handled them. We still get a lot of comments from the states and the external groups in that area.

The other one is we have a lot of detailed planning to re-look at and redo if the site is selected and we move forward in the 2002 time period.

The 1.8 million is only there if we end up with 437.5, because as I said, our priorities continue to be qualifying the site. So at this point, the House has given us a mark of 413. The Senate hasn't acted on our request yet, but I would anticipate that there will not be 1.8 million for us to restart some of these things.

I mentioned some of the DOE initiatives. One of them, which sort of oversees the others, is the Senior Executive Transportation Forum. There has for years been various attempts by the lead transportation police makers within the federal system, not the appointees, but the deputy assistant secretary level within the Environmental Management Group. Dwight participated in it. There were regular meetings or ad hoc meetings to try to keep abreast of what was going on in the transportation area. The Naval Reactor folks participated.

Secretary Pena came on board as the Secretary of the Department of Transportation prior to coming to DOE. He wanted to formalize the relationship with DOT, and he had a couple of phone calls from governors that made him unhappy about the way transportation's operations had been conducted. So he basically established this group formally.

The responsibilities of the group are to better coordinate. This group does not have authorities that go beyond what any of the representatives of the individual programs do. It is, by charter, made up of the program secretarial officers. Actually, the attendance and participation tends to be the senior program managers who are involved in transportation activities. This would be the deputy assistant secretary level within other programs. It was the office directors within the RW program.

The actual makeup of the committee and the representation at the meetings are the parts of the Department that are actually shipping, Defense Programs, Naval Reactors. Environmental Management, who is actually probably doing more shipping than anyone, they are doing the shipments to WIPP. They do the foreign fuel shipments. They do low-level waste shipments from all of their clean-up activities at the various sites.

The Office of Science does some shipment of isotopes. The Defense Programs does national security shipments. The Naval Reactors Program does spent fuel shipments that I think Don Doherty will talk to you about, or maybe Ray will talk about it.

The other groups, our office, who's planning to ship, and also because of the scope of the actual shipments we will be doing and our long involvement with the states and regional groups, we tend to attract a lot of attention, so we are fairly key players in this because our policies do get either criticized very heavily by various groups, or others pay a lot of attention to what we're planning to do.

Materials Disposition is actually planning to do some shipping with the uranium that's coming from overseas, and plutonium. General Counsel is always there to help us with what the law actually means. And because of the public reaction to transportation, the Intergovernmental and Public Affairs part of the Department are actively involved in the council.

And DOT, as I mentioned, may participate. They've come over for a couple meetings if there's something going on where there's a feeling we need to have DOT senior officials involved.

The initiatives that this group has been looking at is the protocols, which are the main focus of what I'm going to talk about today, if I don't run out of time. There is a consolidated grant initiative that the Department has been looking at. Just as RW has 180(c) that says to provide funds and technical assistance to states and tribes, the WIPP program and the Land Withdrawal Act provided for either assistance in funds or actual training.

The other programs under their general authorities, under the Atomic Energy Act, have done training along routes and have worked with states and tribes to ensure that they're comfortable with the shipments that come through, to ensure that there's adequate emergency response training and coordination.

While the consolidated grant was an idea that's been kicked around for quite a while and it's finally getting some--actually being raised up to a decision-making level within the department, as to whether all these different diverse programs can effectively integrate the grant process, pool the funds, and get a better distribution of the fundings, and we don't end up having different programs training the same groups, and other groups that probably would benefit from the training not being adequately resourced to accomplish it.

Now, the transportation protocols, and I probably should have explained a little bit what that is when I started, it is basically a documentation of our procedures and practices that the Department of Energy uses in shipping radioactive materials.

There's long been a concern expressed by state representatives and other groups that the Department does not work the same way for the various materials that they ship, a lack of understanding between the various parties. Any of us who have gone out and talked to legislative bodies quickly learn that a true shipment to WIPP and a spent fuel shipment and a movement of contaminated soil, there isn't a real distinction in the eyes of the people you're talking to. And I personally find I've focused on RW for so long in spent fuel, I don't know a lot of the key practices in some of these various areas. So it's difficult for decision makers, policy makers, and difficult for us in talking to them, you end up with a lot of frustration, so this was partly being done to address this, the document in one place, all the different policies and practices that the Department of Energy uses in its transportation of radioactive materials.

At the same time, the group is looking for areas where we can standardize. We do have different field offices. They all follow the regulations. They all ensure that the shipments are being done safely. But they each may do it a little bit differently. So we're trying to look for standardization and for documentation of how the Department will go along in its shipping and transportation of radioactive materials.

What we did was we reviewed all of the current practices and documented the regulations, how we each will approach them. As I said, we will strive for uniformity in approach. And we are trying to develop this cooperatively with external parties who are interested in transportation, and I'll talk a little bit about the transportation and external coordination working group later. But that has been the body that the Department has been working with for the last ten years with representatives of regional and national groups to help get policy input on transportation.

As I mentioned, we went through and we reviewed our current practices that are used by the different programs to identify the baseline, where are we now. We are sort of a unique agency from the standpoint that different programs have different requirements.

RW probably stands out from a lot of the rest. We have specific statutory language that requires us to use NRC certified packages for any shipments to a repository or monitored retrieval storage facility. We're required to follow the NRC guidelines for pre-notification of states and tribes with regard to our shipments. We also have a requirement to use the private sector to the maximum extent possible in doing our transportation.

The other parts of DOE are not bound to use NRC certified containers. A number of them do in order to have an independent body review, because of the public concerns with regard to the adequacy of the packaging. But under the Atomic Energy Act, DOE has authority to certify shipping packages.

DOT regulations, I believe we are bound to use those. Certainly in our case, in RW, we have made it a policy that we will ship as the licensee. So we are not only committed to the pre-notification, we are also committed to follow all of the NRC safeguards requirements and transportation-related requirements, which include DOT. If you're going to ship under NRC regulations, you abide by the DOT also.

There also are differences because of the material types. Low level waste doesn't have the strict routing requirements for the highway route control quantities of radioactive materials, which spent fuel must follow.

WIPP has identified routes. WIPP has put together an extensive set of protocols. The WIPP program implementation guide, or what is referred to as the WIPP-PIG, which was jointly developed by the WIPP program and the Environmental Management Group, and the--I think a group put together by the Western Governors' Association, they address a number of the areas that our broader DOT protocols are going to address.

And lastly, we do include within the DOE family, national defense and national security shipments, these involving weapons, and the Navy shipments of spent fuel fall under the national security provisions. And that will affect protocols.

The areas that the protocols will address include shipment pre-notification. In this case, the RW requirements are pretty explicitly laid out under the NRC regulations. DOE has different requirements. They're generally similar, but they're a little bit different, which we've tried to actually standardize in this area so we look more alike as the NRC requirements.

Shipment planning information. What information will we make available to states and tribes and parties, and at what time before shipping. Routine protocols, emergency notification, emergency response, operational contingency, which would include safe havens, what you do in case there is a delay in transport. Or excuse me, operational contingencies is probably not safe havens. Driver requirements, which flow down from the Department of Transportation, hazardous material regulations.

Tracking. The WIPP program, the Waste Isolation Pilot Plan, has used TransCom, which is a system developed by DOE. I think it's now run out of Oak Ridge. We have committed to using that system within our RFP, our acquisition strategy. Inspections, recovery and clean-up. Anyway, there are 14 specific areas that will be covered by the protocols.

I mentioned the transportation external coordination working group, which are the stakeholders that we are working with, or providing early drafts of protocols and working with on the review. This is an organization made up of national and regional groups representing states, tribes, local governments, industry. A number of the speakers today actually attend the TEC working group meetings on a regular basis. It is jointly chaired by Environmental Management and Radioactive Waste. I have had the dubious honor of being a co-chair for a number of years.

A lot of the emphasis has been on the emergency response area and training. We have the Conference of Radiation Control Program Directors are a member, the emergency nurses, they've done a lot of work on trying to define what the appropriate level of training will be for emergencies involving radioactive waste shipments.

The rail people, Bob Fronczak is going to speak later today, attends the meetings regularly. The Naval Reactors attend. Although they are not members, the Department of Transportation usually is represented by the Federal Rail Administration, the Highway Safety people and the Research and Special Programs Administration, and as you can see, a host of others representing various interests who will in one way or another be involved in our shipments. The nuclear industry, through NEI usually attends at the meetings, and utility people will attend.

I was going to mention generally the TEC as a body meets twice a year with representatives from those groups. DOE has cooperative agreements with most of those groups so that we can provide them funds so they can attend the meetings. They generally work by smaller groups, or working groups, break-out sessions, and they've addressed such topics as rail safety, training in general. Medical training is actually a separate activity. They've done work on routing, recommendations with regard to how the Department should approach routing. And right now, they are doing a lot of work in protocol areas.

14 have been released to this subset of the TEC working group. They've provided comments. The writing group within the Department who's developing the protocols have been reacting to these comments and trying to see how we can accommodate them, where we feel we can.

One protocol is still under development, and actually I think that one is being incorporated into two other protocols. So those two bullets basically are identifying the same one. This has been a communication protocol, and I think we're looking at it more being incorporated into the pre-notification and letting people know what's coming up, and in operational contingencies, or emergency response area where it will talk about the communication activities that need to take place.

All of them have been completed in a preliminary draft form. The goal was to get them done by June. The writing group, which two of the members are actually here today, have been working long hours. This has been a pretty monumental undertaking by the Department. I think I was actually surprised when they took it on and how well they've been able to do with it. The goal is to complete the review by the end of the summer, and to begin implementation by the end of the calendar year.

The one area that we have to identify as a Department, or deal with now, is what do we do with this fairly healthy document describing all these policies and procedures at the end, and their consideration anything from guidelines on up to rulemaking. It looks like we'll be somewhere in the middle, probably in the DOE order type range, which is binding on the programs, but has a chance of being implemented in a reasonable time frame.

And basically this is just a short summary of what the protocol initiative is and why we think it's a good idea.

That's it, sir.

ARENDT: Okay, thank you very much. Questions from the Panel members? Dan?

BULLEN: Bullen, Board. You shows us your budget and mentioned that if you didn't get the requested amount, the 1.8 million for restart would essentially not be there this year. If you don't get the funding, will you have the capability to implement a transportation system in a timely enough manner to meet the 2010 transportation time? And what will the problems be?

CARLSON: Yes, we would. I mean, it is ten years off, albeit 2001 budget gets us closer. I think I'll be able to get something to get started on, some of those areas where I felt we needed to do additional work. I personally see more problems in staffing up, because it's a relatively specialized area, the retirements, I'm not going to be around that much longer. As I said, I've got more than 30 years now and I'm old enough, and it's not fun a lot of the time.

I think that the total time period gives us enough. I mean, the whole program schedule is tied to resources. So I don't think it will be a problem getting it done. It would be nice to have more time to approach it in a more disciplined manner.

BULLEN: Bullen, Board. Just a little followup question. If legislation passes and there's transportation to an interim storage facility at Yucca Mountain earlier than 2010, does that pose a more significant problem, or a bigger challenge?

CARLSON: A much bigger challenger. I mean, we originally did our planning with one year for the preparation of the planning on the proposals and four years for the acquisition of equipment. So we have plans that have compressed it down to five years. Comments we've received back from potential interested parties have said that would be a very challenging schedule.

Now, the actual cask fabrication and acquisition, the ramp-up in the shipping starts out with 400 a year. If you have a rail cask that can handle close to ten tons, and you can move it, you know, six times a year, you can move 60 tons per cask, so you aren't talking a huge fleet on the ramp-up. So it's not as foreboding as a lot of people portray it, but there's an awful lot of work with states and routes and training, and just going out, the public education process, which I don't even show on here, but I personally think is going to be a major initiative that we're going to have to do along the routes to let the people know what it is, let them know why we feel it is safe and can be moved safely. So it would be very challenging, a very daunting challenge, but I think it's doable, and that's why I'll retire.

ARENDT: Other questions from the Panel members? Norm?

CHRISTENSEN: Christensen, Board. Probably one of the things that makes your position perhaps not as much fun, but I'm just curious about the--you mentioned the dialogue with the states and tribes. Does that primarily happen in the context of the external--

CARLSON: The TEC working group?

CHRISTENSEN: Yeah.

CARLSON: Yes and no. Since mid-1980, in fact, shortly after the program started, actually the Waste Act that we work under was designed by and large by the National Governors' Association. So there had been interactions going on prior to the passage of the Waste Act with the Governors' groups. I mean, spent fuel, nuclear waste, is a very politically sensitive issue, as you all well know, or you wouldn't be here. So there's been an interest. The governors have been involved.

Shortly after it passed, our office set up a number of regional groups, because we didn't feel, without knowing exactly where we're shipping, that we would benefit from working with each state independently. So we ended up looking, the Western Governors' Association already had grants and was working with WIPP. We actually went to the Western Interstate Energy Board, which was more of a technical and less a policy oriented group. Southern States Energy Board, Midwest Council of State Governments, we set up cooperative agreements with each of these groups in the mid Eighties.

We later added the Northeast group of the Council of State Governments. And we fund them to provide information on the program. Now, since our budget has gone down and EM has been more active in transportation, they've continued to fund these groups. We still have liaison with them, and that's where I said we try to participate in the meetings to the extent we can.

They provide staff who maintain an awareness of our program, and provides two volunteer members of the various states who are on the boards. Generally, there will be elected officials. Radiation program directors tend to be very involved in the activities of the regional groups because they're the ones who are most directly impacted in the training and the safe shipment.

So we have direct contacts with the states through that forum, and those groups are also represented on the TEC and we pay them to have their representative, and usually it's their chair will attend the TEC meetings.

In the tribal area, we work with the National Conference of American Indians, who we have had a grant with for--or a cooperative agreement for an equal amount of time, where we count on time to disseminate information about the program. They've set up a high level waste tribal council that includes governors, tribal chiefs and senior tribal members from a number of the tribes. Generally, they tend to be the tribes that are around the DOE sites where they're more familiar with the operations and what we're dealing with.

We've been trying to come up with ways to get broader expanse, because transportation is national rather than that localized. But we do have other ways and we're dealing with them. The TEC provides the more central places where they all come together.

ARENDT: Other questions?

CHRISTENSEN: Let me ask one more, John, and this really relates to something that I think in our last meeting a couple years ago, came up in a discussion, and you mentioned it somewhat briefly, having to do with the competitive private sector initiative, and the status of that. At the time, that was sort of--this was a couple years ago I think when the Panel met. Can you say a little bit more about where that is at this moment?

CARLSON: At this moment, it's on the shelf, is probably the best way to describe it. First, we issued a statement of work. Then we issued a draft RFP. Then we issued a revised draft RFP, and that was the one that was issued at the end of fiscal '98.

That is still the approach that we plan to use to acquire our Waste Acceptance and Transportation Services. As I mentioned, I think we need to re-look at it, because of what happened with the vitrification activity in Hanford, the significant cost increases, to make sure that basically we learn from the lessons, if there are obvious lessons to learn there.

It still has some provisions in it, actually in the funding area, where I believe it probably puts too much of the risk with the bidders on this one rather than the government assuming it, because of the, I'll call them political uncertainties, or institutional uncertainties, associated with starting up this transportation program. There's a lot of uncertainty with regard to whether we can meet the schedules. And to ask the private sector to assume that risk would lead to exorbitant costs. So we've got to find a way to balance it so there's enough to get a good deal for the government, so there is competition and we don't end up buying a lot of stuff we don't need, but not so much to where the price will just make it look like what happened at Hanford.

CHRISTENSEN: This is an area, though, where that risk issue will be important because public confidence will be so critical as well. Aren't you balancing that?

CARLSON: Yeah, I'm not sure how you get around it, to be honest with you. It's going to be a challenge, and the individual on the staff who is the lead on that is one of the folks who retired, which makes it an even bigger challenge.

If any of you would like to take on that challenge?

ARENDT: Any other questions? Richard?

PARIZEK: Yes, Parizek, Board. How does the shipment of fuel to nuclear power plants different from a least spent fuel shipment out to some repository site? Or is there transferrable information from years of the one experience?

CARLSON: The big difference is the fresh fuel is not particularly radioactive, so you don't have the requirement for a great deal of shielding. It does have similar criticality problems, but the packaging is significantly different, and the radiation hazard is not there for the fresh fuel going out to the plants.

PARIZEK: But all of the transportation routes--

CARLSON: No, they don't require--I mean, the routing for spent fuel, which is classified as Highway Route Control Quantities, is under DOT regulations, follows interstates or bypasses or alternative routes designated by the state. Since there isn't the radiation in the fresh fuel, it's not subject to those requirements.

ARENDT: Dan?

BULLEN: Bullen, Board. Just a little followup on the waste acceptance criteria. If burnup credit is going to be taken for transportation as well as for disposal, particularly for the closed containers that are already in dry storage, and the NRC looks like they want to have some sort of measurement from each of the assemblies, who is responsible for the documentation and the obtaining of that information? Is it going to be done at the plant? Will the responsibility be done by the shipper, because he has to have burnup credit to take the shipment? Or will it be DOE at the site?

CARLSON: For disposal, if you didn't have good records--this is going to be a complicated answer because I'm not that sure on it--but right now, I would expect we'll have to repackage. The storage containers are significantly larger than what we're looking at in waste packages. So repackaging at the site, you'd probably do burnup measurements there.

If you needed to do them for storage at a reactor site, that would certainly be the utility's responsibility. The actual loading of transportation casks under the division of responsibility defined in the standard contract is with the utility. So if there was a requirement to do some measurement, it would probably be on their nickel. And basically, they want to be responsible inside their gate. They don't want to have another entity coming in and doing something that's liable to mess up their operation.

ARENDT: Paul, did you have a question?

CRAIG: Yeah, Craig, Board. As the fuel remains in these dry casks for long periods of them, and we now have some that is in dry casks, you mentioned SMUD which has such a facility, there may be deterioration within those casks, and as the reactors are shut down and the commercial firms lose the capability, the technical capabilities, SMUD is an example, has almost none at this point, who is going to bear the responsibility of looking at possible deterioration and handling the transfer of possibly damaged material?

CARLSON: Is this prior to transport are you talking about, or after it gets to the repository?

CRAIG: Well, I'm thinking specifically, since you mentioned SMUD, there is a dry storage facility, and it's possible there will be deterioration of the material inside those casks. Somebody is going to have to take those casks, decide whether they can be transported, possibly do a transfer. Where does the responsibility lie and where does the technical capability exist for doing that analysis and for handling the transfer, should it be necessary? Is that DOE or SMUD?

CARLSON: Well, right now, the canisters that they're putting them in are certified for transport. If they're certified for transport and we can take them, we will. If there's a problem, then it will probably be the lawyers who decide where it sits. I haven't heard that addressed, to be honest with you, because I think the expectation is if it's NRC certified for safe transport, we will provide the transport casks to take it. If it requires being, because of a problem with deterioration, I really don't know. I mean, my gut reaction would be the utilities, but I wouldn't want to be particularly quoted on that. I'm sure they'll help us make the decision.

ARENDT: I think we'll have to end this. Thank you very much, Jim.

CARLSON: Okay. I will be around all day, all night actually, so if there's more, and if anybody wants to help you with the procurement.

ARENDT: And, Paul, John Kessler I think can help respond to your questions. Maybe catch him during a break, or something.

Thank you very much, Jim.

Our next speaker is Robert Lewis from the Spent Fuel Project Office, the Office of Nuclear Material Safety and Safeguards from the NRC. His subject is Modal Study Update.

LEWIS: Well, good morning. I'd like to thank the Board for the opportunity to make this presentation. It's very timely in terms of some significant progress we've made in two risk studies that we're performing.

I'm Robert Lewis, and as Mr. Arendt said, I work for the Spent Fuel Project Office. We're the entity at NRC that has the responsibility for storage, dry storage and wet storage, if it's away from a reactor, of spent fuel prior to disposal. We also have the responsibility for transportation of all radioactive materials, and we're the lead agency for both of those matters.

I'm a nuclear engineer and criticality specialist by training. But currently, I'm a project manager for package performance study, which will look at the risk of spent fuel transportation, and I'll get into that in a lot more detail in a moment. But our role for spent fuel transportation at NRC is clearly specified in the Atomic Energy Act. We certify casks. We look at Quality assurance programs for the manufacture and use of those casks. We do inspections, as well as approve the programs themselves. We evaluate physical protection as part of our security function.

However, with respect to shipments to Yucca Mountain of DOE owned material, our role is very clearly specified in the Nuclear Waste Policy Act, that DOE will use certified NRC casks, and DOE will abide by our advance notification procedures, which are part of our physical protection requirements in 10 CFR, Part 73.

I don't have a specific slide about our role, but I do have slides on the rest of these topics. I want to briefly talk about the cask performance standards. Everybody is probably familiar with them, but I just want to make a couple points about those. I want to talk about transportation studies we've done and are doing, and I want to talk specifically about one that we're doing, the package performance study, and just introduce it, talk about where we want to go with it, and what we believe it can do for us.

I believe the slides are in random order, so the talk will also be in random order. In terms of the cask performance standards that we have, these are set out in our regulations. Everybody has heard of these. The points I wanted to make about these, though, is that all the risk studies we've done have used these as the starting point, and the package performance study, the one that we're just starting, will also use these as a starting point.

We're not questioning the validity of continued use of these standards. We believe they've been historically developed and they've served their function very well. Over the last 30 years, there's been 1,300 spent fuel shipments in NRC certified casks.

The other point I wanted to make was that in terms of spent fuel, the way that these are reviewed is done usually by analysis only. There could be some testing done of the impact collimator. We reserved the right to require testing if it's necessary, but we haven't found it to be necessary for spent fuel casks. The analyses that have been done and the conservatisms that have been built into the analysis and the applicant's views, has been adequate.

Smaller packages are usually tested, like radiography cameras. Those are usually tested rather than done by analysis, just because--primarily I guess because of the costs involved. So, once again, we're not in any of the risk studies I'm talking about, we're not trying to challenge or change any of these requirements.

We have, in terms of transportation risk studies, we've completed four major studies in the last 25 or so years. The first study is the most significant, and that serves as the basis for all future studies, and the basis, in fact, for all future environmental impact statements, such as the environmental impact statement that was done for Yucca Mountain and also for the private fuel storage facility were primarily based upon the methodology that was initiated in NUREG-0170. I have a slide on each of these studies, by the way.

An important thing to note is that NUREG-0170 not only looked at spent fuel, but looked at all transportation of all radioactive materials, and the rest of the studies only look at spent fuel.

In 1982, based upon NUREG-0170, the Commission, meaning the five commissioners, made a finding that the current regulations were adequate to provide for public health and safety protection, but that prudence would dictate continuing and ongoing close review as new tools become available, and the rest of the study is what we've been doing ever since, reconfirming the 0170 study.

0170, 1977, that was the first comprehensive look at radioactive materials transportation. It's used by both

NRC and the DOT as the environmental statement that's the basis behind the regulations that we have. Spent fuel was only one of 25 materials that were studied. Some of the important assumptions that occurred back then were a reprocessing economy was anticipated, so we were shipping 90 day cooled fuel, much more hazardous in terms of its radioactivity, as compared to the fuel that has been stored.

There's a very simple accident release used, because the tools weren't available to do finite element analysis and try to calculate using computers or a prediction of what could be released in an accident. So they used a very simple engineering judgment approach.

Another important assumption was that they estimated a total of about 2,000 shipments a year. 1,500 or so were rail, and that was the estimate predicting forward to 1985. Based upon those estimates, they got those person-rem doses, 565 person-rem, 298 person-rem.

One thing to note is that those are risks that were found to be acceptable in 1982 by the Commission, but those are risks that were never realized because the shipments didn't happen.

In the 1980s when the West Valley facility closed down, there were several shipments of spent fuel being returned to the nuclear power plants, and questions came up, I mentioned the accident release models that were used in

NUREG-0170, questions came up about those. And in response, we sponsored the Modal Study, which was performed at Lawrence Livermore Labs.

The goal there was to do computer analysis of spent fuel casks response, and the methodology they used was to look at the streams that were created by impacts in thermal forces on the cask wall, interior of the cask wall. It did not attempt to model the lid region. The goal, of course, is to relate a cask that is minimally acceptable under Part 71 to the forces that could be created in real transportation accidents, based upon data that existed on the probabilities of those accidents.

There's a lot of engineering analysis involved in translating an accident to the forces that are created in that accident, and that's all explained in the Modal Study how they did that.

Another thing that it did was it took some sample cases, like very severe historical accidents, Livingston Training fire, the Caldecott Tunnel fire, and postulated what would have happened had a spent fuel cask been in those accidents. And the results there were very favorable, and those case studies turned out to be very useful, we believe.

The answer was that the risks that they predicted in 1987 using the better analysis tool were approximately a factor of three lower than the risks that were predicted in

NUREG-0170, but once again were never realized. Therefore, it confirmed the adequacy of the environmental statement.

The Modal Study is summarized in this blue brochure that NRC hands out quite often. I didn't bring any copies today, but if you want one, just let me know and I can mail you one of those.

About 1996, there was a lot of talk about multi-purpose casks and dual purpose casks and increasing the payload and so on, and NRC sat down and said, well, what should we do? Do the original assumptions in 0170 and the Modal Study still hold for those new types of containers and new types of shipment? Remember, 0170 was the reprocessing economy and now we're shipping older fuel, and we're shipping it across the country instead of to repository sites, shipping across the country.

ARENDT: If you all have the agenda before you, Robert Holden, who was going to speak at 11:10, was unable to get here. So we will not hear from him this morning, so what we're going to do is we're going to continue the program and see how far we get. We'll maybe allow a little more time for questions and take that time. So we're going to play that by ear.

You can continue, Robert.

LEWIS: That was a good place to break, actually, because we finished up talking about the past studies, and now I'm talking about what's going on right now.

There's two studies going on right now. There's one called the reexamination of spent nuclear fuel estimates. The next slide is the other, it's the package performance study.

Like I said, in 1996, there was new technology, cask technologies, meaning dual purpose casks coming in for review, beginning to come in for review. There were different assumptions regarding the fuel, and there was a potential for a near term large shipping campaign. So we started these two studies in--started conceiving them in 1996. This one actually started in late '96 or early '97, and the package performance study started last year.

The goal of the reexamination of risk estimates was to assess the risk of shipping spent fuel only to either storage sites or a repository using currently available means by analysis only, computer analysis only.

We used RADTRAN 5 code to do this. It's a generic study, in that it looked at the routes over the whole country. It looked at incident-free risk as well as accident risk. And its conclusions were that the risks using the new assumptions and new techniques, they showed that the risk was in the Modal Study in 0170 was conservatively calculated. So, once again, this study is validating 0170 by showing that using the newer abilities we have, the risk is actually smaller than we originally predicted.

The report itself is--I only brought one copy, to save on my baggage--but it's also published on CD. The CD happens to have Volume II, which is a lot of the explanatory material of how the calculations were actually done. There is no Volume II in hard copy because it has color figures in it and it would have been cost prohibitive to produce a NUREG report in color.

A plain English compliment to this technical report is in development, and that will be about a 30 page document fashioned after the plain English version of the Modal Study. That was recently mailed in draft to the mailing list for the package performance study, which I'll get to in a moment, but it's about 300 people. Anybody that's ever shown an interest in these new projects that we're doing, we mail the hard copy to them, and it was Attachment 2 to that hard copy to that mailing.

Package Performance Study has been called Modal Study 2, and it's probably not really appropriate. I'm the guilty party for that. But we're not redoing the Modal Study. We still believe in what the Modal Study results were and the methodology. In fact, we're trying to build upon the Modal Study results as well as build upon the 2000 reexamination study results to further the knowledge of the adequacy of our regulatory approach.

The Package Performance Study will only look at spent fuel. It will look at both truck and rail packages. It will assess severe accidents. So this is how it got the name Modal Study 2, because we're not looking at incident-free transportation anymore, but we are looking at severe accident risks, how the cask performs in those severe accidents, as well as how the fuel performs in those severe accidents, because the assumptions in that area are two of the harder parts of doing the Modal Study and the 2000 reexamination study. So we want to make sure that we have done all we can to understand that phenomenon.

One thing that's different about Package Performance Study is it will consider the need for physical testing. All the previous risk studies have only looked at analysis. No testing has been done to support them. We haven't decided the nature of the testing. I think we know what our goals would be in doing the testing. It's not just a demonstration. I'll get to that in a moment. But we haven't decided if full scale testing or scale testing would be necessary to support the goals.

And one unique thing about--well, not unique anymore--but one thing about Package Performance Study that hasn't been used in previous transportation risk studies is using this enhanced public participatory approach, not only in trying to get peer review of the results of the study, but in trying to define what should be done in the study itself. So we've had meetings.

Actually, the next slide I'll talk about the public interactions we've had in two more slides, but just keep in mind until then that we are using this enhanced approach, which is--a lot of agency efforts are doing this. This is the first time we've tried to use it in transportation.

Why are we doing this? Well, I came up with these reasons. Risk insights, we have better modeling tools available to us. We have the potential funding to do a test if we need to. So we believe that if we fashion that modeling and testing appropriately, we can get some risk insights to focus our cask reviewers on the important aspects of cask design, and also to focus our risk studies on the important aspects of cask design, future, any future risk studies we might do.

Once again, this all started because of the dual purpose casks that we now have. Several have been approved. We know the designs now. Timing-wise, some of the designs that are being approved now are predicted to be used for Yucca Mountain. That's a situation that hasn't existed in the past really. There's potential, of course, for a large shipping campaign, whether it be to Yucca Mountain, if it's licensed, or whether it be to the private fuel storage facility, or some other interim storage.

Age of data of the previous efforts is an important factor that started all this. Some of the accident rate information, some of the accident sequence information that's in the Modal Study was outdated, especially for rail. Outdated doesn't mean it's necessarily bad, but we want to confirm that it's still useful. We have the ability to work with Federal Railroad Administration in the transportation study to get some of that better data. So we're going to take advantage of that opportunity.

Consistency with NRC performance goals and Commission direction. There's a real recent effort in the Commission to develop a strategic plan with performance goals. These are the four performance goals that are trying to be applied to everything the Commission does these days. This study happens to fit well with all these goals, probably as well as any other activity we're doing right now.

Maintain safety. Of course we want to make sure the assumptions we have in our risk assessments are appropriate. Increase public confidence. We can do that by helping the public design the study and helping solve some of the questions they may have about spent fuel transportation. Reduce unnecessary regulatory burden. The key word here is unnecessary, because as our former chairman used to say, all regulations have a burden. But we want to reduce the unnecessary burdens and maintain the safety at the same time.

Burnup credit might be an example in that area, allowing burnup credit. We previously, for criticality analysis, have assumed fresh fuel, optimum moderation. Those are conditions which physically don't exist in any transportation accident. Maybe we can do something there, and that's been an ongoing effort actually way before these performance goals were developed.

Make our decisions more effective, efficient and realistic. That's kind of the catch-all, but it's supported by the other three.

As far as what we're doing to increase public confidence in spent fuel, in our regulatory approach, and in spent fuel safety in general, in the Package Performance Study, you can't see this address, but it's on the handout, we have established an interactive website. We have opportunity there, a forum to provide questions on the products we develop, and upon just general questions that might be incorporated into our testing plans or analysis plans. It's been relatively successful actually. There's been a lot of people submitted comments on the website maintained by Sandia National Lab.

We went out, when we first started this study, we went out and said we want to do a scoping study. Industry, the public, the affected governments, state organizations, for example, tell us what your concerns are about spent fuel, and we'll try to wrap those concerns into our scoping study and propose options to resolve them. We've done that. We have just finished that in June, and mailed it out along with the summary document, the public document on the reexamination study both went out under the same cover letter. And we're going to go back out August 15th in Las Vegas at the Tropicana Hotel, and August 16th at the Mountain View Casino and Bowl in Pahrump.

We are presenting the findings of the scoping report, asking if we really have effectively understood the public concerns, incorporated them into the options that could lead us forward, and any other general issues that may not have been covered could also be addressed, such as the reexamination report didn't get any public comment period, but we are sending the summary out. And at these meetings, we'll be ready to talk about that as well.

Follow-on workshop in Rockville, Maryland to get the D.C. government types; Las Vegas workshop to get the state governments out there and county governments out there, trying to capture as broad a perspective as we can on where to go from here.

We are maintaining a mailing list of interested people. Like I said, this is 360-some names at this point. We mailed this scoping report results and the summary report on the reexamination to the entire mailing list just last week. So if you haven't got it, a lot of people in this room will probably have it in their mailbox when they get back.

Where we are today. We have a contract with Sandia Labs to do this study. We picked Sandia because of the testing facilities that they had, should we choose to do a test. We're leading down the path that testing is inevitable, some form of testing will be useful. So staying with Sandia is good in that respect.

The scoping study was to collect public views, to perform literature search, and to produce options and recommendations for follow-on research. As I said, that was just mailed in June, and we're having meetings in August, and if you don't have the opportunity to attend those meetings, we are also accepting comments on the website from those studies, and also you could just mail it to NRC as well.

I'll talk a little bit about the results of the issues report. And this is the last slide I have. The issues report had four areas that said this is the best places that Sandia believes could further the reexamination study results, further the Modal Study results, and those four areas are to verify cask modeling through analysis and impact and/or fire tests. Now, the nature of NUREG-6672, this reexamination study that was just done by analysis, it had 40, maybe 41 different accident environments that each cask had to be evaluated for. Because of computer time, those evaluations required less than fully detailed finite element mesh in each environment.

The goal here would be to verify the use of that conceptual model by doing a very detailed finite element calculation for a particular cask, comparing that detailed evaluation to the generic casks, and the less detailed finite element mesh that's used on those generic casks from the reexamination, provide that verification. And I'd go a step further and provide verification by doing a test, and the goal being there that if we can predict, using this conceptual model, cask response for one of these environments, there's no reason to believe the rest of the environments aren't also adequately represented.

Another important area that the issues report believes we should look at is fuel assembly response to impacts. This is always an area of much engineering judgment. There is a facility in Germany which has the ability to do impact tests on simulated fuel and determine the amount of respirable particle size, for example, that's created from certain impacts. We could on a bench scale at Sandia compare that simulated fuel to a real fuel, real spent fuel, that is representative and then that's where we would get into the issues of fuel aging, and any fuel we'd want to use would certainly have to be representative.

So that's the area there, is to further look at the ability to predict the fuel, because in accident risk, of course, there is no risk from the radiation unless there's a leak, and there's no leak unless the cask fails, and then there's no leak also unless the fuel fails. And you can assume that any accident that would fail a cask would also fail a significant fraction of the fuel assemblies, but the big question is how much of that fraction is respirable and how much of that fraction can not only be released into the cask, but released through the small hole that might be made into the environment and available for uptake by someone.

We would like to reconstruct the event trees that were used in the Modal Study. This is the issue I previously spoke about. There is newer data of accident rates, accident types. We received several comments on this during the last series of public meetings last year that, for example, railcars now are built to vent and when they burn, they burn for several days, and that's a relatively new phenomena, so that accident scenario might not be represented in your older event tree. And we can reconstruct that using newer data that is available, particularly for the rail, but also we would like to look at the highway data that's available.

And, of course, I already mentioned that some type of testing would support, in our opinion, would support the conclusions of NUREG 6672 and through the chain back all the way to NUREG 0170. Testing would seem to, when we look at

NRC performance goals, testing would seem to have a big effect on public confidence if it's done right. We don't want to do any test that is just a demonstration, just a dramatic show of what the cask could do. We don't want to run a train into it and bounce it down the rails like I think they did in England. We don't see any need to repeat that.

But if testing could support the conceptual models that were used in 6672, we think it would be useful. And with that, I'll take any questions people have.

ARENDT: Question from the Panel? Dan?

BULLEN: Bullen, Board. You mentioned the testing at the end here, and the full-scale finite element evaluation, and then maybe possibly a test to verify that, and then not have to repeat the testing, but to do the finite element evaluation of all the other damage analysis studies that you'd done previously.

I guess the question I have is you mentioned Germany for the fuel impact. Are you also collaborating with the international community who have tested casks? For example, when we went to Germany a couple years ago, they had a drop test of a half scale cask from 800 meters, and looked at the deformation of that. And if you could use your finite element on data that are already existing--it would be very expensive to redo quarter scale and half scale tests, and so if you could, you know, basically borrow the information from the international community and then use your finite element analysis and see how well that code works, have those types of opportunities been undertaken?

LEWIS: You're absolutely right. We're looking into that. We have interfaced with the IAEA, through the IAEA, to try to obtain the international experience. Our contractor is also very aware of the international, as are we at NRC very aware of what's been done internationally. Just from our corporate history, we have people that have been involved and have worked with IAEA through the years and know what other countries are doing through that forum.

We're trying to use that information as much as we can. There are issues that exist. The cask designs are different. That doesn't mean from a technical standpoint they're irrelevant, but for example, in England, they test the Magnox Cask. After they hit it with the train, they did do the hypothetical accident tests.

Just one more thought. The idea of testing that we're doing is extra-regulatory. We're not trying to test a cask at the 30 foot drop. We're trying to look at the extra-regulatory response of cask, which testing for that purpose I'm not sure has been thoroughly done, even in other countries.

ARENDT: Carl?

DI BELLA: Carl Di Bella, Board Staff. I'm sorry I was out of the room when you started your talk, and you may have already addressed this issue, but for the Modal Study or the reexamination study or the package performance study, what sort of initial manufacturing defects do you assume might exist in the package, or in the case of, say, reusable casks, like transportation, what sort of accumulation of operational handling problems do you assume for the purpose of the analyses?

LEWIS: We have addressed that issue specifically in the issues report, as a possible issue for follow-on work. The previous work, like the reexamination study and the modal study, did not assume cask imperfections that resulted from the manufacture, for example, during the casting.

The issue, as I understand it from what Sandia wrote, I'm not a structural engineering, but they say it's relatively easy to address those types of defects by incorporating them into a finite element analysis. And that is something in the issues report that they do recommend be followed up on.

Other human errors, we also have not traditionally addressed other types of human errors which might be during cask preparations, or such. That's also an issue that we have to look at.

DI BELLA: Changing topics just a little bit, you mentioned burnup credit. I know that NRC is working with DOE in the disposal area, looking at burnup credit, and that they are actually some time behind what's going on at the transportation area. It seems as if in the disposal area, that NRC is going to require an actual physical assay of the fuel before burnup credit is allowed, at least that's what I read it looks like what they're converging to.

Where does it stand in the transportation area? Are you also going to require some sort of assay in order to get burnup credit for transportation?

LEWIS: Well, we did in the last--until about a year or so ago, we had a joint review team at NRC that included transportation, storage and disposal people to review the burnup credit topical report that DOE was developing. I think we got to Revision 2 of that report, and my recollection, and I could be wrong, maybe a DOE person knows more, that report was withdrawn.

In the transportation and storage arena, we have issued what we call interim staff guidance. It's basically our expectations of what should be in an application for burnup credit. I'm pretty sure that no cask vendor has tried to apply that guidance to date for transportation or storage casks, although I could be wrong there. But that's my impression.

During the review of the DOE topical report, we did have for transportation and for storage and disposal purposes, all three were unified in having a requirement to do a physical verification of the assembly burnup prior to loading. I think that in the transportation arena, that reliance on administrative records of the utility has since been decided that that was acceptable.

DI BELLA: In which area did you just say?

LEWIS: Transportation.

DI BELLA: Okay.

LEWIS: But I'm a little bit out of my area. I worked on it for a while, but I haven't in the last year or so. So I'm not up to date on the current.

DI BELLA: Thank you.

ARENDT: I have a question here from Alfred L. Languelle from INALL. The question is is there any consideration/work going on aimed at relaxing the double containment requirements of 10 CFR 71.63 for transportation of spent fuel?

LEWIS: Those apply not for spent fuel, but for transportation of plutonium. It says if you have plutonium transportation in a quantity greater than 20 curies, it has to be first of all in a solid form, and second of all, it has to have double containment, meaning two, basically a package inside a package.

That is an issue which is currently subject of an open petition for rulemaking at the Commission. It will be addressed as part of revisions to Part 71 to become compatible with IAEA/ST-1 standard which came out in 1996. We're just in the process of starting a rulemaking on Part 71 for compatibility. There are some additional issues which have been tagged onto the IAEA compatibility. Plutonium double containment is one of them.

So there is consideration of relaxing the double containment, but that doesn't mean that we will relax the double containment. That will be gone through the petition process and we'll get public comments on that during the proposed rule phase and see what comes out there. I know the TruPak container that's used is double containment.

ARENDT: Any other questions from the Panel? Staff?

DI BELLA: Carl Di Bella again. You mentioned the possibility of tests of the impact of impacts on the fuel assemblies. It would be interesting at the same time to look at the possibility of a transportation accident damaging the fuel assembly, and its consequences for disposal. It seems to me that would be easy enough to look at at the same time. That's a comment, not a question.

ARENDT: Okay, well, thank you very much. Our next speaker is Don Doherty from the Naval Nuclear Propulsion Program.

DOHERTY: The microphone works, I presume?

I am listed, and correctly listed, from the Naval

Nuclear Propulsion Program. And Jim Carlson earlier talked about Naval Reactors, and we're one in the same. The Naval Nuclear Propulsion Program is a two-headed organization which has an identity in DOE which is the--well, it's Naval Reactors, and we have an identity in the Navy, which is a long involved name. But basically we have considerations, because of our support of active duty Naval ships, which makes us a little bit different in some aspects than the normal DOE thing.

I have handouts out there. By the way, Jim Carlson mentioned over 30 years. I've got 39, and it isn't fun all the time in my job either.

In the handout I put out, there are a number of pages of words, but we have talked to the Waste Board a number of times about Naval fuel considerations, and I'm really not going to go over all those words at this time.

I want to show an update of where we are on the program, which will be basically pictures, because we're in Idaho and most of the action right now is here in Idaho, so let me start.

This shows a nuclear powered aircraft carrier being shock tested. The reactor is its power inside the ship, and does not shut down or scram during the shock. And as you can see, that's a fairly impressive underwater shock. You see the old World War II movies where these depth charges come down and go off a foot from the submarine and the submarine is fine. Not true. There's a tremendous shock wave that comes from an underwater explosion, and we have video tapes of reactor components and other components during shocks, and they wave around like it's a raging storm going on, and yet we insist that the reactor continue to operate to provide the commander of the ship the ability to continue to fight the ship.

The last thing you want is to shut down during a battle situation and basically not be able to launch aircraft. So, again, that's slightly different than a commercial plant which has a little different set of objectives, and has a different reaction to, for instance, an earthquake, which is a much lower shock. Naval fuel is designed for over 50 g's. It's even higher than that, but it gets into classified things, which is appreciably higher than what a commercial plant is designed for.

Consequently, the Naval fuel is very robust, which is a term we use, but it basically means there's an awful lot of metal there and not as much uranium as you're used to seeing when you look at commercial fuel.

All of the spent fuel that has operated in every ship has been shipped to Idaho when it's removed from the reactor. It has come to the Naval Reactor facility out in INEEL and has been examined, every single core is examined, and some in more detail than others if it's a first of a kind, or something like that. And then before 1990, the fuel was moved and reprocessed.

In 1990 when reprocessing was stopped, we were sort of left without a home, and we have worked since then with a number of organizations, RW, NRC, the Waste Board, and others, to try and make sure that Naval spent fuel also had an end to the process. I mean, ultimately, operating a large program, which we intend to operate for a long time, you've got to have an end. You've got to be able to say yes, you know, we are responsible, cradle to grave, we're going to make sure that we responsibly take care of this. And, therefore, Yucca Mountain is very important to us.

The picture in front of you here is the Naval Reactor facility, which I will probably call NRF a number of times. And for historical note, that is the prototype of the original Nautilus, and there are several other reactor prototypes there, too. They are all shut down now, and the main active facility is this one right here, which is the expended core facility. And this is the facility to which all the fuel that comes and is removed in refuelings of ships comes to. There are rail lines that come in both this end and then come around in here, and we have made over 700 shipments. I'm sure there will be some exact numbers that Ray English, who will follow me, will give you on that, and they've all been safe. And those shipping containers come into the building and are unloaded, and then the fuel is moved into a water pit where it's put into fuel storage racks, which are common to most of you, quite similar to commercial or other places underwater.

What we are working on now is a dry storage facility, which would be in this region right here, which would be a storage pad, and when we remove the fuel from the water pit and cut off the excess structural material on both ends, we would then put that fuel into canisters which are welded up, and then put into storage over packs, which would be moved out to this facility and put on a storage pad. We're going to have a building over it, but basically it's a storage pad which could be in the open.

This is what the inside of ECF looks like. It's a water pit which is 400 feet long, and you can't see it very well, this is taken up from the crane, one of the cranes that goes across the top. Right there are some of the fuel storage racks which are similar to ones in other places. The water pit differs from 25 to 45 feet deep. Most places where fuel is stored is more than 30 feet deep. Those are bridge cranes that run across. But I'm not going to talk about the water pit. That's just to calibrate you.

All the fuel comes in and goes in there, and then when we move it, we will move it to a new facility, which is under construction. And this is a cartoon. I'll show you some pictures of the real thing in a minute. This is a big storage facility--there's a few people around here to give you a little sense of scale--where we would move the fuel in through water filled canals from the water pit, and then move it down a line, process line, where the excess ends, fuel on the ends is--not fuel--structural material on the ends is cut off, and so you would just end up with the active portion of the fuel.

And then we will also have a facility there to affix a poison material permanently to the fuel, and the material we're affixing is hafnium, and the fuel itself is basically large amounts of zircaloy, with a small amount of enriched uranium, both of which have excellent corrosion resistance. And we think the hafnium will stick with the fuel as long as the fuel maintains its integrity and doesn't dissolve into dust, which we think is a very, very long time.

When the fuel comes off the line, gets loaded into a basket--that's the basket, the red things are supposed to be fuel cells--and here is a shielded cask which contains a canister. And that cask is moved up here under that--we actually have a shielded cover on that port--and then the basket is put down into the canister. It is moved back out here. The canister is welded. It's then further moved here under this hole, and a right circular cylindrical reinforced concrete overpack, 13 feet in diameter, is placed over here, and then the canister is pulled up into it. And that will be shown here.

That shows you this is the device that rolls back and forth. And these exist. I mean, the transfer mechanism exists. The shield cask is being built right now. The dry cell is completed. It just has not become contaminated yet because we haven't put real fuel in it yet. And this would be a basket with the fuel, the spent fuel in it, and the spent fuel basket would be lowered into the canister.

Now there's some real pictures. This is the inside of the dry cell, and he's looking around, but he provides a little bit of scale. It is, as I said, a large hot cell, stainless up most of the walls for decontamination, although it's not intended to have people go in there really almost ever, but things happen.

This is the process line I mentioned, and this here is a drill which co-drills through the fuel cell, and the poison that you're going to permanently attach. And then there are zircaloy pins which go through those holes and have locking devices associated with them, so that that permanently ties the poison to the fuel.

And then after that, you move further down the line to this big saw, which is a slow moving, looks like a band saw, but it's not a band saw, but it looks like a rotary saw you'd use at home, but it's very slow moving and fairly wide. It really has milling cutters and it just goes slowly and mills through the fuel, so we have nice big chips, no worry about zirc dust fires or anything.

When the fuel is finished, it is put into baskets in that area, and this here is the lid, the shielded cover on that hole through the bottom of the dry cell that I mentioned before. So when the basket is full, it would then be picked up, put through that hole in the floor, into a waiting canister. Typically, there would be two or three baskets per canister, depending on the size of the fuel. We have a number of different types and heights of fuel. This is the only picture I could get. This is the crowd. But this is the outside of that same dry cell I showed you, that same hot cell.

So this is the operating gallery. There are some manipulators and windows, and there are people out here, there's a control panel behind this gentleman, and the operations inside the dry cell--let me just shift back to that for a second. For instance, here's one of the windows from the inside. There's another window there. So looking in that window, you can see the cutting operation quite clearly, and the cutter is controlled by someone outside the window.

Now, a lot of this is sort of semi-automated in the sense that we have a controlled rate of cut, rate of advance, but there are people there, and they can, in fact, make judgments about whether the process is moving right or there's something unusual about a particular case.

Now, what do we put this fuel into? This is our canister. It's 316L stainless steel. Wall thickness over most of the length is an inch. It's thicker up at the top, and it has a thicker base, about three inches, and this, I don't remember exactly what it was, somewhere between 10 and 12 inches. And the reason for the shield plug at the top is to keep the radiation level in the region where people have to do welding and do inspection. The welding can be pretty much done remotely. Inspection is more difficult. It is to keep the dose down to those people.

Now, again, the fuel that we will be loading in here in many cases will be more than five years old. Occasionally, it may be lower, but Naval spent fuel--Naval reactors operate typically in a mode where the average power level is more like 20 or 30 per cent, and there are fairly long periods of time where the ship actually is tied up at a dock doing some work or something, or giving leave to the people, and when you're operating, you're operating either on a go fast run around and play games basis, or you're just sort of transiting, and it's a relatively low power thing as opposed to commercial reactor which operates for most economic efficiency, which is usually very high power. So our fuel will tend to be cooler than commercial fuel at the same amount of time after shut down.

I've got a picture here of what that closure looks like. Again, let me show you what I'm going to show you. This region up here, which will show you how we in fact hold the head on and do the seal, and this is the shield plus, the thick plug I mentioned at the top, and this is the wall. This is thickened up here. This is a shear ring, which is a split ring, and it has to be compressed with a little section cut out in order to get it in there, because that's a groove all the way around in a right circular device. So think of it like a piston ring, and once it's in there, then the piece that was missing is put in so you have a complete shear ring all the way around. And the shear ring holds the upward force of the fuel plug under accident conditions, or even for lifting. We actually lift from some threaded holes in the top of the shield plug. So that is the primary way that the stress is taken through that shear ring.

We also use that shear ring as one of our two welded boundaries for the canister. And it's welded at the top and at the bottom with fillet welds, and also obviously I can't show it here, but where you come together with the insert, it gets a little more complicated because you've got to do some welds there in a number of other directions to make sure you've got that totally sealed. So that's two welds, plus a number more where the insert goes in. All those welds have to be inspected. The welds would be done with a fairly automatic process, but the inspect will take people.

And then this is a--again, this area here is a void and goes all the way around. This would be a flat piece which also would then fit into the top of that void, and that is welded here then, and here. And there are provisions which I don't show on this for little threaded pipe plug type vents to go do helium leak tests and to inspect and ensure that this weld is holding, and then that this weld is holding, too, independently. Again, I don't have time to go through those steps, but it can be done.

And I showed you pictures of baskets, mostly cartoons, before. This is very close to what our first basket is being fabricated at today. That's an interesting point. We're building these things. The canister I just showed you, that's on order, being built. In fact, the lead unit is done and undergoing some dimensional testing right now. We think it's done. We'll find out after we do the testing.

This basket is a set of disks, goes all the way across, with holes in the disks, and then it has pillars that hold all the disks together. It's not really relied on for anything other than both in dry storage at Idaho and in a transportation accident. It maintains dimensional separation of the fuel, strong enough to take care of that. We're not counting on this in a repository.

The canister I showed you is technically a dual purpose canister in that it is currently designed for storage at Idaho and shipment to an eventual location, a repository or interim storage facility. But, in fact, we fully intend it to be a multi-purpose canister so that it is suitable for insertion in Idaho, and that's our intent, and we've worked with RW to make sure that in fact we are doing everything. The rules aren't established, so you don't know, but that's the intent. As I said, we're also buying them right now, so we sure hope it comes out right. And, again, those are the fuel cells.

I mentioned the storage overpack. This is about 30 inches of concrete. Maybe it's more than that. it's a lot of concrete, reinforced concrete with control density. We hunted around a lot to find the right quarry around here to give us the right kind of the gravel base to put in. It's got a lot of reinforcement. The metal is carbon steel, and the canister, of course it's in the middle, and there are vents, doors here really, and there are screens on them, where air can come in, circulate up between the canister and the overpack, and then go out the top. That's a screen there. And we show pretty good air flow, depending on the driving force, the thermal driving force of the heat of the canister. But this is carbon steel. All these are carbon steel, and this would be used just at Idaho.

When it came time to ship somewhere outside of Idaho, we would transfer the canister unopened to a transportation overpack. This is a little sketch here because we're not building this yet. The design has been completed and currently happens to be at our place for approval, but we're going to be chewing on it for a number of months. Nothing particularly exceptional about this. It's a solid stainless steel container I think on the order of eight inches thick, or eight and a half inches thick, and with gasketed closure, and has impact limiters on both ends and would, again, we've shown, we intend to show, and I've already analytically done in terms of the analysis to support the design shown, that it would be able to meet the NRC requirements for shipment.

We will probably order that in '04. We want the design in place, but there's no sense spending all the money it's going to take until there's someplace we can ship, or at least we're getting closer to it.

I pointed out where we're going to have the storage facility. This here is a corner of the expended core facility, ECF, and there is a transfer path right across here where the loaded storage overpack, this big concrete cylinder with the canister inside of it, where that is moved over and stored actually in this building. This is the storage building. What this higher building is is the overpack fabrication building, because the overpacks are going to be fabricated here in Idaho by an Idaho company, and they'll be making them on--they'll make three at a time in there, and have them far enough ahead, but we don't want to end up with 50 overpacks sitting out in the desert getting rained on, so we'll make them up as we need them a little bit ahead of need.

And that's a look at the--it's kind of a fuzzy look at the transfer path. It's really a lot smoother than that. We're going to use air pallets to move the loaded overpacks so that they are never more than a few inches above the deck. There's very little in the way of accident or drop that can happen to them. Overpacks don't handle drops very well--or concrete doesn't handle drops very well. And it seems an efficient way to move it. So that, I think is the end of my presentation really.

There are a number of points which I chose not to go through all the words, but in the handouts you have, at the very end, it talks about where we stand on procurement. I mentioned we have the first lead unit canister already, and there will be eleven more delivered really this year.

We have baskets on order, again for delivery toward the end of this year. The storage overpacks, the contract is placed and the metal parts of the overpacks, the carbon steel parts are being fabricated, and as you can see, the building was being built. So we're well on our way, and we've obviously ahead of what all the requirements are at the mountain, and we're trying to do a very conservative job, which is typically the way we approach things anyway, and be in a position that if Yucca Mountain is approved, or some other facility is approved, that what we have already packaged and defined very well will be suitable.

We've been working with RW. We've talked them through what kind of a certification data package we would send with each loaded canister so it's clear what's in it. Those are underway. We've been engaged with them on our quality assurance program, and they have agreed with our planning. The NRC has been involved with that and has also agreed.

We are working with the NRC on our plans. We're ensuring that Naval spent fuel will not be critical, will not become critical in a repository. We are also working with NRC, different group, in terms of making sure that the facility we have out here in Idaho Falls--or I'm sorry, in INEEL, will provide comparable safety to the public as a commercial spent fuel facility would sitting on the reactor site. And that's really all I had.

ARENDT: Any questions? Bob?

LUNA: Don, what kind of capacity do you have in your storage building in, say, years? How long can you store there?

DOHERTY: That's a good question. The answer is a long time, even though we're not intending to do that. But the storage pad is very thick and we have done seismic analysis, and it's a very stable situation. That building that you see there is designed to hold 54 storage overpacks. We also have conceptual designs where you could add onto the end of it to the point where, you know, we've conceptually looked up to 150 overpacks, I mean, depending on what scenario you put together.

The total number of loaded canisters the Navy expects to have by 2035 is 300. We expect that, you know, we will be shipping somewhere between we hope 2010 and, if not, shortly thereafter. And, therefore, those kinds of--150 would be satisfactory for that, with some comfort zone. We would not build the extensions until it became apparent that we need the extensions, although I'm pretty sure we'll need at least one.

ARENDT: Any other questions? Bill?

BARNARD: Don, you mentioned that Navy spent fuel emitted less thermal energy than comparable commercial spent fuel. Without revealing any classified information, can you give me an approximate percentage of how much less?

DOHERTY: About half.

BARNARD: About half?

DOHERTY: I mean, that's really ballpark.

BARNARD: Yeah, that's fine.

DOHERTY: And it's the same with radiation levels. I mean, typically a canister with Naval spent fuel will have about half the heat and about half the radiation level. Now, that's assuming the commercial one is the same size. I know that there have been a number of studies about shrinking and moving sizes of containers to control heat loads. So, you know, it's within those variables.

ARENDT: Dan?

BULLEN: Bullen, Board. Just a quick question about your shear ring design on the closure lid for your canister. I mean, obviously you've interfaced with the DOE on that. Is there any interest in DOE in adopting a similar design for those types of containers? I mean, you've got a container that's just as heavy as, or maybe even heavier than the DOE containers. Have they shown any interest in your analyses associated with that shear ring design?

DOHERTY: It has been shown to them. We go down to Las Vegas about every four months and have an interchange with--and you've been in some of those--with RW and the people down there YMPO and the M&O, and they are clearly very well aware of what we have. I suspect when we really have something built and welded, there may well be more interest in the sense of, gee, why do we even want to design our own, that thing works, maybe, if it does. But I don't think anybody right now is saying yeah, yeah, yeah, I want a board. Not yet.

BULLEN: Just for the record here, the last time we were at one of those interchange meetings, the lights went out there also.

DOHERTY: I heard that, yeah, I was supposed to go on that one, but my father-in-law died.

BARNARD: Don, I've got another temperature question. This is related to the diagram, Viewgraph 14. Can you put that up so people can see what we're talking about?

DOHERTY: Sure.

BARNARD: You indicated between the inner liner and the outer concrete storage container, there was an air space?

DOHERTY: Yes.

BARNARD: For ventilation; is that correct?

DOHERTY: Yes, that's right.

BARNARD: Can you tell me approximately what the temperature of the liner will be?

DOHERTY: The temperature of the concrete--

BARNARD: The surface of the liner.

DOHERTY: Well, but, I mean, it's not going to be very different than the concrete right in here.

BARNARD: Okay.

DOHERTY: The liner is capable of handling pretty high temperatures. The concrete can't. Boy, I'd hate to give you a number off the top of my head because I don't know that it would be the right number. If anybody here from Naval Reactors knows the number, feel free to walk to a microphone and contribute it if you know it.

Guesswork kind of thing, it would be a number in the--I'd better not even guess. I think it's under 200 degrees, but I--

BARNARD: Centigrade?

DOHERTY: No, fahrenheit. I mean, concrete, there are certain temperatures at which concrete tends to deteriorate above that for long periods of time, and there are rules in the--the NRC has rules about what are acceptable temperatures, and it depends to some extent on the aggregate you use, and things like that. And we meet those rules, and we also have assumed for design purposes a very strong thermal source. We will never have anything as hot as we have assumed for design. So if I gave you a number, it would be a high number, and I can't give it to you, because I don't have it. I mean, I could get back to you, I could probably get it to you by the end of the day. But it would not be anywhere near that high. I would guess two-thirds of that number. And we show we're okay with the NRC rules on that number. Does that answer it, I mean, to the extent I'm capable of it?

BARNARD: Yeah. If you could get me a number in the next week or two?

DOHERTY: Will do. Sure.

BARNARD: Temperature is pretty important in canister performance, and that's why the interest.

DOHERTY: Sure. We ran tests. We did fairly large scale tests, I don't know if they're full-scale or not, where we in fact mocked up the thermal path and showed how much air flow went through here, and we have done other extensive analyses, mostly analyses here in terms of conservative sources, assuming that instead of, you know, a hot spot near where the center of the fuel is, it's hot all the way up, and that's the kind of conservatisms that go into the number. But we'll get you a number.

ARENDT: Okay. Anything else? Thank you very much.

DOHERTY: Okay, thank you.

ARENDT: Our next speaker is Ray English. Ray is the transportation officer for the Naval Nuclear Propulsion Program.

ENGLISH: We'll give you a change of pace and go on this side. The Board members over there were starting to get this crink in their neck and they said could you please go to the other side? We'd appreciate it.

Good morning. I have been responsible for the Naval Nuclear Propulsion Program Transportation activities, rail transportation activities, for 20 years, and that includes shipments of spent fuel. And, gee, I don't--is Jim Carlson still in the room? I don't understand he and Mr. Doherty, because I have fun every day. I guess one of the differences is that I'm actually shipping stuff, Jim. I don't mean that as a slight, but--

The Naval Nuclear Propulsion Program's outstanding operational record with utmost care and concern for public health and safety and the environment extends to its spent fuel transportation activity. Since 1957, the program, in conjunction with the nation's railroads, has safely moved 727 containers of spent fuel to the Idaho National Engineering and Environmental Laboratory.

And earlier, Mr. Doherty talked about activities at the Naval Reactors facility on the INEEL; what I'm going to talk to is the activity getting spent fuel to the INEEL.

Naval spent fuel shipments are safe for three reasons. First and foremost, because of the robust shipping containers in which the spent fuel is packaged and transported. Secondly, because of the inherently rugged nature of Naval reactor fuel components, which Mr. Doherty alluded to. And third, because of the proven practices we follow in making these shipments. And I'll speak to each of these three factors in a little more detail now.

I don't want to replow any of the ground that Bob Lewis talked about concerning the performance standards. Naval spent fuel shipping containers are Type B containers certified to Nuclear Regulatory Commission accident performance standards. These accident performance standards require that a loaded container be able to withstand severe real world accidents, with minimal release of radioactivity and limited radiation level increases near the container.

Now, these performance standards are expressed in engineering terms, for example, a 30 foot drop onto an unyielding surface. There's no such thing in nature as an unyielding surface. The reason the standard is written that way is so that as a result of the standard, all of the energy of the drop is absorbed by the container itself. A 30 foot drop onto an unyielding surface is roughly the equivalent of a 60 foot drop onto a reinforced concrete surface.

There was some discussion about the performance standard of the fire test, 1475 degrees for 30 minutes. Again, that's an engineering standard. It's 1475 degree heat input to the container for 30 minutes solid. In a real world environment, flame temperatures would likely have to be much higher than 1475 degrees. And there are other accident performance standards, water immersion and puncture.

The regulation specified that the same container must survive all of the accident standards in sequence, so you have the cumulative effect of damage coming into play in order to certify a container also. And there have been full scale crash demonstrations of containers performed in the United States and the United Kingdom. These demonstrations have proven that the standards and the analysis methods used to evaluate containers against the standards are effective and reliable.

Here is the workhorse Naval spent fuel container, the M-140. The M-140 is 14 inches solid stainless steel. Naval spent fuel is shipped dry, meaning the container is not filled with water for transport. With internal support structure modifications, the M-140 can handle a variety of submarine and aircraft carrier reactor fuel. There are 24 M-140 containers in our inventory. Each container has its own railcar to which it is permanently mounted.

Here is the only other container we are currently using, the M-160 container. The M-160 is specifically configured for a particular Naval reactor plant fuel design, and it's currently being used for a handful of shipments of that design fuel. The M-160 is twelve inches thick, consisting of a steel inner and outer shell, and lead in between the inner and outer shell.

Now, regarding Naval reactor fuel components, Mr. Doherty touched on this, the components are solid metallic form, not flammable and not explosive. The nature or U.S. Navy war ship operations and life on a nuclear powered war ship requires that Naval reactor fuel components be manufactured to withstand battle shock conditions. And because the ship's crew lives and works within feet of the reactor plant, the fuel components fully contain all fission products manufactured, or produced.

The other operational requirement, which results in an extremely rugged fuel component, is the designed operational life of Naval reactor fuel, 20 years or longer. We are currently installing reactor fuel in the new class submarines that should last the life of the ship. The boat will never have to be refueled. The result is a rugged component, exceptionally well suited for transport, storage and disposal.

Now, the third factor contributing to the safety of Naval spent fuel shipments is adherence to the shipping practices, which over 40 years of shipping experience, have proven effective from an operational and safety standpoint. Every shipment is escorted by specially trained Navy couriers. The escorts serve as on-board traffic managers, working with trained crews and local railroad officials for the movement of the shipment.

The escorts also receive training and have the equipment and material available to act as first responders in the event of an accident or security emergency.

Government owned railcars are used, and inspected thoroughly and maintained to ensure mechanical worthiness of the transport vehicle.

We make advance arrangements for each shipment with the involved railroad operational and police departments. There are no surprises between us, the shipper, and the rail carriers.

We do not require that the shipments move in special or also called dedicated trains. It is the longstanding position of the Navy and the Department of Energy that dedicated train service is not required to make spent fuel shipments safe. There may be other reasons to use dedicated train service, but it is not clear that the perception of safety and dedicated train is valid. But in many cases, and this may be one of the cases, perception may be reality, and this is why we continue to work with the railroad industry on this issue.

Routing is determined by the railroads. The detailed routing is determined by the railroads. They know their tracks and their system better than anyone else, and they must have the flexibility to route the shipments as they see fit.

This slide depicts our most common shipping routes. Obviously, the destination for every shipment is the INEEL. The origins on the East Coast are Portsmouth Naval Ship Yard in Portsmouth, New Hampshire, Newport News Ship Building in Newport News, Virginia, and Norfolk Naval Ship Yard in Portsmouth, Virginia. On the West Coast, the one origin is Puget Sound Naval Ship Yard in Bremerton, Washington.

When East Coast shipments reach Kansas City, this is an example of rail carrier routing flexibility, the Union Pacific Railroad removes shipments on the Nebraska route or the Kansas/Colorado route, depending on factors such as traffic volume on each line, and ongoing routine track maintenance on each line. And we often do not know which route Union Pacific is going to take until the shipment gets to Kansas City.

Discussion of a few more of the shipping practices. The location and status of every Naval spent fuel shipment is monitored constantly through the same satellite tracking system which is used for nuclear weapons shipments. Since Naval spent fuel shipments are classified national security shipments, no pre-notifications are made to governors' designees per NRC or DOE procedures for unclassified shipments. But state law enforcement and emergency management officials are briefed periodically about Naval spent fuel shipments by the DOE Albuquerque office that briefs state officials on nuclear weapons shipments, and the Naval Nuclear Propulsion Program representatives provide briefs as requested.

One other point here is that the Naval Nuclear Propulsion Program sponsors and coordinates a periodic Naval spent fuel shipment emergency exercise with state and local emergency services personnel. We do these exercises every other year, and we alternate them between West Coast and East Coast. These exercises familiarize participants and observers with Naval spent fuel shipments, interacting with the escorts that accompany the shipments, and the coordinated response and recovery required in the event of an accident.

This picture of a Naval spent fuel shipment shows that we usually move more than one container at a time, typically two to four containers in a single movement. The other point I want to make here is that the escorts, our escorts in the caboose, which is at the rear of the train, maintain a hand-held radio link with the railroad's train crew in the engine. We think it's very important for our escorts to be able to talk with the people that are driving the train.

I guess one other point I can make, you can't see it very well, you can probably see it a little better in your handout, there are two containers at the rear of this train which look different than the M-140 or the M-160. Those two containers are the older generation M-130 container that used to be the workhorse of our fleet, but we recently made what we think is the last shipment of M-130 containers. The M-140s were designed to take over for the M-130s.

The safety of Naval spent fuel shipments has been fully analyzed in Navy and DOE spent fuel environmental impact statements. The analyses addressed incident-free transport and potential serious accidents, and covered past and future Naval spent fuel shipments.

The future shipments included approximately an additional 500 containers between 1995 and 2035 to the INEEL, and about 300 containers from the INEEL to a repository or interim storage site outside of Idaho.

These next two slides and the ones in your handout summarize the results of these analyses, and clearly show that the average annual risk to the public from the radioactive nature of the shipments in all scenarios is extremely, extremely low.

Expressing that radiological risk in terms which are more pertinent and easier to comprehend, the average radiological risk associated with Naval spent fuel shipments are well below one chance in billion. Comparing this risk to other annual risks provides some perspective.

For example, the risk of dying in an automobile accident is one chance in 40,000, compared to the Naval spent fuel radiological risk of one chance in one billion. And the chance of dying from a meteor striking the earth is even greater than the Naval spent fuel radiological risk.

That concludes my remarks about shipments to the INEEL. I'll be happy to try to answer any questions.

ARENDT: Dan?

BULLEN: Bullen, Board. Just a quick question about your first responders being on the train. Is there a problem associated with a severe accident and their survival? I guess that's the key issue.

ENGLISH: Certainly there is, yes.

BULLEN: So they--I guess that's just the easiest question. I mean, the first responder on the train is actually a good idea, because it would be there for the emergency responders from nearby counties and the local governments if there is a derailment that doesn't have the severity that would injure those people.

ENGLISH: Right. We think that having the escorts on the train brings a lot to the shipment in terms of being able to interface with local emergency responders. Whether or not the escorts survive a severe accident, that's a crap shoot, we think. So we think it's worthwhile having them there.

ARENDT: Carl?

DI BELLA: Carl Di Bella, Staff. Of the 727 shipments that have been made of Navy spent fuel, how many actually have been in dedicated trains? Not how many, what fraction, roughly?

ENGLISH: Well, that's a tough question, because in the Fifties, Sixties and Seventies, I think we mainly moved in regular freight service. Starting in the Seventies, the railroads started to move some shipments in dedicated trains. We went through a period where all the shipments moved in dedicated trains, Seventies, Eighties, and then we started to move shipments in regular freight again in the late Eighties and through the Nineties, one exception being the Union Pacific Railroad has almost always moved the shipments in dedicated train as a matter of company policy. So I couldn't give you a number, but there's a fair mix.

ARENDT: Any other questions? Richard?

PARIZEK: Parizek, Board. You don't tell the governors you're coming, but an M-140 looks like a pretty unique train car, as does the M-160, so I guess anybody with any alertness would know here comes one now?

ENGLISH: Well, yes. It's an interesting dilemma for a national security shipment, especially the last five or six years when we're gone out of our way to go talk to people, show pictures, just like this presentation. But you're right, so there is a paradox there that we have to deal with because it's a national security shipment.

ARENDT: Any other questions?

Okay, we've got some extra time and I believe what we will try to do is to--does anybody in the audience, would they like to ask any of the speakers questions.

Linda, has anybody signed up so far? Carl, why don't we take the question that you've got.

DI BELLA: This is Carl Di Bella, Staff. A member of the public, Sally Devlin, called in an hour or so ago with several questions, and let me just--there are three questions. Let me read them one at a time and see if there is anyone here who can tackle them.

The first question is--Sally Devlin, incidentally, is a resident of Pahrump, Nevada. The first question is, "Where did the new railroad plan for Pahrump come from, and who prepared it?"

Is Jim Carlson still here? Jim, did you hear the question?

CARLSON: No, I was out of the room.

DI BELLA: This is from Sally Devlin. "Where did the new railroad plan for Pahrump come from, and who prepared it?"

CARLSON: Jim Carlson, Department of Energy. I'm not aware of a new railroad plan for Pahrump, or who prepared it. Perhaps they're talking about some of the alternative routes that were analyzed in the draft environmental impact statement, and I would probably pass that over to some of the folks who are here from the Yucca Mountain Project Office.

ARENDT: You wanted to speak, didn't you, Wendy.

DIXON: What was done in the draft environmental impact statement was an analysis of both some alternate routes as it related to sensitivity analyses for transport vis-a-vis truck, just again for sensitivity analyses because they don't meet DOT regulations and the state hasn't come up with a preferred alternative route at this point in time.

And then we did look at various rail corridors, not proposed, but for purposes of analysis. We called them implementing alternatives and we turned to the public and we asked for their input during the DEIS time frame on those various alternative routes. And one certainly does go in that vicinity. I wouldn't use the word proposed. These are alternative implementing corridors that we're looking for public input on, or we were looking for public input on, during the comment period on the draft, and they did do comparisons between length and differences in cost and construction and a suite of environmental parameters.

DI BELLA: Thank you on Sally's behalf. That's question Number 1. Question Number 2, "Are they aware that there are absolutely no medical facilities in this area? This area meaning all of Nye County and the part of Lincoln County that Nellis Air Force Base falls in."

DIXON: Yes.

DI BELLA: An anonymous person in the audience who just spoke said yes. Question Number 3, "Route 95 and Route 160 are 9 hazard roads." That's the number 9 hazard roads, which is a state rating system. "Are you aware of this?"

DIXON: We are aware that they do not meet DOT regulations, yes.

DI BELLA: Could you come to the mike and say that so we can get it on the record? And this is Wendy Dixon again.

DIXON: We are aware of the fact that these do not meet DOT regulations for the transport of spent nuclear fuel and high level waste. They were done for purposes of sensitivity analyses. So thank you.

DI BELLA: Thank you again on behalf of Sally Devlin.

ARENDT: Richard?

PARIZEK: Parizek, Board. We've heard a lot about a lot of shipments, and I guess everything seemed to have gone more or less as planned. We understand there was a lot of engineering judgment used, and then we have finite element modeling that comes out and adds another dimension to the analysis routine. So all of this, if we go back 30 years ago and think about shipment, it's performed as planned and is more or less, you know, the experience is as good as what you had hoped? I'm thinking about this in terms of the Yucca Mountain Project in general, how to anticipate how that's going to perform, and in 30 years, you'd like to feel good about the decision to operate 30 years and say it's just like we hoped it would be. Is that true for transportation, or were there surprises, and you had to do some fix-ups along the way?

DOHERTY: Doherty, Naval Nuclear Propulsion Program. It's interesting because back in--I've been in the program a long time, and when I came in the very early Sixties, we were still working on that old fashioned M-130, which we are about to retire, and it was designed very conservatively with a lot of margin. It was designed originally to ship wet. We had heat exchangers that mounted on the rail cars. We even had some shielded container to hold fission gases, or something, all of which were just unnecessary and ended up being stripped off.

But in all the years I've been in the program, I don't remember any significant problem. There are problems. there are always problems. The M-130 head has bolts that hold the head on. Every now and then you'd gall one of the bolts and you had to go in and grind out the hole or put an insert in. It's that kind of a problem, not ever a problem with meeting function.

PARIZEK: Thank you.

ARENDT: Paul Craig had asked a question earlier, and John Kessler was going to respond, and we've got time now, so he's agreed to ask the question and offer a response. John, thank you.

KESSLER: John Kessler, EPRI. Paul had asked a question earlier about who was responsible for looking at aging during dry storage for the existing dry storage systems. The answer is the utilities are responsible for that. What are they doing? There is currently a project being funded jointly by NRC Research, EPRI, DOE/EM and DOE/RW to look at one of the particular casks that's sitting at INEEL, the caster cask. It's been there about 15 years fully loaded with spent fuel for that whole time.

The interest is is that current spent fuel storage systems are licensed for 20 years only. Virginia Power is going to have their license expire in 2006, and there's some interest to understand, you know, what's the basis for being able to extend that license beyond 20 years. So this project is part of that effort to develop a basis for extended storage by looking at any potential degradation in this particular cask.

There's also an ASTM committee that's meeting to develop standards for looking at aging of dry cask storage issues. So that's what's been happening in terms of that issue, to answer Paul's question.

Getting back to the last issue we talked about regarding experience during shipment, we've asked in Europe about activities in terms of EDF shipping to spent fuel reprocessing, what is it like when it gets there? Also, in Sweden, what's the experience in terms of when the utilities ship to CLAB, their interim storage facility, what is it like when it gets there? The anecdotal evidence, and we're trying to track down some actual physical reporting, is that they haven't found anything that started out intact that wasn't fully intact when it got to the end of the line, so to speak. I'm trying to find some references to verify that.

ARENDT: Thank you very much. We have someone from-- yes, ma'am? Identify yourself, if you would, please.

GOFF: Sure, thank you. I'm Jackie Goff with the Department of Transportation Inspector General's Office. We're getting ready to look at internally what DOT is doing that's preparing for this. So that's why we're here. But I find it interesting while this is about transportation, a couple of the earlier presentations, for example, the forum, there was no mention of DOT other than they can come. It was on the sly, but no mention, they can be involved if they wanted to.

And on the stakeholders, on the next presentation of all the stakeholders, it was then anecdotally incidentally mentioned that there were two parts of DOT that could be informed if they wanted to, but I guess they're not considered stakeholders, if you will, although the transportation.

It was very interesting what the Navy is doing, but the Navy is not--is outside, obviously, the transportation regs. and the piece that we have, and it is our understanding from FRA that those new cars you're talking about have not been upgraded for their brake system. And so for FRA, when they're not told ahead of time, they can't inspect, but they haven't been upgraded.

So I guess my only question is I'm interested in to what extent here today you're going to get into other transportation issues, not within the Naval portion of INL, where they're only transporting it within there, but the transportation that most people are concerned about, which is going from East Coast, West Coast, or all the routes that you're talking about.

So I'm just asking for a sensitivity for the rest of the day to presentations, if you have any information on that, if you could add that, because that would be very helpful I think.

Thank you.

ENGLISH: Ray English from Naval Reactors. I appreciate the comment for the need for sensitivity from DOT. Regarding the brakes on the M-140 container cars, the M-140 container cars did go through extensive dynamic testing and were certified by the Association of American Railroads to meet all their requirements when they were built.

I think what you may be referring to is that the AR is developing a new type of electronically pneumatically controlled braking system, and we are evaluating that. But those cars right now currently meet all AAR requirements.

CARLSON: Jim Carlson, DOE. Just for clarification on the slide that showed the membership to the TEC, those are members. We also have a number of participants. DOT is a very active participant, as I mentioned. Three administrations actually participate. FRA has been very active for a long time. Federal Highway through particularly the Motor Carrier Safety Administration, has been very active in the routing area. And the Research and Special Projects Administration, who actually promulgated the routing, has also been very active. We do have regular reports on the DOT activities that go on and attendance at the meetings.

ARENDT: Do you want to make any comment, Bob, or Chuck? Very good. Okay. Does anybody else have any question they'd like to raise?

(No response.)

ARENDT: We're going to--I think what we'll do is we'll break early here. It is now almost 11:15. Instead of coming back at 1 o'clock, how about coming back at 12:45. Does anybody have a problem with coming back at 12:45? Chuck, are you available at 12:45?

DETTMANN: I'm available to do it now, if you'd like.

ARENDT: Do you want to finish yours now? Why don't you come up? Why don't you come on now then.

Chuck, Bill just points out there are people that wanted to hear your presentation, and they plan on coming to hear it and they won't be here. So why don't we do--I guess why don't we just go ahead and break, and get back at 12:45 or 1 o'clock. 12:45, I guess. Let's shoot for 12:45.

(Whereupon, the lunch break was taken.)

AFTERNOON SESSION

ARENDT: Good afternoon. We'd better get started. Those that are out can catch up when they get back.

We have as our first speaker today Chuck Dettmann, who is the executive vice-president, Safety and Operations with the Association of American Railroads in Washington, D.C. Chuck is going to tell us a little something about railroad human factors.

DETTMANN: Thank you, John.

Before I get into the human factors, I would like to say that we in the railroad industry, not only the AAR, and when you speak about longevity, I've been 37 years coming up through railroad operations for the first 29 of them, and spent the last eight in Washington with the AAR. So I'm an engineer out of Georgia Tech, and then went to Harvard and Northwestern. So I understand what we're trying to do.

We in the railroad industry very much consider ourselves partners with all of you in trying to develop a safe transportation for spent nuclear fuel as we all work forward together.

We were asked to talk about railroad human factor safety issues, so that's what here for the next few moments I'd like to discuss with you. After this, Bob Fronczak will be talking about our performance standard piece, and I'll be glad to get into that following Bob's presentation.

So the discussion this afternoon is going to be dealing with four issues. Number one, the current state of railroad safety; two, fatigue; three, crew change requirements. This is a little fuzzy, but I thought it was important because there's a lot of rumors that go around this industry that I wanted to clear up to the Board. And, four, a new program that we've started in the railroad industry, crew resource management.

The railroad industry employee injury rates versus other industries I think is important. When you look at railroads, wholesale and retail, i.e. clerks here in the hotel, at Wal-Mart, anywhere else, mining, agriculture, construction and manufacturing, lost workday cases per 100 full-time employees in 1998, the railroad industry was safer for its employees than other industries.

Our injury rates in the transportation sector, and these are injuries to employees, again, airlines, transit, trucking, barges and rail, we are the most safe transportation industry for our employees in the United States.

When we look at overall safety, train accidents per million train miles, which we feel is the most appropriate way of looking at it, human factors is the largest--human factors and track, and when it comes to equipment, and then other, let me discuss this here a little bit. This is as reportable to the Federal Railroad Administration. It is any accident that incurs over $6,500 damage. One of the documents that I read on the way out said that the reportable to the Motor Carrier Safety Administration is $50,000.

So I think as we look at the statistics, we've got to be careful about what we're doing. The vast majority of these track accidents are slow speed accidents in yard tracks. So that's the reason why the anomaly of track there.

Train accidents per million train miles, significant reduction since 1980. This is back when the re-regulation happened. We were able to act more like commercial operations, and we have seen a steady improvement here. We've sort of levelled out. We recognize that, and I want to talk to you again, the human factor piece, which is the largest piece and the hardest one, truly, to address, is one of the things that we want to get at by our crew resource management program that I'll be speaking to.

Hazardous material train accident with a release, and you can again see the significant improvement, although we have levelled out somewhat. I think the most significant piece is right there, 99.996 per cent of car loads of hazardous material are accident release free in the United States.

So when we look at human factors caused train accident, again, it has plateaued, slight growing here in the last couple of years, and then if we level it per million train miles, we've seen a significant reduction in the early Eighties, and it has begun to flatten out now. But it has flattened out still at a rate that is significantly, let's say, better than what we have seen in the past, or in comparable forms of transportation.

The next topic, fatigue. Fatigue is something that has been under consideration not only in the railroad industry, but in all of transportation for many, many years by the government, by NASA, by NTSB and all others. We began our effort in the railroad industry in 1992 as a cooperative program between our two largest unions, the Brotherhood of Locomotive Engineers, and the United Transportation Union and the Railroads. We got together and said what can we do about fatigue. Again, this was eight years ago.

We began to look and we started out with no preconceived ideas. We began to look at data. The review of the data, and this was the largest study that has ever been done in any transportation industry in the world, we looked at over 6 million engineer start shifts to correlate fatigue, time on duty, safety, all of these kinds of things. It was a landmark piece of studies that we worked together, and it culminated in a national agreement between the railroad industry, BLE and UTU, where we set up committees on each railroad to address the fatigue issues.

Now, in our industry, as in aviation and in marine and highway, there are significant economic interests that are surrounding this thing called fatigue. And fatigue is not a very cleanly identified piece. I think research has shown, and Martin Mulreed and a lot of the others, you know, the person least able to tell you that you're fatigued is yourself. You always feel that you can go ahead and get on with it.

In any event, we set up committees on each railroad that worked outside of the traditional labor relations piece to address fatigue.

Research on individual railroads, we came up with the help of Circadian Technologies out of Boston, a thing that was tried on the railroads in Canada called CANALERT, where instead of, as the traditional railroad operation is, is that you have trains that run and you have rotating crew schedules that when you get to first out, you catch the train. They said let's do it differently. Let's have a pool of crews that are set up to work in time pools, and they catch whatever train that is coming through. Radical thinking. Never been done before in the industry. It is being implemented throughout Canada, and various places in the U.S.

Now, one of the major considerations in the railroad industry is there are no two crew districts or train schedules or things that operate the same way. Some crew districts are 350 miles long. They take eleven hours to get there. Some crew districts are 90 miles. And you turn 90 miles out and 90 miles back. Lots of fast trains. Lots of slow trains. Lots of them with all different kinds of train speeds in there. So one of the things that we have come up with is that there is no Silver Bullet, there is no particular answer which we have been--regulators and NTSB have been pushing for for years. But what we have found through this research and the work that we've done is there is no one size fits all.

We additionally, for the non-operating employees, which are the maintenance away employees, mechanical employees, clerical, and even the railroad officers in times of distress, such as accidents, storms, what have you, we are looking at the fatigue issues that are even in the non-operating crafts as we speak. The FRA, by the way, is a significant partner in all of these efforts with us.

Our research findings. Accident potential increases when a crew has been on duty more than nine hours, and it is in the Circadian period between midnight and 6:00 a.m. And we've talked about midnight to 6:00 a.m. is dangerous, the 6 million employee study said no, it's not between midnight and 6:00 a.m., it's if you've been on duty more than nine hours, an employee has worked five consecutive permissible shifts with a greater than ten hours on duty, or more than six consecutive permissible shifts in seven days.

The railroad industry, Amtrak is one of them, has readjusted the schedules based on the data that we have come. What we do here is that we will notify crews, and in our training programs, we bring this issue up between midnight and 6:00, if you've been on duty nine hours, there is a potential for an increase in an accident.

Any of you who are students of the fatigue issue, Mark Rosekind, who was with NASA Ames and has not got his own company that he's doing, did significant research in commercial aviation and military aviation, and fatigue cannot be changed. You can't do anything about it. The only thing you can do is come up with counter measures, recognizing when you're fatigued, recognize what the Circadian rhythms are, and then come up with counter measures with which you can mitigate fatigue. But you cannot eliminate it. The human body will not allow it to do so.

So what we are doing in the railroad industry is we're assigning work days and rest days. Now, this may seem a little funny if you're not in the railroad industry, but when you're 24 hours, seven days a week, through the holidays, through the weekends, all the time, good weather, bad weather, having assigned work and rest days, again, some of which is matching trains to crews rather than vice versa. Minimum of eight hours undisturbed rest between calls, 7:00 a.m. markups after 72 plus hours leave. What does that mean? We found out the hard way. There was an accident in Kansas here a couple years ago where a locomotive engineer had been on vacation for two weeks. And tradition has had it over the years that when your vacation or leave is up, you mark up at midnight, the start of the new day.

Well, what we have found, and there was a subsequent accident unfortunately, in any event, what we found is the midnight markup, which is traditional in this industry, is not conducive to getting people from their leave cycle, which is normally work during the day and sleep at night, to going to work at midnight, or whenever else, so that we're going to a 7:00 a.m. markup. It seems sort of simple when you've been around for 150 years and there's so much tradition and culture associated with it, that after you look at the data, you can find out there's a lot of things we can do to improve fatigue.

Increased assigned service so everyone knows when they're going to work and coming home. One of the big things we have found, it is not the amount of time on duty that addresses fatigue. It's the predictability of time off. The predictability of time off has more to do with "fatigue" and reducing fatigue, and how much time off depends on how much sleep that you have. Okay? And how much sleep that you have depends on how much you've been working.

But in any event, there are a whole lot of issues, prompt relief after twelve hours, standards for lodging, improved accuracy of line ups, these are some of the things that we have done.

To get into some of the more exotic things, and I say exotic, time pools, we talked about time pools where you match the trains to the crews. Sleep disorder screening. We probably have looked at 50 per cent of the craft employees in the railroad industry for sleep apnea, and we have found it varies between 7 and 20 per cent of our employees suffer from sleep apnea.

Sleep apnea is a disease. There is a way you can control it. But if you don't know you have sleep apnea, which you don't get your rest, and because of the way you sleep, that fatigues you when you come back to work, and this is the screening that the railroads are doing on their employees to let them know--all we're doing is letting them know that it appears that sleep apnea, that you are subject to it, and then they are free at company expense to go forward and deal with a treatment of choice.

Napping/employee empowerment. As I mentioned when I started, I was an operating officer, assistant train master, train master, superintendent, general manager, all that stuff in the Sixties and Seventies, and I have fired my number of employees for sleeping on the job. In a little over one generation, now we are encouraging employees to nap, train and engine crews.

now, it is very, very specific what napping is. It is a 45 minute period of time, of which you're allowed 20 minutes to nap. And you tell the dispatcher where you're going. The train either is in the siding, or the train is on the main track where there's no conflict with other trains, et cetera. But if you as an employee, for whatever reason, feel that you cannot make safely your objective terminal due to fatigue, you are free to nap in the railroad industry.

Ongoing committee review, modification of measures based on effectiveness. We are looking at this. We have the work/rest committee that I mentioned. We have a scientific advisory panel, which there's three of the best independent scientific minds in the country, Greg Bolinki of the U.S. Army who is the guru for the U.S. Army for fatigue, Dr. Carlos Compretor, who is with the Coast Guard, and then an academician in Canada, and his name just left me, but I'll think of it who is working with us reviewing what we are doing in the railroad industry as far as fatigue is concerned.

The sum of all of this fatigue in the railroad industry, and I leave it with you this way, the North American railroads are the leaders in world transportation in addressing fatigue. And this is recognized by NTSB, by the National Sleep Foundation, and all of the others. There is no other transportation group anywhere in the world that is addressing fatigue like the North American railroad industry.

So this gets a little murky, but I think we've had some of our folks at the National Transportation and Safety Board making noises about how railroad engineers can work 432 hours and truckers can work 250 hours and an airline pilot can work a maximum of 100 hours per month, and isn't this terrible as far as what railroad engineers are allowed to do.

Crew change requirements, this is hours on duty, maximum per shift. Railroad engineers are 12 hours. Truckers are 15 hours on duty. The new Motor Carrier Safety Administration proposal is a trucker will be allowed 12 hours on duty. An airline pilot on duty is allowed 15 hours. 15 hours. Okay? Barges are 12.

Now, as far as operating the locomotive, the aircraft, the barge, the truck, railroads are 12, the existing motor carrier can operate ten hours out of 15 on duty. 12 and 12 for both the proposed motor carrier and barges, and the pilots can fly eight. Fly eight, on duty at 15. That is from push back at the gate to engine shutdown at the gate. That's what that means. Okay?

So, I mean, the pilots, and I've got a lot of good friends who fly and, you know, they live in exotic places, and they'll fly for hours to get to their job, and they'll go to their job, you know, and they can only fly for eight hours, but they can be on duty for 15, but they have no requirement about where they come from or how long it gets to.

So we were singled out in the railroad industry, unfortunately by a few, because of this. It says theoretical maximum hours per month. Well, our hours of service regulation says that if you work 12 and were off eight--worked 12 and were off eight, theoretically, you could work 432 hours a month. Truckers could work 250 hours a month. The new proposal is they can work 300. Theoretically, on duty, an aircraft crew can be on duty 420 hours a month, and 350 for the barges.

Operating--this was on duty, I'm sorry--operating, theoretically, 432, you know, 280. 300, they can only operate 100 hours a month, and this is where the railroad employees operate 432, and you can fly 100 hours per month, 350. When in reality, this is what the distribution looks like for TE&Y employees that are out here.

By and large, for the 160 or so hours a month, or 170 that most 40 hours of work, four and a third weeks, et cetera, 172 hours, that's where the vast majority of our people are. Yeah, we have a few out here, and these are the ones that we are working with our labor organizations to address.

We have agreements that provide you can get so many miles per month, so many hours per month. They're agreements from the late 1800s, things that were working, and we are working very closely with our labor organizations addressing this. But by and large, the vast majority of crews that operate your trains on our railroads in this country are operating within, you know, 160 to 200 hours per month.

Now, just some of what we're doing, one of the major things that we're addressing now is crew resource management. NTSB recommendation in 99-27 following a fatal train collision at Butler, Indiana on March 25, 1998, develop for all train crew members, crew resource management training that addresses crew member proficiency, situational awareness, effective communication and teamwork, and strategies for appropriately challenging and questioning authority. I'm sure many of you have heard of this last one, the Korean airliner that went down over in Guam, and all of these others. You hear these things around.

This accident, by the way, is there was Norfolk-Southern had us, had and has a requirement that new engineers have mentors, and that they only go to work with their mentors. Well, it turns out that when this new engineer reported for duty the night of this accident, his mentor had laid off due to some family illness or something, and another engineer took it. Well, he wasn't supposed to work unless the mentor was there, but they, you know, oh, come on, let's go.

Well, it turns out the other engineer sat over there reading a book, and the way the territory was, that the engineer, the new engineer was not familiar with the territory, missed a signal at an interlocking, ran through the conrail train and the conductor was killed. So NTSB said that you guys in the railroad industry need to get after crew resource management.

What we have done is we looked around. We do not suffer from not invented here. We looked around and we said what are the best practices out there in military and aviation. It turns out Southern Pacific, before the UP merger, had done a portion of a crew resource management based on US Air, based on American Airlines, based on the military, with a lot of the in cabin flight crew examples that they show in crew resource management for aviation.

So we, with their permission, plagiarized that and brought that into the railroad environment. Well-developed, structured training exercises, performance measures and feedback mechanisms. The results. In aviation, there had been 8 to 20 per cent more teamwork behaviors by cockpit crews that have been trained on crew resource management rather than not.

And as we have found, those of us in the safety business over the years, rarely is there one incident that causes an accident. It is an accumulation of incidents that all of a sudden the crew awareness is not that we have this accumulation of small incidents, and one or two is just enough to cause a significant problem.

In any event, what we have done in the railroad industry, and this is within the last 60 days that we have put this out, customized for each railroad, offered free to the short lines and others, free throughout the North American industry, we published the Crew Resource Management manual, about that thick, produced a video for wide distribution, again, customized for each of the larger railroads, begun training of the train and engine crews, worked closely with FRA, BLE, UTU, short lines and others in designing this program and implementing it throughout our industry.

What other things are happening? We've had, and we will continue to have because safety is good business, massive safety programs for all employees. There was a piece in some of the documentation about how our federal government has been responsible for the significant improvement in rail safety over the years. I would submit to you that the federal government is a part of improvement in safety. The railroads and their employees have done a significant amount of improving safety in this industry in the last 20 years.

T&E crews, signal and train dispatchers, all of these have random and post-accident alcohol and drug testing. We are the lowest in the industry, less than one-tenth of one per cent positives on drug and alcohol.

Operating rules training. Every other year, massive training on simulators, et cetera. So there's a significant training effort that goes on with our safety programs.

So in conclusion, our safety record is very good and we're striving for continuous improvement. North American railroads are in the forefront on industrial research and application on fatigue.

But I would offer to you science and flexible application, not regulation, is what guides fatigue counter measures, and understanding what fatigue, the part that it plays in safety. There is no one size that fits all.

And, finally, as the Crew Resource Management Module we show, we have no pride. Anything that can improve safety, such as we're willing to reach out to aviation and the military and others through our oversight advisory board, we're willing to do to improve safety in the industry.

So, John, that's the fatigue and human factors piece. I'd be glad to take any questions.

ARENDT: Questions? Excellent presentation.

DETTMANN: Thank you.

BULLEN: Bullen, Board. I'd also like to echo John's comments about the excellent presentation, and found it very informative.

I guess the question I have is with regard to the data that you have on accidents. Do you find that--well, I guess it's a mix. Do you have dedicated trains that have hazardous materials on them associated with it, and do you find that the fatigue or the awareness of a dedicated train would be greater or less than that of just a standard shipment?

DETTMANN: It's not that simple. We have what we call key trains, key trains that have a percentage of hazardous material on them that take special precautions in operations, not unlike dedicated trains. The key trains are in regular pool service. Okay? As I mentioned, the crews, when you get up to a first out, you know, if it's a key train, you take it, and our crews, when they have the potential of catching a key train, Hazmat train, they get additional training in that.

Now, dedicated trains can be either pool crews or dedicated crews, and that is something that we work out. It's just like the comments that Ray made earlier. Sometimes they run them through Kansas and Colorado, the UP does, west from Kansas City, sometimes they take them up over the Marysville Sub. A lot of it is crews, what the crews availability, and things like that.

We have not, as of this point in time, said whether dedicated crews are safer than regular crews. I don't know how we'd get to that. However, we have underway a significant study on the relative safety of a dedicated train, such as what Bob is going to be speaking to with our performance standard, not in the past, what a dedicated train, because of the new technology and the changing environment that's around us, what that means versus the regular train service.

BULLEN: Just a little followup on that. You mentioned fast trains and slow trains. And if we have a dedicated train for a nuclear waste shipment, for example, and it's a slow train, does that really fowl up everything else in the entire system?

DETTMANN: It can. It can. Our preference is, because we design a system that works together, which is what you'll be seeing, that we operate those trains and they will be capable of maximum track speed. One, there's less exposure for the material. Number two, if we've done the testing right and we've got all the instrumentation that you'll see, it will be a safer shipment. There is no need to have the

1970s style requirements that we brought in when we didn't know a lot. A lot of other folks did. As Ray's safety performance shows, we've done a lot together over the last 30 years.

But where we've had, what, 700 since 1956, we're going to be having 400 a year for the next many, many years out here. There is a C change of volume here in, and I'm sure all of you that read the papers know that there's congestion and some problems in the railroad network from time to time, that when you put a train out there when you've got everybody else running 60 and 70 miles an hour, and you put one up there at 35 miles an hour, all it's doing is going in and out of sidings. And that is not the safest way to operate a railroad.

BULLEN: Thank you.

ARENDT: Paul?

CRAIG: Paul Craig, Board. I'd like to ask you to expand a little bit on the idea that you mentioned that you'd need a series of events, or usually find that there's a series of events that lead to a disaster, or lead to an accident, would suggest you get some warning signals. And I was intrigued by the remark, and it has a number of implications to it that I can think of.

DETTMANN: Well, let me give you a couple of examples. One, the one in Indiana, number one, the mentor wasn't there.

Number two, the new locomotive engineer did not insist when he got to a point where he was uncomfortable, he didn't know where he was, and this was at nighttime now, this was at nighttime on an intermodal train running 70 miles an hour, that he lost where he was. Then there was the long end of the engine was running forward in a left-hand curve, so he couldn't see the signal. Rather than I want my mentor or you take the train, number two, you're not my mentor, but you sit with me.

Number three is the conductor was over there and he was not performing his duty, looking out for the signal, what's the signal that's coming, or I'm lost where I am, I sit down and take the train. All of these things, just like there was one of the more stark examples of the crew resource management in aviation, is that here's the flight crew and they're taking off, and the bells and whistles go off. Engine failure. And so they're doing all of this stuff, and engine failure, and all of a sudden they're calling out things in code rather than the right language. And it was check the engine for shut down, but which meant which engine is shut down, rather than the co-pilot was reading it out and the captain was sitting over there and he reached up and he turned off the engine that was working.

So we had an engine failure on one, and the one that was working, because of the lack of communication, and these were pieces that fit together, and this is where situational awareness and crew stuff is, if you begin to see these things come up, you say woah. You begin to challenge authority, that the engineer on the Norfolk-Southern train did not challenge authority.

The 747 KAL that went down in Guam, the other members of the crew, which there was a relief captain and there was the co-pilot and flight engineer, all knew they were--that, number one, the ground proximity warning was out at Guam. Number two, it was in a storm. And, number three, they were flying too low without it, but none of them spoke to the captain because he was an old Korean Air Force, you know, rough and tumble guy, didn't challenge the authority of the captain, and they went in.

So these are the pieces. When I say that, there are small things that if you are trained to look out for, can lead up to where you're at the point of no return, and that's what the whole crew resource management piece addresses.

ARENDT: Any other questions?

(No response.)

ARENDT: I guess not.

DETTMANN: Okay.

ARENDT: Thank you very much.

DETTMANN: Thank you. Glad to be here.

ARENDT: Our next speaker is Garrick Solovey from the precision Components Corporation. Garrick has been employed by PCC from 1966 through '83, and he rejoined in 1996, and his current position is vice-president, Corporate Business Development, Strategic Planning. He has 25 years of operations management and technical responsibility. He has a BS ME from Drexel University, and a master's in Engineering Science from Penn State. He's a professional engineer in Pennsylvania and Virginia. He's received a number of awards in professional activities from ASME, and so on.

Garrick, we're glad to have you this afternoon.

SOLOVEY: Thank you very much. It's certainly a pleasure to be here.

The degree to which we let human factors influence the outcome of any activity is really a measure of tolerance for risk. And, of course, in this business, the nuclear industry, there's very little tolerance for risk. And what's I'd like to do over the next few minutes is describe how, during the manufacturing process, we control, manage and direct human factors to our benefit. I'd like to, and I guess it's appropriate, to have a little disclaimer that my comments certainly reflect those of my experience in the company, and there are several good fabricators out there who I certainly would probably share very closely the thoughts which I'm expressing today, and I would have no qualms at all about going to them and putting work into their facilities.

But as this market begins to grow, there's going to be people that will want to get into this market. The industrial base in this country, particularly in the basic industries, both in welding and machining, is not at the levels it was 20 or 25 years ago. So I think at this point, we're going to start to see some new folks get in, because there is a market there, and they feel that there's opportunity. But possibly you could use this presentation as a benchmark to compare it against new folks coming in and how they might approach the manufacturing business of casks.

And by the way, even though this is geared to transportation casks, I would say that you could apply this to currently the storage cask, and most any nuclear-related manufacturing.

Basic discussion. I'd like to break the discussion basically down into some discussion on transportation cask characteristics, talk a little bit about four aspects of quality, which is directly relatable to this subject, talk about how we look at controlling and managing human factors, what are the challenges, what are the success factors that a manufacturer can achieve will give a good product, a product that certainly meets all the quality and customer expectations, and then summarize and talk a little bit about the results of the discussion.

Transportation cask characteristics. PCC was formerly an Allis Chalmers company, and we've been in the nuclear business for over 30 years. In fact, during Mr. English's presentation earlier, he showed you an M-160 cask, and that was our entre into the cask business. As long as everyone is sharing how old they are, that was my first assignment when I got out of college, was to work on that project. Really a sobering thought how many years ago that was. But that cask has been around for 30 years, and in operation.

Since that time, we've probably built over 150 different types of casks and canisters of all different types and materials and constructions, and that's one of the things I want to talk about. But most recently in the early Nineties, we really began heavily into the commercial nuclear aspect for the utility business. So we still do work with the Navy, but the cask business and container business right now represents about 60 per cent of our business.

This schematic represents a TN-68 dry storage cask. It's mislabeled, in that now it's also going to be a transportation cask. These are casks that we're building for Pico Electric. We've delivered three of them so far. This cask will be used on their site for their dry storage cask program, with the option to be able to transport.

TN has a variety of different casks. We built the TN-32s for Virginia Power and the TN-40s for Northern States, and some TN-32s for Wisconsin Electric, and it's a very economical design, good use of materials.

As you can see from the description, we have combinations of gamma shield, which is basically a carbon steel inner shell, which is shrink fit into an inner stainless steel shell. That full length is shrink fit. We actually heat up components in the oven, in our furnaces, before we put these units together. We did stick the first one, but we've built 50 since then, and I think we've learned how to do that fairly well.

The outside, there are aluminum boxes which contain neutron shielding material, which is a resin type mixture. You can see there is a closure, a bolted closure design, which is certainly critical to function. The trunnions, in some cases, they may be welded on or bolted on, which is also an important feature to safety.

Internally in this cask, there is a basket. The basket also is very critical. Baskets come, there's different designs, this particular basket is a combination of layered material using borated aluminum between the cell sections. So this particular cask is very popular. It was licensed several years ago as a storage cask. Now it's moving into the transportation arena also, and we see that this could be a very good economical solution to both storage and transportation in the future.

This is a picture of how the cask looks when it's put together. You can notice it's painted, and this is basically the transport frame that is used for transport. We typically transport these by truck. This cask is a 100 ton order of magnitude, and fully loaded--one of the things, too, which constrains utilities is the ability in their fuel buildings to be able to handle things much over 100 tons. Some utilities would not even be able to use this. That's why they're going to the canister design.

Here's a schematic of the M-140, which you saw earlier. This design, very simple, straightforward. As you can see, it's 14 inch thick stainless steel, very simple structure, a monolith, so to speak. The original M-160, as was mentioned before, was basically two--was inner and outer shells with approximately six to eight inches of lead for use for shielding. Lead does have its issues. Pouring lead is more an art than it is a science in many regards. You also have to be able to gamma scan that lead, and not too many companies can do it. You need a facility where you can put the component and be able to do a fairly good gamma scanning inspection of it.

Additionally, lead is not the most popular environmental material these days. Originally, we did the M-160 internally in our shop. But because of the environmental concerns, as we do lead pouring now, we'll send those out to be done.

Externally, you see they have fins for heat transfer dissipation. As you notice with these casks, you know, you typically have the structural integrity issues, you have the thermal transfer issues, and then you have your shielding issues.

These casks are very large, as you see in some of these pictures, but they're not pressured, they're not what you would call serious pressure retaining components. They're basically a containment component, which the inner, in the case of a multi-layer, the inner wall really is your containment boundary, and that's the key factor in that design.

This cask is a 100 ton cask, this is the cask on our 150 ton crane going to our machine shop area. There's a lot of both welding and machining challenges with this. Putting those fins on is not an easy task. Going from the lead to the monolith required us to look at narrow groove welding as an approach to put this unit together. So in some cases, you trade off one fabrication challenge for another.

Now, most of these heavy wall casks, too, the other thing that we face as a fabricator is material. On a structure like this, you go to forgings where you have a built up section. Where you're dealing with thinner wall, you can go to rolled plate. Forgings, in this country, we've lost a lot of our ability to make forgings in this country. We go overseas, we go to Cruessot Morrel, we go to Forge Masters, we go to Hanjong (phonetic) in Korea. We can go to Japan. The big forge shops in the United States do not exist anymore. So we as a manufacturer, we are certified NCA 3800. We go over and audit these facilities. But it takes about six months to get forgings, and the material requirements are very stringent, so we have to make sure that the material we get has the proper traceability, and it's correct as it's received in our shop.

In the whole scheme of things, material generally represents half of fabrication costs, and a big portion of our ability to deliver a product. A heavy wall cask like this could take 18 to 24 months, with six months being to receive the forging material.

This is another shot of the M-140 on rail cars as it was leaving our shop.

Probably the most complex cask we ever did was for the Japanese. We were the first American firm to actually build transportation casks. NFT is nuclear fuel transport. They are a consortium of Japanese utilities. They purchased 40 casks. We completed nine casks for them in the spring of '98. These casks will be used to transport fuel from the various plants to Rokkasha, which will be the reprocessing plant.

The cask itself, the body is stainless steel. You'll see an inner chamber here with copper fins used for heat transfer. We poured resin in between those channels. To actually to be able to weld the copper fins which extend the full length, we had to develop an optic system. We actually had cameras inside. We actually welded this thing vertically with cameras that looked at the front and back wash of the weld to be able to inspect that.

It also has fins on it, external fins, which was a major challenge in putting those fins, meeting the tolerance requirements and so forth. It's a bolted closure, has trunnions, which were bolted, and we provided the impact limiters for shipment.

The impact limiters is another testy challenge for many manufacturers. Impact limiters, as you know, are usually a thin type material, usually stainless steel, and internal to the impact limiters, there are various options, use a honeycomb design for crushing. Some people use tubes, aluminum tubes. Others may even use plywood. In the case of the Japanese, they use plywood.

You can see here also there's a basket which I'll talk about in a minute, but this particular cask was an extreme challenge. It took over two years to manufacture one individual cask, a lot of forging material, plate material.

You talk about inspections, on a particular cask like this, we did three inspections for every hole point. We did one for ourselves with their resident inspector there, and then we did an inspection with the NFT people there, and then we did the same inspection with their STA, which is their science and technology equivalent to NRC. They came over and we repeated the inspection three times. So we did get experience in dealing with the Japanese.

As you will notice on this sketch here, this was the size, 150 tons, notice the high polish. Japanese require these to be a mirror finish, though admit that it doesn't mean anything relative to what it does, but they want a high polish on it, because to them, that means quality. So we provided the frames and the cask.

This is the basket, interesting design. It's borated stainless steel. Borated stainless steel is not permitted in designs in the United States, but it is permitted in Japan. It's an egg crate design where you actually water jet cut the various structures, put the plates together, and then put tie rods and weld corner braces on. This particular basket was an interesting challenge, particularly after you get through the first basket. But the borated material in itself, whether it's borated stainless steel or borated aluminum, there's an issue whether isotropic material, it does tend to move on you. Tolerances are tight to hold. We were able to find with water jet cutting and not machine, we were able to hold the tolerances that were required.

There are other different types of construction. Today as we speak, one of our casks, MP-187, which is the Vectra design, is being received at Ranchosico (phonetic) for SMUD. That design was a combination of resin and lead. So you run into, as you get into these various fabrications, different types of materials of construction. Sometimes you could do it with plate. Many times you need forgings. You get into dealing with resin, how you deal with that, how you deal with lead, deal with fins, to deal with the design requirements.

We as fabricators these days, things have changed somewhat from what they were when we designed and built the M-160. There are now designers out there who actually will come to fabricators to have these things built. There are no fabricators that actually do the whole design build anymore. In Japan, it's a different story, where the actual fabricators like Mitsui-Zosen and Hitachi-Zosen and Kobe and so forth, Mitsubishi, they will actually design and build. So in this country, we have designers, who then provide to the fabricator a specification package, and it's almost treated as a build to print project.

Ishikawa basically said that there were four aspects of quality. Quality is how we meet the technical requirements and expectations of the customer. Cost, how efficiently we can build the product. Delivery, what our performance would be in providing that product. And then service, how do we deal with it after the product has been completed and in the field. And I'd like to kind of--those are kind of key drivers in this discussion relative to human factors.

There's no doubt that human factors influence these aspects of quality. Most of the technology to build casks exists. Now, with some fabricators, more so than others, some do not have those capabilities. But like anything else, those can be learned. The issue I think we all face is how do we meet, through the people we have and the things we have, how do we achieve those aspects of quality in our operations.

When I tried to jot down examples of human factors, these are probably the key ones that come to mind. Certainly competency and expertise of the fabricator is extremely important. As the market starts to mature and there's more repeatability of work, the more you learn, the more you can take advantages of your initial investment in learning how to make these, developing new processes, new technologies. But competency and experience, there's nothing that replaces that for a fabricator, particularly in this business, to get that repeatability of making these.

Material procurement and traceability. I mentioned that before. That's as critical as actually making the cask, is finding material suppliers that can meet the quality requirements necessary to begin production, providing the certified material test reports, doing all the preliminary testing that needs to be done, making sure that all quality requirements were met during the forging process or the plate process.

Work instructions and communications. Here again, internally, the people that are in the shop have to have clear instructions on how to fabricate, how to manufacture, how to machine. This is a critical link to making sure that you end up with the product that you want.

You also have to have the workmanship and craftsmanship. Certainly these are skills that are certainly being lost in this country, but the folks in your shop are very key in having the right craftsmen and the workmanship. Welding is not just something you do and magically you get results. Welding is an art also, and welding is extremely key, particularly on the containment boundary. Without good workmanship and good quality welds, the product is meaningless. There are ways to do it manually certainly, but there's also ways to do automated processes to become more efficient and more repeatable. Automated process are certainly more preferable over manual techniques because you do get that repeatability.

Honesty. I can't emphasize that enough. I kind of equate quality actually to an honest product, and that's what I mean, is you have a product that meets every expectation that you've been contracted to fulfill, and the people in your shop, I'll talk about that a little later, have to be honest, and you have to be honest about what you're doing and honest to your customer. Bad news is better than no news. You have to be honest in everything that goes on in your fabrication.

And the priorities in production, and this will relate back to discussion on the commitment of management. You do not shift anything. That's what quality guys keep telling me. We do not shift anything for the sake of schedule, and that is the first rule. Priorities in production as to what's important and why we're doing what we're doing.

I guess if I were to answer the question how do we control factors in manufacture, I'd look at probably four building blocks, which I'll talk about. The identification of the technical requirements, that's the foundation. Certainly the establishment of the quality systems and procedures, that's the operation that verifies and puts the stamp on it and says yes, we've built this product, it's met our expectations, and it's monitored the fabrication of that product through the shop.

Independent oversight is an area more and more we're seeing where there's more requirements to have third party review. I think depending upon the performance of certain fabricators has forced this issue to come to the forefront, and we'll talk about that also in some of the additional requirements that are being passed down. And then finally develop training and culture. You don't quickly get into this business. You have to have a culture of people that really understand what the expectations are, and you have to train those people to understand that. And whether it's in the office with the engineering people or in the shop floor, that becomes a big investment because that's the investment of your future, and we'll touch on that also.

When we look at the technical requirements, we see that we begin with design documents and licensing, and those are the documents that are the basis for development of the fabrication specification. And the specifications, that's where we start as a fabricator.

We then take that, we apply to it based on the spec. those industry codes and standards that are required. I think things today are starting to move, that we're starting to get some standardization in some of the fabrication areas, particularly I'll talk about the ASME code in a minute. Equipment up to now has been built to the code, but it's been done by picking certain aspects of it, certain sections, maybe a section to requirement for welding, and a requirement for certain examination.

Fabrication planning and procedures, this goes back to communications. These are your documents that the people on the shop floor see. They have to be clear. They have to be understandable. And if they're not, it's a place for disaster.

So let me talk a little bit about the ASME code. The NRC about a year ago was very concerned that there was not the third party oversight within the fabrication shop, and they figured well, you know, let's invoke the ASME code. The ASME code has been around for a hundred years. it started a hundred years ago on a boiler explosion in Boston, and since that time, it's become the bible for pressure vessel design and fabrication.

Additionally, it's been something that provided the authorized nuclear inspector an independent third party, and the requirement that the fabricator provided a stamp on that. But we're in a little different case here, is that these particular casks are really not for high pressure applications. We're focusing on containment boundary, which is the key factor.

Additionally, the code really doesn't address all the other things. The code does not address neutron shielding, lead pouring. Those are not really part of the containment boundary. But nonetheless, by taking code and bringing it to a standard, we can now focus at least in this aspect on making sure that the containment boundary will be satisfactory.

There's a major rewrite going on. I have the privilege of being vice-chairman of Division 3, which is the new section of the code for this type of component, and I chair the WA section, which is on general requirements.

General requirement section will be adopted probably at our September meeting, which will deal with how the responsibilities are placed with regard to the owner, the fabricator, and the designer.

WB and WC, these are a new section on transportation containments. Notice we've gone to the word containment. WC did exist, but that's also being revised. These will be very comparable to NC-3200 design by analysis section for Section 2 components in Division 2.

Let me just say a couple remarks with WA. WA, which will be adopted this fall, will exist in the following form. The organization that has design responsibility will be required to have the certificate of authorization, i.e. the N-stamp. So whoever is doing the design will be responsible, whoever has design responsibility. So typically a designer will apply to the society, get their certificate.

It could be a utility who decides to take design responsibility on an existing design, but there's where the responsibility held.

As a fabricator who does the basic construction of the component, we will have an NPT stamp, and those that might do, in cases where you have a field closure that's not bolted, but welded, whoever does that will also have to have an NPT as a minimum. And that we'll start seeing next year in the new edition of the code.

WB/WC, I would expect to be available sometime next June, and they will clearly define what the design requirements are as far as normal operating and upset conditions.

The authorized nuclear inspector will play a key role now. And right now, I guess there's been a consolidation in that industry now between Kemper and Hartford. They will come in, and in the past when you're in this business and you were doing a job, brought the authorized inspector in and you agreed on several hole points during the fabrication process. These guys will be full-time in your shop right now, and that's where that's headed. So as far as impacting the cost of the fabrication, this will be major cost. And then of course the N-stamp, and the N-stamp will be you signing off and stamping the component saying you've met the requirements of the code.

As I mentioned earlier, quality systems and procedures, I always kind of viewed the quality system as it being the oversight internal watch dog of the company, having the program to whatever standard, NQA-1, 858, whatever, to be able to say this is how we're going to do business. This is how we're going to preclude situations that are going to be unfavorable, minimize our mistakes and how we're going to fully verify and document that we've built these components in strict accordance to the requirements.

Additionally, too, fabricators make mistakes, and there will be mistakes. The key factor of any good quality program is that those mistakes are found before that product ever gets too far down the line, or leaves the shop. And I think that's the key success factor. If your quality program picks that up, and we're going to talk a little about the culture later, about even the people that are not quality related.

Inspection, acceptance testing, we've got acceptance tests now that are much more involved than they were in the basic primary system components. Helium leak tests. Since we're dealing with components that really are pressure containing and you're more interested in containment, Helium leak tests, Helium, as we know can seep through anything, and that's probably a more effective test in the long run than actually doing a pressure test.

Pressure tests, from the standpoint of pressure vessels, you pressure the thing to one and a quarter or one and a half times the design pressure. That was to get everything to set and seep, get your mating surfaces together, get all the local deformations. You really don't need to do that with a shipping cask. What you're looking for there is that the welds will not leak, and you can do that with a Helium leak test better than you could ever do with a pressure test.

Documentation. When we ship one of those casks for TN, we have a documentation package which we call a history book, it's that thick, with every component with ship. That's required. That's required by the designer and the customer. That book has the total history from the material, CMTRs, all the way to the final testing and sign off. We try to do those things as we do the fabrication, and get them signed off. But that document gives you the ability to go back ten years from now to look back and find out how that component was made if there's a question.

In fact, the x-rays are there. You can go back and look at all the welds that you had to x-ray on the containment boundary to see if there was any changes.

Training and culture. I can't emphasize this enough. People getting into the business now who don't have a nuclear mentality or nuclear background many times can't appreciate this. Proper attitude of the workers, and I don't care if it's the guys in the shop or the engineering department. We have a thing in our business where no one does anything or turns anything over to an inspector until they are sure that that product is right, whether that's the machinist who can inspect that part on the machine before he turns it over to the inspector, or the welder. The welder knows if he put a good weld in. Now, there may be some little inclusions that will get picked up later on in RT, but he knows if that weld is good, and our welders will not turn over that part to an inspector if he thinks there's a problem with it. They'll bring it to the attention of the engineering organization to immediately address it. And that's just good business, too. The quicker you get on it and take care of the issue, the better you are.

Understand the customer's expectations. We do a workshop every year at our place. We invite material suppliers, customers, other fabricators in. And the first year we did the workshop, we wanted to understand what makes a successful project. And understanding a customer's expectations came out on the list every time. If you don't understand the customer's expectation, boy, what are you working to. That is a key factor.

Management commitment. Let me give you a couple of examples on that one. We have had four NRC audits in the last five years. Now, the NRC really doesn't come in and look and do detailed inspections. They come in and look at your program and everything else like that. They came to the president of the company and said, John, would your people ever sacrifice shipping a product over quality? John said absolutely not. And you could go talk to anybody out in the shop floor, and they went out to three people and they got the same answer. We would never ship anything for the sake of schedule over quality. And that's when you talk about culture, when people would say that.

Now, another case is also on our routings and shop followers, there's statements on our routings that say, "Falsification of any data is a criminal offense." Our people know that if they put anything wrong down, that is a criminal--that's criminal. They're lying. We do not tolerate it. If it ever happens, that person is out on the street, and it's not that--that kind of business does not exist in our company.

Everybody can't pick up everything. Let me give you an example of what we did on welding, for instance. 25 years ago, one of our customers, who will go unnamed, came to us and said, hey, how do you know that welder is qualified to make that weld? How do you know he used the right weld wire material? How do you know that that inspector who inspected that weld is qualified? We developed a barcode system 25 years ago, which that welder on his badge has a barcode. He goes in the computer on the shop floor, swipes it, and that tells him if he can go make a weld. He can't go get weld wire unless that passes through there. And the inspector cannot inspect if he's not qualified to be that kind of inspector.

So it's not all up to the people. You still have to put things in place which help people do their jobs. It is very conceivable that a guy who's qualified to do an overhead weld, he's one day past his qualification period. That could happen. That could happen in any shop. But this system will preclude those things from happening. It makes it idiot proof. So you have to help your people. It's the management commitment.

You develop the skills. You give the people, you teach them how to do it. We have a weld lab where they go, and they're not turned on the floor until they know how to make that particular weld. You've got to give them the resources, give them the right tools. You've got to give them good technology. But most important, you've got to have everybody thinking along those lines. Quality is extremely important, and if we do things wrong, we're going to put ourselves out of business, and that's the last thing we want to do.

The independent oversight. This is a real issue that's affecting everybody in this particular business. And let me just kind of touch on this. Internal quality control. That comes without saying we have internal quality control. We have regulators. We have the NRC who comes in, as I said, four times in five years to see what we're doing. Customer inspectors, these are the designers, the transnuclears, the hole techs, might be NAC, or someone like that, someone who's in the designer. They have full-time resident inspectors in our shop.

We have owner's inspectors. We've got Virginia Power. We've got Wisconsin Electric. We've got Northern States Power. We've got Philadelphia Electric. They're all in our shop. We had to open up a floor of our building for over 15 resident inspectors, providing them telephones, fax machines. We also have our government representatives there also. So it's very intrusive oversight of what we do. It's there.

The authorized nuclear inspectors, that's coming, but in fact SMUD decided they're going to do that ahead of time. We have two ASME code full-time authorized nuclear inspectors in our shop also, people watching over everything we do all the way down. We welcome this, though. We're not going to oppose it. Our shop is open. In fact, as I was mentioning, NRC came up two weeks ago and they're doing a video in our shop of the fabrication process. We want people to come in our shop. It's an open shop. We're not going to hide anything. They can go and talk to anybody on the shop floor, and we trust our people to have the right answers and know what they're doing. That's the kind of culture that you have that you can feel comfortable with an independent oversight.

The last point, the EPRI guidelines. That's relatively new. Here again, about a year ago, I think NRC realized in several discussions that the ASME code is not sufficient to deal with all the other areas. Had an opportunity to sit on the task force at the Nuclear Energy Institute working with EPRI to develop this document. This document will also be available in September. It will be provided as a guideline by EPRI for use in the industry. And what this does, it looks at everything from cradle to grave of everything from the licensing down to the final testing and acceptance of these components.

It looks at the planning, fabrication, examination, testing. Originally, NRC wanted us to find someone who had absolutely no special interest or conflict of interest of doing oversight. We had a meeting with the NRC in early June, in which we presented an approach, in which at the beginning of the job, the fabricator, the designer and owner will sit down and they will define this oversight program, and there will be a primary responsibility for a certain operation. That typically would be the fabricator.

And there's a secondary responsibility, and then there will be the third party who will check what the other two have done. And that program is now, as I said, would be available. It's something that some of the utilities are already starting to look at and do, and this will provide another vehicle for third party oversight. Without a doubt, it will be costly, but I think in the long run, it's going to be fairly efficient.

What we're forced to do also is in the front end on the fabrication, is do manufacture ability reviews, look at how we're building a product, and debugging things, so to speak, as you go through the process.

I guess there's three big challenges in this whole thing, is having a good technical design and a good package to which you're basing your fabrication on, having the right documentation, proper documentation that fully supports that yes, this product has been built to meet those requirements. And then the third part is having the right people, capable people, people that understand and are willing to be able to become fully involved and stakeholders in this whole operation.

Here again, I think if you look at the top success factors, here again, top of the list, making sure we understand the customer expectations. The definition of the critical characteristics. You know, much of the information that goes in the safety analysis report, which is approved by the NRC, has a lot of information in it. Some of that information is not necessarily critical to safety, but critical to having the component built right. In fact, sometimes it has too much information because it even dictates how a manufacturer is going to build it, which really shouldn't be in there. But with the EPRI document, we're going to sit down and define those critical characteristics.

It's not only dimensional information, that you get the right minimum thicknesses and that you have the right tolerance stack up, and that everything is going to fit together, it deals with do you have the right inspection criteria for knowing the hydrogen and carbon content of your resin. Do you have the right way that you're going to inspect and do the gamma scan of your lead? Does it have the right features associated with how those trunnions are going to be designed, or the right closure? So definition of the critical characteristics is boiling everything down to what's really important to safety and, by God, that's what we have to meet.

The manufacturability review of that design will be part of certainly the critical characteristics. I can't tell you how many times we'll get a design that you can't x-ray one of the joint welds because they didn't provide enough room on the, say, where the bottom plate comes into the shell. You have to provide the curvature so you can get a pin behind it and be able to do an x-ray. Those are things that are really important, and those are things that a knowledgeable fabricator who's in this business will understand how to do.

Material selection, I mentioned that. Boy, if something is not made with the right material or there's a question on it, that's a big loss to everybody.

And the critical or special processes, here again, you have capabilities to do the pours, whether it be resin, lead, can you do flame spring. We have flame spring requirements on some of the TN casks where we do a zinc oxide spray, so when you put it in a fuel pool, you don't get interaction with the fuel pool water.

Electrolysis, electro process on the baskets. I mean, we know what happened at the Trojan plant. Do you have those capabilities? Are they accessible to you?

Documentation review, here again, I can't emphasize that enough. You have a lot of people looking at it. You want to make sure that you've got a package that works. And then the people experience.

So, in summary, and I went through this for myself, do you have the people and the culture who can meet the requirements of the designer, the customer and the public?

Everyone's got to feel good about the product that goes out the door, and you as the fabricator have to be efficient, otherwise you're not going to be in business very long either. So there's a benefit to everybody to making sure that everybody is working together on this particular type. This not like buying pumps and valves. I mean, this is a highly engineered product, very much different than what we've dealt with in the past in the nuclear industry.

So that's what I have. Any questions?

ARENDT: Thank you very much. We're running a little bit over. We just have time for one or two questions. Go ahead, Paul.

CRAIG: Paul Craig. I've got ask a question which you may elect not to answer, which will be fine. But as you know, our Board is charged to look at Yucca Mountain specifically, and Yucca Mountain is a program which has a number of deadlines, some of which are mandated by Congress, but some of which are internally established by the Department of Energy. And you said several times, one, we do not ship anything for the sake of schedule. And, secondly, you talked about having a clear understanding of customer expectations.

Now, one of the things that the Department of Energy does is it operates in this area in a totally schedule driven way, which if I take that idea and I overlay it against what you're saying, combined with some confusion on customer expectations, it seems to me we have a prescription for major problems. This is the main lesson I'm taking away from your presentation as I try to take your ideas and apply them to our situation. So I'm asking you to comment, but if you choose not to, I will understand.

SOLOVEY: I'll always give a comment. We, of course, as fabricators always consider ourselves at the bottom of the food chain. Okay? When everything gets done, then they say okay, this is the time you've got to make it. Can you make it? Many of the schedules are very ambitious, but they are doable, but it takes--you just can't--years ago you used to be able, and that's the way engineering and manufacturing companies work, you take and you design something, you throw them over the fence and give it to somebody else to deal with it. You can't do it on these projects. That's a very important aspect. It's important to get the fabricator involved way up front so you don't run into design or a fabrication problem before it gets to them. Can you get the material suppliers? Can you buy this material? Is it readily available? Can you buy it in this kind of form? How much is it going to cost? I mean, those kinds of basic questions.

But to answer your question, you know, we run into a lot of deadlines. Utilities need equipment. They have to do their refueling operation. You try to communicate the best you can and say if you need it by this date, this is when we've got to start. But here again, you know, you just can't--sometimes you just can't work back from the end date and say this is when we're going to start. You've got to do all the things up front in the planning phase, and this is what we're hoping to happen with this EPRI document, too, is give people a little bit more visibility on what they need to do and when they need to do it. But it's a challenge, and it will be there.

ARENDT: Dan?

BULLEN: Bullen, Board. Maybe to repeat myself from this morning, we heard that for the shipping casks, for example in the shipping campaign, it may be necessary to ship waste to Yucca Mountain by 2010, and that the budget shortfalls that may become a problem associated with the DOE's efforts, there's still plenty of time to build the transport casks necessary to do that. And I guess a couple of things that you mentioned in your presentation with respect to essentially the loss of the ability to do large forgings and having to have 18 to 24 months of lead time for some of the forgings of casks that you want to fabricate, is it, from a fabrication point of view, do you think there's going to be a problem in meeting a deadline if we wait too long to place the order to be able to ship in 2010?

SOLOVEY: No, I think the whole point of starting early enough, the first one is usually the challenge. Once you get on a roll and you learn how to build it, then you get that time down. I mean, there's strategies that you can do. You can go ahead and buy material if you know the design ahead of time. One of the things I--you know, I try to go to the utilities and say, hey, you know, if you know you're going to buy this kind of design, let's go to the material supplier now, get into their mill run, or when they're going to do their melt, and let's get that material reserved now so that we can shorten up that six month delivery span on the large forgings.

There are things that could be done ahead of time. Now, it's an investment, but I think the material suppliers, knowing how hungry the market is right now, will be more than happy to commit to you, say okay, I'm going to commit from these months to these months, that I'm going to make a melt and I'm going to have these forgings available to you at a certain time.

So it's not a matter--I think that's why we start up front and we all work together to get to a point where we can do those things that are not going to make this thing a critical path item.

ARENDT: Richard, one last question here.

PARIZEK: This is kind of an eye opener for me to sort of see this process, and I've seen some German examples, and it's spectacular because they're kind of prototypes and they're beautiful things you're building. It's like the Rolls Royce, and the workers can look at it and see how wonderful it is. I think 10,000 waste packages later, there must be a certain element of fatigue that would creep into this process, you know, if someone is doing this for year after year after year. And how is the industry going to deal with this, the repetition of doing this again and again and again, to keep everybody's interest up? Again, you're going to stick it underground, it's not like it's something you can look at and admire and show your family, in a sense.

SOLOVEY: The canisters are going to be a little different than the cask. They're going to be plate, rolled plate, formed heads. It's not going to be long lead forgings typically. There may be some small forgings you might need. But a lot of manufacturers would love to have that kind of backload of work to be able to get into production. What you will gain from that is you'll get better repeatability in quality because you have an operation that is repeatable. You can do certain things. There will be automated processes, such as the welding. You can train people, do crewing, where you have people that are used to the same process along.

Right now, it's kind of sporadic in this industry, where sometimes you don't have people that have been familiar with this. So it will help and it will help also to develop a supplier base, not just one supplier, but maybe six, you know, maybe four, whoever you feel who has the capacity. But I think in a sense, it will help it from a standpoint of quality. Like you say, you just can't drop your guard on it. There will still be requirements for document packages, data packages, and that component will not leave the shop until the customer has signed off and say, hey, you met the expectations.

You know, maybe somebody will get burnt out, but I don't know, that's a good chunk of business and it makes a lot of sense for a manufacturer to be able to respond to that.

ARENDT: Okay, thank you very much.

Our next speaker is Bob Fronczak. Bob is going to talk on the railroad performance specification for transportation of spent fuel. Bob is assistant vice-president of environment and hazardous materials for the AAR, Association of American Railroads, Washington, D.C.

FRONCZAK: Thanks, John. This is my second time addressing the Board. I addressed the Board a couple years ago on I guess the last transportation workshop you held.

A little background on myself. I think I'm the babe in the woods here. I've only been involved in the rail industry for about 22 years. I worked for the Milwaukee Road Railroad out of Chicago for seven. I was in sales to the industry, consulting to the industry, and now with AAR for the last six years.

Chuck and I apologize that you don't have copies of our overheads. We had e-mailed them to the Board last week with the understanding that they would be reprinted. But apparently that didn't happen. I think somebody might be making copies as we're done with the presentations, and they may be available before the end.

What I'm here to talk about today, and I think Chuck set it up nicely, is our goal for the transportation of spent nuclear fuel. The last time I talked to you, I talked about dedicated trains and where we stand as an industry, and the need for dedicated trains. I think I talked a little bit about our goal, which this is the goal of the chief operating officers of the railroads, which is a dedicated cask car train system that ensures cask integrity in the rail operating environment, and is able to be transported at time table speeds without restrictions on meets and passes.

One of the questions that we've been asked is, well, how do you get from where we are today to there? And the way we get there is the performance standard for spent nuclear fuel trains, which is what I'm going to talk about.

I thought I'd make a few comments about the modal studies. I think NRC is in the process of redoing that. I thought I'd say just a few things about our concerns, or some of the critiques we've had on the modal study, too.

The performance standard has been in the works for the last couple years now. the first draft was December of 1998. There's two groups that are working on this. They're industry committees. One is the Nuclear Waste Transportation Task Force, which I am the AAR liaison for. The other is Equipment Engineering Committee. It was approved this year by the Equipment Engineering Committee. The Equipment Engineering Committee is the committee responsible for all new railcar standards. It was approved at their March meeting. The standard is a little bit different than Chapter 11. Chapter 11 is our current standard for--all new rail cars have to meet Chapter 11, and it's a whole bunch of tests, which I'll get into.

But this not only applies to just the car, but it also applies to all cars in the train, requires modeling before construction, full-scale dynamic testing of each car and the train, and a circular letter, which is the way we get information out to the public in the rail industry, was issued in May of this year, and comments were due June 26th. I think we've received two comments at this time, and it's due to become effective September 1st of this year.

What I'd like to do now is get into some of the design requirements, keeping in mind that most of these design requirements are current requirements in Chapter 11, our current manual of standards and recommended practices.

There's a standard AAR freight load. These include things like dead load, live loads, vertical load uncoupler, jacking load, et cetera. There's a load case for passenger cars. This would apply to the personnel car or cars carrying people in the train. There's a crash worthiness requirement that applies to all cars in the train, and that is based on the crash worthiness requirements that hazardous materials cars as well as passenger carrying cars currently have to meet.

There's a fatigue design load requirement. What we do is we have a spectrum of loads that is published in our manual of standard and recommended practices, and all cars have to meet that fatigue design requirement. There's also weld analysis through finite element analysis. It meets with American Welding Society standards, and full penetration radiographic welds are required--I'm sorry--radiography is required on all full penetration welds.

Continuing, there's a non-structural static analysis, which includes truck twist equalization and car body equalization. That is conducted to estimate truck and car performance under statically applied track twist conditions. In addition, a curve stability analysis is performed to calculate real loading for adverse curving scenarios. There's a truck warped restraint requirement. That is to document the ability of the truck to withstand longitudinal and lateral forces that might cause truck warp resulting in high angles of attack, which can cause a derailment. In addition, there's a static curve stability requirement and curve negotiation requirement.

Dynamic analysis includes perturbed track performance. This provides an evaluation under less than ideal conditions. What we do is check for purvations at 39 feet and also at the wheel spacing of the car. 39 feet is the old rail joint, and what it does is checks under worst case situations for things like twist and roll, pitch and bounce, sway and dynamic curving.

In addition, we've got perturbed special cases. We've got a single bump requirement. That simulates something like going over a grade crossing where you'll have a little bit stiffer track, an individual bump, and also a curving with single rail perturbation.

Continuing on the dynamic analysis, you get into unperturbed track performance. And what this does is it looks at the performance of the train under normal operating conditions, over the road operating conditions, and that includes hunting, constant curving, curving with various lubrication conditions, limiting spiral negotiation, turnouts and cross-overs, how does it deal with turnouts and cross-overs. If you're not familiar, the rail industry does use track lubrication for curving, and on tangent or straight parallel track for energy efficiency, reduced wheel and rail wear.

It looks at ride quality. We want to make sure that the people that are in the personnel car aren't subjected to abnormal forces, and also looks at drafts. That would be run in and run out forces in curving applications.

Finally, on the dynamic analysis, there's a braking effects on steering and worn component simulations. We want to find out what that car will do ultimately long-term as the components start to wear out.

In the brake system design, this is different than our current Chapter 11, in that it uses, like Ray talked about, our new technology, which is electronically controlled pneumatic brakes, an ECP brake will apply the brake at the speed of light instead of at the speed of an air signal going through the train, which is the way brakes are applied today. It also has the advantage of being able to provide a communication system throughout the train. The specification calls for either radio controlled or cable controlled brakes. So there's two different ways you can have electronic brakes, but that provides the communication system for some of the defect monitoring, which is what I'm going to talk about in a few minutes.

The brake system also looks at brake ratios and shoe force variations. This prevents the brakes from overheating the wheels, which can cause a wheel failure, which leads to derailment, and also looks at jerk rates, which is just how fast the train accelerates and decelerates.

Now, this is also a new requirement over and above Chapter 11, our current Chapter 11. What we propose in the new specification is a system safety monitoring, so that all cars in the train would be monitored for location, speed, truck hunting, rocking, wheel flats, in other words, there would an excel rounder, which would determine whether or not the wheel is flat and hitting the rail too hard. Bearing condition, that will be a straight temperature reading. That's one of the causes of mechanical failure in derailments, is overheated wheel bearings.

Braking performance, you know, what is the performance and the status of the electronic brakes. Ride quality, vertical, lateral and longitudinal acceleration, in other words, did you hit a bump or something, in train forces laterally that could cause a problem, and then finally, ride quality, and then braking performance, which I mentioned before.

Now, what does this look like? This is our concept of what a dedicated train will look like. We've got two locomotives, primarily just for redundancy, just in case one of the locomotives were to break down, you've got redundancy. It's not needed necessarily for power. Followed by a buffer car. A buffer car, and I talked about this in the past, needs to be of consistent weight with the cask cars and locomotives. You don't want a real light car for a buffer car, also connect as an energy absorber if there were a derailment. And then a series of cask cars, and the cask cars would have enhanced performance trucks, and all of them would be equipped with defect detection. And then finally, a security car which would be able to communicate with the locomotive, as well as back to a home base.

One of the questions that we are asked on occasion is does this technology current exist? This is a picture out of our--at our transportation technology center of one of the enhanced performance trucks. There's several other enhanced performance trucks. These are being tested right now in our heavy axle load loop, and we're looking at 286,000 pound loads, 350,000 pound rail loads in just heavy axle service currently. So this technology does exist.

And one of the things that took two years from the current--from the draft of the specification to the finalization of the specification, is the Equipment Engineering Committee was quite concerned about the ability of existing technology to meet the specification. And the performance requirements in the specification, all the things that I talked about, are tighter in this specification than they are in Chapter 11. The concern was can current technology meet it. We went and we did some modeling on our own, and we determined, were quite confident that current technology can meet the specifications.

Now, as far as the approval process, the AAR Equipment Engineering Committee, which approves all new equipment for the rail industry, is the governing body. There is a preliminary design review required after you design the equipment. After that, you have submittal of full-scale test report. So once you have an approved design, the builder would build the equipment, send it to some place for testing, and then a design report would be--I mean, a full-scale test report would be submitted to the Equipment Engineering Committee.

Once that goes through the committee for approval, it would be approved for a conditional run, and after it runs for so many thousand miles, then it would be full scale approval, that's after 100,000 miles of operation.

Now, I thought I'd mention right now the fuel storage people are currently designing their system to meet this standard, and they're in the design phase. They haven't submitted anything to Equipment Engineering yet, but that's where they're at.

Now, on the modal study, we've taken a keen interest in the modal study. Primarily, I think what we'd like to do is relate the forces that the casks are subjected to in the regulatory testing to forces in derailments, and that's one of the key areas we felt needed addressing in the modal study. Another one was can the impact limiters stay on in a derailment. There's a lot of glancing blows in derailments and we're quite concerned that the impact limiters would come off, and the casks would be subjected to full loads without the benefit of the impact limiters.

Crush loads are something that the large casks don't have to meet at the current time, and yet they're a very real possibility in rail derailments. I'm sure you heard about the Eunice, Louisiana derailment that happened over the Memorial Day weekend. It took several days just to identify all the cars that were involved in the derailment.

We also felt that the study needed updating, and I think Robert talked about that a little bit, for credible rail accidents. There's been some pretty severe accidents since the study was written.

Robert also talked about the modeling techniques that were used, and it sounds like they're going to look at that and update that. Wayside conditions was another area. Highways are built generally to follow topography, so there's not as many cuts and fills. Railroads are limited in the grade that they have to operate on, and because of that, there's a lot more cuts and fills. So we felt that the wayside conditions are different, and they used highway conditions in the modal study.

And we filed comments, and our comments were I think somewhat on the order of 100 pages, to NRC, and I'm assuming they used that as part of their scoping process for updating the study.

So in summary, I guess we're looking to a dedicated cask system for the transportation of spent nuclear fuel, and we feel that the performance standard is the way to go to get there.

So I'll open it up for questions.

ARENDT: Questions, anyone? Dan?

BULLEN: Bullen, Board. You talked about the performance standard and essentially the need for dynamic testing. But that was essentially dynamic testing of normal wear conditions. Could you speak a little bit about off-normal conditions, where you'd expect sort of beyond dynamic testing characteristics, and what would you expect to see for sort of performance confirmation tests associated with that?

FRONCZAK: Well, I think the perturbations testing is abnormal testing. In other words, that wouldn't be track you would normally find in mainline track in the United States. But it's those perturbations that can exist in yards and terminals where those cars can be switched, and that does address the abnormal testing.

BULLEN: And then a quick follow-on to that one. Then if you fulfill all these testing requirements, then do you foresee that the dedicated trains should have the ability to meet the speed requirements that won't bottleneck the system that we've heard about earlier?

FRONCZAK: Yeah, that's correct. Our goal is timetable speed. So whatever the posted speed for the track is, that's what we'd like to see. And we feel the performance standard is the way to get there.

BULLEN: Thank you.

ARENDT: Carl?

DI BELLA: Carl Di Bella, Staff. Could you give us an idea, Bob, of the heaviest cars that are moving around at timetable speeds today, and how those compare with the weight of future railcars carrying synthetic fuel casks?

FRONCZAK: Chuck, do you want to address that? I mean, I know we're running 286 at timetable speeds. Much more than that, it's the locomotives that are--

DI BELLA: Is that 286,000 pounds, or 286 tons?

DETTMANN: 286,000 pounds is what is normal. We're running 315,000 pound cars on four axles out there in very specific origin and destination conditions. But then our locomotives are 480,000 pounds out there. So, I mean, weight and speed are the issue for testing of the unit together, but weight of itself, I mean, when you look at the old steam engines, there were steam engines out there of a million pounds. And that's why the bridging today in this industry is frankly not an issue for the weights that we are moving up towards.

ARENDT: Bob?

LUNA: Yeah, one of the items on your list of specifications was crash worthiness. What does that mean, really?

FRONCZAK: There is a crash worthiness requirement for all personnel cars, or passenger cars, for that matter, that we have at AAR that all of our passenger cars meet. And the passenger car will have to meet that crash worthiness requirement.

LUNA: But it doesn't apply to the freight cars themselves, or to the cask cars themselves?

FRONCZAK: That's right.

LUNA: Okay. So it's only the personnel cars?

FRONCZAK: Right.

ARENDT: Any other questions?

(No response.)

ARENDT: Well, seeing there's no more, we'll have a ten minute break, or a fifteen minute break. Let's get back at 3 o'clock.

(Whereupon, a break was taken.)

ARENDT: Our next speaker is Jim Reed with the National Conference of State Legislatures. He's going to present views of states that may be affected by spent fuel transportation. Jim is the program director for Transportation, the National Conference of State Legislatures in Denver, also known as NCSL, the National Association of all Southern State Legislatures. NCSL has been involved in spent fuel transportation for 16 years. Mr. Reed has worked for NCSL for 12 years, providing information to state legislatures on a variety of transportation issues.

Prior to that, he worked for the State of Texas and for former U.S. Senator Lloyd Benson. he has a BA in political science from the Colorado College and a master of public affairs from the LBJ School of Public Affairs at the University of Texas. Jim?

REED: Thank you, Mr. Chairman.

I'm going to do it a little different. I don't have any overheads. I've got a written statement that I think you should all have, and I'm going to go through that. I won't be reading it verbatim, but pretty close.

I do appreciate the invitation to speak today. NCSL has not appeared before the NWTRB before, and we sure appreciate the opportunity.

A little more background on NCSL, besides being as the National Association for all the state legislatures, we provide information to the 50 states. We have a staff of experts in virtually every policy area from abortion to taxes in Denver, and we're a clearing house for state legislatures, legislative staff and others.

In addition to that, we have meetings every year, many meetings a year where state legislatures from across the country get together and share ideas between themselves, and also hear from policy experts and others that are interested in state legislative processes.

Finally, we do also provide input to Congress through our Washington, D.C. office. We agree to state positions every year at our annual meeting, which is coming up next week, and those positions then become the basis for lobbying in front of Congress, and we also provide information to federal agencies.

As your Chairman mentioned, we've looked at this issue of spent fuel transportation for 16 years. Through NCSL legislatures and legislative staff, have had input into the DOE program through a cooperative agreement that we have funded by DOE, and it supports a variety of activities, including a quarterly newsletter that informs state legislatures and others of what's going on, NCSL attendance at a variety of DOE and other related meetings, and as well, a legislature task force, which we've had active in one form or another since 1984.

The information that we provide then allows the state legislatures to enact legislation in areas where they feel affected by spent fuel transportation.

I have distributed a report, and I ran out, so if you didn't get a copy, please give me your card, but it's called The State Role in Spent Fuel Transportation Safety, Year 2000 Update, and I'd be happy to provide that if you didn't get it. It goes into quite a bit more depth about what the states are doing in this area.

Today, I want to focus in four areas; modal selection, routing, emergency response, and uniform state permitting. But first let me mention that we have had an interaction with the NWTRB. We had Dr. Melvin Carter appear at our meeting, one of our early task force meetings back in 1990, and he recommended that DOE look into human factors at that time to apply what is known about human limitations to the design and operation of transportation systems to ensure optimal safety. But that's still a very relevant suggestion today, and in bold in my statement here, I've got six or seven recommendations, or suggestions, I guess. They're not formal recommendations, but suggestions for the NWTRB to look at.

The first one is that we urge NWTRB that DOE go ahead and look at human factor studies, look at all the state of the art, and try and incorporate relevant findings into their plans and activities as they initiate a transportation system for spent fuel. Because as the US DOT statistics show, 65 per cent of all transportation accidents can be attributed to human error.

moving to modal selection, our legislature task force in the early Nineties focused on spent fuel transportation issues, and a significant effort of this group was a modal selection study. I think it's still relevant today, even though it's almost ten years old. It's distributed to the Board members. It's this study. I didn't have copies for everybody. If you're really interested after hearing what I have to say, I'll be happy to provide you a copy of it.

Basically, this study, after going through the materials available to us at the time, suggested that rail would be the preferred mode for spent fuel transport over truck and barge, because of several things. One, the lower probability of an accident and radiation exposure in transit. Higher capacity for shipments. The availability of dedicated trains, which were perceived as safer. And lower overall cost. The preference, however, was tempered by concern that the states lack a strong regulatory role in rail safety, that no rail routing provisions exist currently, and still don't, and that some rail accident response could be hampered because of the inaccessibility to roads.

By contrast, states have a much more prominent role in terms of regulatory capability in ensuring highway safety, and also have routing authority for highway shipments. But the task force at that time was concerned that higher risk was associated with truck shipments in terms of higher accident probability, greater radiation exposure, and greater public fear of highway transport.

Well, since that study, there's some additional concerns that have arisen due to the ongoing consolidation of the railroad industry. There was passing reference earlier today about the Union Pacific/Southern Pacific merger, and in fact it caused a severe service meltdown, as it's been called by some in the Houston area, and this spread through the entire system of 36,000 miles. The resulting chaos cost the national economy $4 billion, and the Surface Transportation Board took the unprecedented step of allowing another railroad to operate on UP's tracks in the Houston Gulf Coast area.

Other mergers have occurred since that time as well, and there's a pending proposed merger between Burlington Northern, Santa Fe and Canadian National that had enough concern expressed that the STB a few months ago imposed a 15 month moratorium on mergers so they could kind of get their act together and decide what they're going to do in the future.

Some have said that over time, there's only going to be two railroads left in the country the way things are going. And this does raise some safety concerns. Spent fuel shipments could potentially be caught in a volatile shipping situation, such as was seen in the Houston area. Congested rail lines could leave spent fuel casks stationary for periods of time that could expose workers and the general public to potentially unsafe doses of radiation. So NCLS recommends that the NWTRB ask DOE to study the impact of rail mergers on the safety of future spent fuel transportation.

Moving to routing, there's been a longtime concern that current regulations require the carrier to select routes rather than the shipper, in this case of commercial spent fuel, it would be DOE. The states believe that DOE should play a central role by narrowing the number of acceptable routes. Then the states can concentrate their scarce training resources along those routes for emergency response and enforcement.

The Waste Isolation Pilot Program provides a positive model for the states. In selecting the WIPP routes, a preliminary set of routes was proposed to the states, and then it was modified based on states suggestion and also based on formal alternative route designations.

The routes that DOE selected, in consultation with the carrier, states, tribes and others, were included as mandatory provisions in carrier contracts.

With respect to mode and route issues, NCSL has asked DOE to conduct route and mode specific analysis of transportation impacts to exhaustively evaluate the risks associated with spent fuel and high level waste transportation, and many others have made the same request.

The draft environmental impact statement for Yucca Mountain does not contain this analysis and, therefore, we feel it's significant flawed. NCSL continues to believe that specific routes and modes entail different risks. Thus, the generalized analysis contained in the DEIS is not adequate for determining risk and making informed judgments, as required under the NEPA. Therefore, NCSL requests that NWTRB press DOE to analyze specific routes and mode combinations to states the opportunity to begin specific preparations to address safe routine transportation and emergency response to spent fuel shipments.

The third area I want to address is emergency response. This is a very key concern of state legislatures. We've seen the substantial variation that exists among the states as to the adequacy of emergency response capability for radiological transportation accidents.

There was a study done in 1990 by Indiana University that was sponsored by NRC, and this is the most recent comprehensive survey that I'm aware of of state capabilities. It divided the states into four categories, and I want to briefly summarize those results because I think that the Board might find them significant.

I do have the reference for this study for the Board if you're interested in following up with that. I didn't have an extra copy to bring. It's a lengthy report.

Basically, one-third of the states, which would be about 17 states, reported that their program is basically adequate and they have no pressing needs. They would like additional resources, including upgraded field communications equipment, state of the art laboratory and field equipment, protective clothing, respiratory devices, and dedicated vehicles.

Another group representing a fourth of the states, or about 12 to 13, indicated that their program was more or less adequate, but reported that they needed additional resources, such as upgraded equipment, more training for radiation technicians, and first responders, support to conduct field exercises, and planning support as well.

One-fifth of the states, which would be ten, reported the existence of a deficient transportation emergency response program in the opinion of their radiological health personnel. These states need substantial resources to attain an adequate program, including basic laboratory and field equipment, planning support, needs assessment and training.

Finally, the remaining states, which is ten, declined to offer an opinion due to internal state disagreement or other reasons.

At least one state in that survey said that they rely on the Federal Nuclear Research Facility within its borders for emergency response to radiological emergencies.

Increases in the number of spent fuel shipments therefore will be viewed differently by state officials, depending on the sophistication of a particular state's emergency response system, and other factors.

Presumably, there's been some improvement in ten years, but I'm aware of no new data to support such a claim on a nationwide basis. To its credit, DOE has worked closely with the states in attempting to increase state capabilities, but funding has been scarce.

So, NWTRB can assist the states by encouraging DOE to generously and fairly fund programs, such as Section 180(c) of the Nuclear Waste Policy Act, that are designed to help states in dealing with spent fuel shipments that pass through their jurisdictions.

The Board can also help by asking NRC to update this 1990 study on state and tribal emergency response to radiological transportation incidents, to help develop a better baseline for objectively determining emergency response needs.

The final area I want to address is more in the way of information for the Board. It's the Uniform Hazardous Materials Transportation Program. Several states have agreed on a better way of regulating Hazmat transportation, which includes spent fuel, that works more efficiently while still protecting public health and safety. This effort standardizes the forms and procedures for hazardous materials, including radioactive, on the permitting and registration and motor carriers.

Pursuant to 49 USC 5119, the Alliance for Uniform HazMat Transportation Procedures has recommended a base state system where motor carriers receive credentials in their home state that are valid in all the participating jurisdictions. The credential is issued after a stringent safety analysis to determine that the carrier is fit to operate safely.

States using the uniform program have found that it improves safety through better regulatory compliance on the part of motor carriers. Motor carriers must certify as part of the process that they are aware of and will comply with all applicable federal and state regulatory requirements.

Well, Congress created this Alliance as part of the Hazardous Materials Transportation Uniform Safety Act of 1990. Back then, there was a lot of pressure from industry, the trucking industry primarily. There were 80-some programs in existence that regulated in this manner, and at one point, Congress was thinking of preempting all these programs, but the compromise was to put this group together to study the process and come up with uniform forms and procedures. It consisted of 28 state and local officials that had these kinds of programs, and 27 different jurisdictions.

Their charge was to establish uniform forms and procedures for states that do register and permit carriers that transport, cause to be transported, or ship hazardous materials by motor carrier. The initial recommendations were conveyed to the Secretary of Transportation back in 1993, and pilot programs were subsequently set up in Minnesota, Nevada, Ohio and West Virginia. In 1994 and 1995, they tested the recommendations.

In the meantime, Illinois, Michigan and Oklahoma joined the program. A final report was issued in '96 basically asking Congress to create a compact-like process to encourage new states to adopt the new uniform program.

Registration and permit programs that are inconsistent with the uniform program after a certain date would be preempted.

When fully implemented, the end result would be a consistent national safety permit and registration process run by states to ease motor carrier compliance with state programs, and also it would decrease the administrative workload in individual states because it would spread the regulatory burden across all states. In other words, all states--each state wouldn't be doing all the carriers that come through their state. It would be shared with those states where that carrier was based in another state.

The implementation ultimately does depend in part on the new Federal Motor Carrier Safety Administration. The way the law reads, if 26 states adopt this on their own, it would become federal law. However, before that time, the Federal Motor Carrier Safety Administration would have authority to implement this program before that number was reached.

In conclusion, state legislatures are continually vigilant, if not sometimes weary, in monitoring the progress of DOE in the civilian waste program, and in following what the impact may be on state and local transportation systems.

Unfortunately, DOE has curtailed its funding of spent fuel transportation planning and education work needed to implement a spent fuel shipping campaign of the magnitude planned for a potential Yucca Mountain repository. NWTRB could help the states as well as national and regional groups, of which states are members, by urging DOE to restore adequate funding for the cooperative agreements like the one that has allowed NCSL to inform and educate state policymakers of DOE's plans for spent fuel and high-level waste transport and disposal.

I thank you for the chance to speak today, and I'd be happy to address any questions.

ARENDT: Thank you very much. Any Panel members, any questions for Jim? Yes, Dan?

BULLEN: Bullen, Board. I was actually very intrigued by the results of the 1990 study that the University of Indiana did with respect to the number of states that thought they were adequately prepared for the emergency response necessary, and your comment was you didn't think that that may have changed much since then.

In light of that draft environmental impact statement and the routes that were proposed coming out, do you think that that should be a focus for the funding that you would request that we urge DOE to provide to the states?

REED: To do the study?

BULLEN: Well, to complete the study and to maybe improve the emergency response capabilities of those states and localities?

REED: In terms of improving the capabilities, absolutely. The study, it would be nice to have, but I guess I wouldn't want the money to go for a study. The NRC did the study, so I'm thinking the NRC can do that. DOE is really more on the implementing side that would provide the funds.

So I guess in my mind I was separating it that way. But in terms of scarce dollars, I think that the main thing is to get dollars into the hands of the state and local jurisdictions that need the funding for emergency response.

I don't know, was that responsive?

BULLEN: That actually answered the question. The concern that I have, I mean, with the limited resources available, I was hoping that we would be able to direct where it would go. For example, if it looks like a majority of them are going to follow down the I-40 corridor or the I-70 corridor or the I-80 corridor, you should probably emphasize that, or specific UP rail corridors, that those kinds of things would be a focus as opposed to saying well, you know, we want to make sure that everybody who wants to have a piece of this pie can say okay, you know, we have a county that's maybe within 200 miles of the rail line, we want to make sure we have emergency responders that can respond in case there's an accident. So focusing it based on essentially the efforts associated with DOE and trying to identify where the need would be greatest, I guess is the question that I asked.

REED: Absolutely. And that's why we want DOE to give a better indication of routes and modes, and so those kinds of--the money can then be more funnelled to those areas.

BULLEN: As a follow-on to that one, what kind of lead time do they need to complete this training? I know that, for example, my state has a pretty good emergency response, and it's based at the University systems at University of Iowa and Iowa States, but how long does it take to bring everybody up to compliance and to give them the equipment and to do those kinds of things? Is it something you could do in a crash program in a year? Or would you have to do it over a five year period or a ten year period?

REED: The number that's out there is three to five years. That's the number that the states typically throw out, three to five years.

ARENDT: Any other questions? Yes, identify yourself.

SWEENEY: My name is Tim Sweeney with SAIC. The WIPP experience shows that on the average, every 18 months, you have approximately 100 per cent turnover of first responders. So starting five years in advance doesn't really gain you much because you have to do it all anyways. So if you're worried about utilizing dollars properly, that might not be the best way to go.

And, too, I'm a little concerned about a study where you basically send out a letter to a state saying how do you feel about your capability, because again the political answer is well, we can't say we're doing a bad job, but we still want to keep our hand out for more money. So in terms of using that as a decision making tool, I'd be a little resistant to that.

REEDL: Yeah, I don't think the intent would be to use it as a decision making tool as much as to provide information in a general sense on where some of the deficiencies are. I'm not sure in terms of the methodology, it was done by Indiana University, so, you know, I don't know how they--any time you do a survey, you're going to have some of the issues you raised.

As far as--what was your first question again? I'm sorry.

SWEENEY: Just about the timeline prior to--

REED: Oh, yeah. I think we're not just talking about training emergency responders. We're talking about the whole system of a state getting ready for these kinds of shipments. And certainly that's a key part, is training responders, but just the whole apparatus of state government planning and some of the things that need to be done. I mean, we've talked a lot at the TEC meetings about the turnover of emergency responders, and that's a constant process of refreshing. So I don't think the suggestion is you train all the responders five years ahead of time and they'll still be there. Some will be. But there's all these other activities that are involved as well.

ARENDT: Okay, any other questions?

(No response.)

ARENDT: Okay, thank you very much. Our next speaker is

Bob Halstead. Bob is with the consultant to the State of Nevada, Nevada Agency for Nuclear Projects, and his topic is the Nevada issues related to transportation of spent fuel.

HALSTEAD: Thank you for the opportunity to be here today. We've been quite busy since the last time someone from Nevada addressed the board on transportation, and a lot of what we've been busy with since last August is reviewing the draft environmental impact statement that the Department of Energy issued last August.

Additionally, we've been working on a couple of other issues with the Nuclear Regulatory Commission. One is a petition for rulemaking for enhanced safeguards regulations, counter-terrorism and sabotage, and also we've been actively involved in the modal study update process, and I'll talk about those two things in a few minutes. But mostly I'm going to talk about the Department of Energy's environmental impact statement and the review that we've been doing for the last nine months.

In fact, it seems like I haven't done anything else since last August but think about this draft EIS and the 50 boxes of references that came to the office, and for those who like to carry it around neatly like Rob does, you can carry all the references around on only 22 CD ROMs. So it's a pretty challenging review, plus we've generated our own technical documentation.

We gave statements at all of the hearings around the country on transportation issues. We filed written comments at the end of February, 220 pages of our comments related to transportation, which means we wrote almost as many pages about transportation as DOE did, and all of our material is available on the web at our websites. I've given you the address there.

Now, before I get into Nevada's critique of the draft EIS, I had hoped that someone from DOE would save me from having to spend a few minutes by describing what the transportation aspects of the draft EIS are. But for those of you who aren't familiar with it, the transportation system that DOE is proposing in the draft EIS is broken into two parts, a proposed action and an extended action.

The proposed action involves disposal of the 70,000 metric tons uranium of waste that is actually specified as going to the repository in the Nuclear Waste Policy Amendments Act. As most of you know, 10 per cent of that is reserved for defense high-level waste. DOE then developed two modal scenarios for that proposed action, mostly truck, in which there would be 49,500 truck shipments and 300 rail shipments of Naval fuel from Idaho. So that's a little more than 20,000 truck shipments a year each and every year for 24 years.

They also developed a mostly rail scenario in which all but nine reactors are shipped by rail. There would be a total of 10,800 rail shipments, 2,600 truck shipments, and that works out to an average of about 560 shipments a year every year for 24 years.

Now, as most of you know, that 70,000 metric tons doesn't actually cover all the projected waste that requires geologic disposal. So DOE added an extended action. It's very confusing. If you read the document, there is an action to address inventory Module 1 and Module 2. It's kind of typical Washington speak, but what it means is 105,000 metric tons of civilian spent fuel, plus about 15,000 metric tons equivalent of DOE spent fuel and high-level waste gets shipped to the repository over 38 or 39 years. There are different year markers at different parts in the draft EIS, and I got called on the carpet the other day, where did you get this 39 years? DOE says 38 years. But over 39, 38 years, we'll say one year isn't much.

But that actually results in a higher average number of shipments for the truck scenario, 96,000 truck shipments, or an average of 2,400 a year for 38 or 39 years. And under the mostly rail, you have 19,800 shipments by rail, and 3,700 by truck. That works out to 602 per year.

Now, I'm sorry to throw these numbers at you without an overhead, but it didn't occur to me I would come today and want to talk about Nevada's concerns about transportation and the draft EIS. And unless you understand these numbers and the confusion over DOE's refusal to specify a preferred mode or modal mix along with the issues about routing, then you wouldn't understand the rest of my comments.

Now, Nevada also has its own view of the way the modal mix should be set forth in the draft EIS. DOE's approaches a bounding scenario, let's say 100 per cent truck and let's say maximum rail, which is about 95 per cent rail. We've been studying this issue for ten years on a site by site basis. We know the ins and outs of all the reactors. We know what their crane capacities and their set-down spaces are. And for the last five years, we've been arguing that shipments ought to be planned basically on what the current capability of the reactor is. That's 32 truck only reactors, 40 capable rail reactors and five DOE sites. And I don't want to bore you with any more numbers, but that's an in between shipment scenario of 26,400 truck shipments, 14,000 rail shipments, or an average of 1,000 shipments a year for 38 or 39 years.

Now, it's important to put this in perspective against what the history of the industry is. The glory days of spent fuel transportation in this country were between the mid Seventies and the mid Eighties. For the last ten years, we've had an average of about 75 to 100 NRC regulated spent fuel shipments a year. The experience that the industry has is old experience, and by the time we get to 2010, the people who supervised that, you know, most of us in the business know the names, you know, it's John Fisher from Vepco (phonetic), or John Vincent from GPU, or Caneda (phonetic) from Duke, or Sheiman from Webco, or Bob Jones, who seemed to be involved everywhere in all shipments at all times for the last 40 years. The people who have that experience are going to be retired by the time these shipments get full tilt.

So it's important to contrast the history of spent fuel shipments and the numbers of shipments, and the shipment characteristics in larger casks, larger quantities, longer distances, to understand the concerns we have in the State of Nevada that when we look back at the historical track record of the industry, we're still not satisfied with what we see in the Department of Energy's transportation plans.

A second general issue that I have to share with you regarding the draft EIS has to do with the difficulty of transportation access to Yucca Mountain. From a transportation planner standpoint, put bluntly, it's a terrible place to set up a facility where you have to do a lot of shipping. It has no rail access. Building rail access will be technically and institutionally difficult and very expensive. It has no direct interstate highway access. So legal weight truck shipments either have to go through metropolitan Las Vegas to stay with the interstate system, or they have to go through torturous mountainous terrain on two lane highways characterized by sharp curves, steep grades, and the general absence of guardrails.

Heavy haul truck access will also be difficult. You know, the Department of Energy has looked at intermodal transfer stations at a number of locations, but in each case, the routes that these heavy haul trucks would have to use from the intermodal locations, or from the intermodal stations to Yucca Mountain have the same difficulties of either having to go through highly populated and congested urban areas, or going through dangerous and difficult roads through mountainous terrain.

Now, let me turn to a brief overview of what we see as the major deficiencies in the Department's draft environmental impact statement.

First and foremost, the failure to designated a preferred mode or modal mix scenario, and the failure to designate a preferred route for construction of a new rail spur from the existing Union Pacific rail line to Yucca Mountain raises great doubts in our minds about DOE's ability to build a rail spur which has profound implications for modal choice and the number of shipments and the impacts nationwide.

Furthermore, we're concerned about DOE's failure to designate an acceptable highway interchange for their base case routing in Nevada. They have assumed that they could use the new Las Vegas beltway, I-215. There are both technical and institutional reasons why they will likely not be able to use an interstate equivalent bypass to downtown, and unless they decide to go with an alternative route, or the State of Nevada designates an alternative route, the base case would put all those shipments through downtown, through the intersection we call the Spaghetti Bowl, where US 95 and I-15 join.

We are also concerned about unrealistic assumptions regarding the national mostly rail scenario. As I said, we think the best that can be done, even if there is a rail line, is to move 60 per cent of the inventory by rail and 40 per cent would have to come by truck. And there also are, we believe, unrealistic assumptions regarding intermodal transfer facilities in Nevada, and I'll talk about those in a moment when we talk about heavy haul transportation.

Now, there are some specific issues regarding transportation risk. The first set of comments has to do with specification of the transportation system. We look specifically at the area of risk, we find one key problem throughout the document, DOE likes to give single point values for risk, and we believe this generally creates a false impression about their ability to quantify these transportation risks. We think it's much better to use a range of values that reflects the uncertainty that's involved in calculating these risks, and I'll give you an example in a moment.

Secondly, we're concerned about the under estimation of routine radiological exposures using the RADTRAN model. The RADTRAN model is good for some types of analysis, and we use it, but it's not sensitive to unique local conditions, for example, where the delivery routes through places in Nevada go through small towns. And we've identified locations on the routes in West Windover, Ely, Tonopah, Beatty and Goldfield, where each truck shipment could have a potential exposure time of up to two minutes to people living and working within six to ten meters of the mid point of the highway lane that's going to have the spent fuel shipment. And when you look at the NRC allowable dose rate of 10 millirem per hour at two meters from the cask surface, and you extrapolate that out, that means we're creating hot spots in Nevada communities where maximally exposed individuals will potentially get 150 to 260 millirems of additional radiation.

Now, that may not be significant in terms of increasing a standard accepted statistical cancer rate, but you're talking about increasing exposures by 40 to 60 per cent over the average annual background rate. We believe that that is unacceptable.

Additionally, the heavy haul routes, because of slower speeds and larger cask dimensions, and the fact that state permit conditions are going to restrict them to operating during daylight hours on weekdays would further concentrate the opportunities for routine exposures to the public. This is a major deficiency in the radiological risk assessment of the draft EIS, and is in and of itself, we believe, a basis for litigation if it isn't resolved in the final EIS.

Beyond this, we're concerned about two other areas of radiological risk, the under estimation of accident and terrorism incidents, and the ignoring of the economic impacts of those events, and I'll show you, this is an out of sequence slide, it's on the back of the handout with the map. I've just been working over some new consulting materials this week where we continue to rework this analysis, and let me just give you an example.

DOE, to its credit, for the first time in any of its documents is acknowledging the potential for very significant radiological release from a severe accident. The rail accident is larger because of the larger source in the cask, and what they give you in Table 6-12 is the potential for a population dose of 61,000 person rem, resulting in 31 latent cancer fatalities.

We ran the RADRAN model and replicated their outputs, and then we used credible alternative outputs which we thought were more realistic, in particular, changes in the radiological characteristics of the spent fuel based on cooling time, and looking at some different approaches to atmospheric conditions, and we found much larger results in terms of the population dose in the latent cancer fatalities. And then when we use the economic calculation--I'm sorry--the economic cost cleanup calculation model in RADTRAN, we generated what the cost of cleaning up that release in an urban area would be, and there are some pretty astronomical cleanup numbers there.

Two points here. First of all, we believe DOE was deficient in not looking at a range of values for the consequences, the radiological health consequences of the accident. Secondly, they totally ignored this potentially horrific economic cleanup cost.

Similarly, looking at the way that DOE addressed the successful act of sabotage against a truck cask in an urban area, and the attack on the truck cask is acknowledged to be greater than the rail cask because primarily of wall thickness and the ability to penetrate that cask with available weapons, based on a study that DOE commissioned by Sandia, they came up with some very new numbers. Some of you know this literature goes back to Sandoval's 1982 study. And they concluded that there could be a sufficient release from a truck cask if there's only 90 per cent penetration by an explosive device used by saboteurs or terrorists. And this would result in a 31,000 person rem population dose and 15 latent cancer fatalities.

Again, we ran the model they used, RISKIND, and we replicated their results, and then we looked at their reference which said, you know, if the weapon completely penetrates the cask, then you get a ten fold increase in the release. Now, we would argue that they still have not captured the worst case analysis, and I'll be happy to talk to this point in question and answer. But, again, our bottom line here again is they neglected to do two things. They should have given a range of values considering a range of inputs to their model, and then they should have used their economic calculator in RADTRAN to talk about what the cost of cleaning up that release in an urban area would be. Again, you see very specific impacts.

Other impacts I would argue are equally important, but perhaps less catching of the imagination than these radiological ones are. The under estimation of the requirements for building the rail spur, certainly we're talking about $400 million to perhaps a billion or a billion and a half dollars to build a rail spur. DOE's estimates of upgrading the highway infrastructure are off at least by a factor of ten. It's going to be much more expensive, particularly to upgrade these roads to handle heavy haul trucks.

They've certainly under estimated the impacts on Indian tribes and local governments, and they've ignored the potential adverse socioeconomic impacts resulting from perception of risk. They always turn to the Metropolitan Edison case which we don't feel applies here. Any place where we can show that there is an increase in routine radiological exposures, we believe there is a basis for an impact on the environment. And wherever there is an actual impact on the environment that's measurable, they must address the economic consequences of it.

Finally, we're concerned about their failure to disclose to the public what they actually did in the draft EIS. Now, what they actually did in the draft EIS was in my opinion very illogical, and Steve Maharis (phonetic) and some of the other technical people that worked on this project did a good job once we were able to pick through their data sheets and their model outputs. They actually ran the routing models. They actually came up with a defensible base case for the truck shipments across country. But then they decided first not to reveal what they had done in the draft EIS. Secondly, they decided not to reveal what they had done in the notices for the public hearings. And, thirdly, for the most part in the public hearings, both in Nevada and around the country, they did not talk about what they had actually generated with their routing and shipment models as the basis of their impact analysis.

This is not a properly labeled map because I just got this last Monday. This is one of the products that the Transportation Research Center at UNLV is doing for us, and this is what DOE's base case truck shipment analysis used in the Chapter 6 analysis, documented in Appendix J, documented in the worksheets that you can find on DOE's website. This is what their shipment map looks like. We think it would have been so much better for everyone else if they had just revealed in the document what they actually did.

Finally, there are some additional areas, loose ends where we're doing additional research. One is a study of the I-215 beltway. We're doing mapping and GIS coverage update. We're doing some interesting work supporting Miles Greiner at UNR, who incidentally, as far as I know, is the first researcher to be simultaneously funded by DOE and by the State of Nevada to work in this case in a very important area of benchmarking the new Cafe Fire Code that's being developed at Sandia, and also looking at some of the testing issues involved in the performance of casks in severe fires.

Later this summer, Professor Shashee Nambian (phonetic) at UNLV, who was in a previous life a military aircraft designer, and now a transportation engineer, will look at some of the specific issues involving unique local conditions in Nevada, and accidents that may exceed the national reasonably foreseeable accidents. Because, remember, we have a lot of airplanes both carrying live munitions and some potentially dangerous dummy munitions, i.e. steel tipped, 1000 pound concrete bombs. This is an issue that DOE identified, to its credit, in 1986 in the draft EIS for Yucca Mountain. 14 years later, they have not resolved the issue of military over-flights.

Finally, we're doing some work on radiological sabotage response training for first responders at UNLV.

Let me quickly run through these last two points about dealing with the NRC. Many of you know we filed a petition last summer for rulemaking with the NRC. It was the last major piece of work that I did before I was swallowed by the draft EIS. And the petition was accepted and docketed, published in the Federal Register. Comment period was extended. Comment period closed at the end of January. There are about two dozen comments. These are all available for you to review, as well as the full text of our petition, at the NRC's rulemaking website.

What we asked the NRC to consider in the petition were two specific actions. One is to move right now based on what we know about the terrorism and sabotage, to make specific changes in our 10 CFR 73, which would better deter, prevent and mitigate the consequences of radiological sabotage against shipments.

We also asked for a second action, that the NRC should conduct a new and comprehensive assessment of the consequences of terrorist attacks that have the capability of radiological sabotage in three areas. The first, attacks against infrastructure. The second, attacks involving capture and use of explosives. And, third, the use of weapons that don't require attack.

Now, many of you who know this literature know that the second point is what the NRC has addressed in the past, and is the type of an attack scenario that DOE addressed in its study.

The grounds and interest that we have used to support this petition, while they are very much affected by DOE's proposal to build a repository, also reflect our concern about the potential that Congress will insist on siting an interim storage facility in Nevada. And in our petition, we review a number of issues that have to do with changes in the terrorist threat, and what we believe is the increased vulnerability of shipping casks to attacks with high energy explosive devices.

I checked on Friday, there had been no action on the petition. The way it goes with big petitions is the NRC has a lot to chew on, and they usually take their time. We have reviewed in preparing for our petition all of the relevant petitions that have been submitted in the last 15 years. I'll be very surprised if we hear anything from the NRC before September or October. But I would be delighted to be surprised by some early action.

Finally, let me talk about the process that Rob Lewis talked about earlier. It's really nice to be able to end a presentation on a happy note. So let me first of all give you the unhappy note. The NRC is doing two things to update the modal study. One is they've published this risk reassessment prepared by Sandia, NUREG-6672. And we're extremely unhappy, both with the process they used and the results of that study.

There was not appropriate stakeholder input or peer review, and they repeat many of the mistakes that we felt were done in the modal study. For example, the use of codes that haven't been properly benchmarked. But that's another debate for another time, and anyone who wants to see that can either come to Las Vegas on August 15th, or come to the NRC auditorium in Rockville on September 13th. I guarantee you that sparks will fly.

But there's something really good that I can end this discussion on, and that is whether it's the influence of the new chairman or whatever policy, this commitment that the

NRC seems to have made to enhance public participation, my goodness, it actually seems to be happening.

Now, last night, my airplane circled the Salt Lake City airport as I watched the lightening storm that some of you were probably stranded by on the ground, so I had time to read the scoping study that came in the mail on Friday morning. And this is Sandia's summary of all the public comments, stakeholder comments that have been thrown into this process, and I am going to tell you that I was astounded by how refreshingly objective and open minded it was.

Now, the folks at Sandia know my biases over the last 20 years as well as I know theirs, so I want to today give them credit for having the discipline to stand beyond both work they've done in the past and what I know to be their personal opinions about certain issues, like testing and different types of analysis, and really applaud a very objective piece of scoping work. I would hope that the Board would follow this proceeding, because as I said, it's one of the few encouraging things that I've seen happen in the 20 years that I've been working on nuclear waste transportation, and I only hope that the NRC will follow through and give the same kind of weight to the opinions of the stakeholders that they seem to be doing.

I'm very sorry for taking so much time on the prepared part of this presentation. I really do appreciate the opportunity to update you on what we've been doing in the State of Nevada.

Thank you very much.

ARENDT: Question from the Panel? Dan?

BULLEN: Bob, this is just by way of a little clarification. In the bounding analysis done in the draft EIS on mostly rail versus mostly truck, DOE tried to put their arms around a big problem. And I kind of agree with you that they're going to actually use what capabilities exist at the nuclear facilities and determine it.

Can you explain to me why you think that the bounding analyses didn't put their arms around the whole picture?

HALSTEAD: That's a really good point. I haven't evaluated all of the impacts from the standpoint of mostly rail or mostly truck and our in between current capabilities. The one easy one that was obvious for us to do is to actually look at the routes that DOE had picked for shipments from specific reactors to Yucca Mountain, then use our format or our matrix of who ships by rail and who ships by truck. And what I found is that--and I'm sorry, I have to look this up to get you the exact number--but there is a major difference in the number of states that are affected by both rail and truck shipments, and the number of states that are affected by a variety of routes.

So just from the standpoint of preparing the corridor states, the local jurisdictions and the Indian tribes for their participation and transportation planning, their consideration of alternative routes, the things that Jim was talking about, because Tim's comment about training first responders, we all get hung up on this, you know, that is something that's difficult to do in advance, but everything else should be done seven to ten years in advance. So the EIS is a very good tool for predicting who is likely to be affected, what routes are affected, what modes they have to deal with. Dealing with a truck accident is very different than dealing with a rail accident.

So on that issue alone, I would argue you get a much more realistic assessment of the national impacts of transportation by running that in between scenario. But I'll be honest. I think there's always use in doing a bounding scenario, and I hate to say this because I'm a pro-rail person for safety reasons, but we've been looking at both the economic and institutional issues with rail, and if I were advising a client who is putting in a bid for one of those regional servicing agreements--and, Jim, I might end up doing that--I'm telling you there would be a strong case to move everything by legal weight truck, if you put aside the safety and institutional things.

Remember, DOE's market driven approach says we're looking for people to do this on more or less a fixed cost contract, and so I think it's actually to DOE's credit that they put the 100 per cent truck scenario in there, because unfortunately, that might be a lot more probable than most of us who are involved in transportation would like.

In order to maximize rail the way that they've laid it out, I mean, they have to do some exotic things. I mean, they have to barge big rail casks out of the Kiwaunee and Point Beach reactors and take them into the Port of Milwaukee. They've got to take big rail casks and put them on barges and take them into the Port of Baltimore. Having worked in the Coastal Management Program in a previous life, and I know that some people will argue that there's a precedent with the Shorem shipments to Limerick, those occurred because they were not very radioactive. And in the end, even the environmentalists like Marvin Resnick advised the people involved, you know, don't spend a lot of time fighting these shipments. The radiological risk really isn't here.

I think it will be very different when people come up with these exotic intermodal movements on the reactor to mainline in. So that's why I go back to saying that I think the in between current capability scenario is the most likely one and the best for planning purposes. I like doing the 100 per cent truck, because that might be what happens. And I don't have a problem with DOE setting out that mostly rail as a target that would be preferable in terms of reducing the number of shipments, but they have not at all dealt realistically with the institutional and technical issues and the costs, and indeed, the simple absence of commitment.

You don't hear DOE folks coming out and saying that they're strongly committed to maximum use of rail. And, in fact, even in the RFP, there's kind of a fuzzy little sentence in there that says, well, we'll hope that the people who submit proposals are going to maximize rail. There's a simple solution to that. You make maximization of rail one of the criteria that you use in selecting the successful bidders. There are a number of ways to address this institutionally, either in a program document like the EIS, or in a procurement action.

Anyway, I'm sorry, but I think in some ways, this is the single most important uncertainty about the transportation system. So there are some good reasons for DOE doing that bounding scenario. But I think you have to have that in between one.

BULLEN: Bullen, Board. Just a little follow-up question to that one, and maybe you lost me in the explanation of the differences between not getting your hands around the bounding case, but besides the route selection and the differences that you would have had and heroic measures to move large casks in and out of plants that don't have rail spur access, is there a significant difference in, say, the person rems calculated for each of the--I mean, does the person rem calculation found the case, I guess is the question, from your perspective?

HALSTEAD: That is such a technically difficult question to answer that I'm going to give you my apology first for not having a good answer, because we're still trying to figure out how we will deal with this.

Our assumption is that DOE will not do a much better job in the final EIS than they did in the draft, and so some of the things I'm working on I won't share with you because they're part of litigation strategy. However, understand that in Nevada, these impacts are very different than they are nationally.

To the extent that there may also be unique local conditions between particular reactor origins where, you know, those nefarious pickup and delivery routes, as they're called, where you have to use local highways, it may also be that there are locations where the routine exposures are a problem. But clearly in Nevada, there are--there are two aspects to this. One is when you do an aggregate analysis using a tool like RADTRAN, it's very important that you (a) use the most recent population data, and (b) you have to put the non-resident population data in.

So on those grounds alone, I would argue that whether we're prepared to say there's a big difference between rail and truck, we're prepared to say that there is an insufficient analysis to allow a rational decision based on the fact that DOE did not have the right population inputs when it applied RADTRAN for the Las Vegas valley.

But beyond that, there is the issue of impacts along these unusual routes. I mean, for example, you come into Ely on US 93, and you have to make a turn to catch US 6 to go across the middle of Nevada, and I've stood there with my stop watch timing trucks making that left-hand turn at that light, and there are people's homes and businesses within 30 meters of that lane. You have to go and use another took. One tool is the RISKIND model, which has some potential, and again, we are just getting an understanding of this enough to do that. But there also are some hand calculations that you can do using the exposure rates and exposure time and calculate it.

So I have a feeling that the one thing that might work against the economics of truck is when we start looking at the routine radiological exposures from truck delivery in Nevada. There are going to be big time exposures. They're not going to be exposures that can be just written off, you know, as a fraction of background. We're talking about significant percentages of the average annual background radiation being added onto what people already receive.

So I guess in that, I would say that I think on the routine radiological issue, probably rail looks much better, and that is certainly the approach that Nevada has taken all along. And I know people, you know, many people are offended by our strident adversarial critiques of DOE, and I appreciate that. It's also important to remember that we have taken formal policy positions on most of these issues. I mean, we've had a position out there since 1990 that says all other things being equal, rail is the way that you should go for safety reasons. It hasn't been backed up by a precise radiological impact analysis. And then we've added on the same issues that the AAR is concerned about, which is equipment design, dedicated trains, and the safety protocols.

So to that extent, you know, we've taken a position that the preferred mode ought to be rail, but that doesn't, unfortunately, solve DOE's problems in figuring out how to get the rail casks from 30-some reactors that have difficult access, and then how to get all of them to Yucca Mountain where the newest existing rail line is about 105 miles on a straight shot, and some of the routes, frankly, are almost unbelievable at 300 to 380 miles. You're talking about the biggest new rail construction job in this country since World War I, and through some difficult terrain. And in the old days, we could have built those without NEPA and without

OSHA. You know, now it's a very difficult thing to build railroads in rough terrain.

BULLEN: Bullen, Board. Just one last question. You mentioned these analyses that you're doing in your modeling. Are you going to have your results done end of the year, or sometime soon, and would you be able to share those, I guess is the question? And that's probably it.

HALSTEAD: We've been struggling with it, because our past practice has been as soon as we've completed our internal reviews, we've posted them on our website. We haven't always published them in hard copy with document numbers. To be frank with you, the last set of analyses that we've done with RADTRAN and RISKIND, both for the sabotage and the accident consequences, are so startling in terms of the radiological health consequences and the economic analyses, that I'm not comfortable putting them out yet until we subject them to some type of a fierce internal peer review. And budget limitations have kept us--some of you know that in the past, we had a very formal internal peer review process with outstanding transportation folks like Edith Page, who had been at OTA, and Mike Bronzini, who was head of the transportation center at Oak Ridge, and we haven't had the funding for that kind of internal peer review.

But, yes, as soon as I'm satisfied with them, they will be posted electronically, and then we'll decide what peer review before we do, and publish it.

BULLEN: Thank you.

ARENDT: Any other questions?

(No response.)

ARENDT: Thank you very much. Our next speaker this afternoon is Fred Dilger from Clark County, Nevada. He is going to speak on the views of affected local governments on spent fuel transportation. Fred is with the Comprehensive Planning and Nuclear Waste Division in Clark County. He's a transportation planner.

DILGER: Good afternoon. I'm very glad to be able to be here to talk with you today, although frankly, Charlie Dettmann has ruined my airplane flight home.

I'm going to go through some of the concerns that the affected units of local government have with the DEIS. I'm going to try and not repeat a lot of what Bob said, but we are going to flog a dead horse in some areas.

I'm going to talk about three things in particular. The first are cumulative effects, the next is transportation assessment concerns. We've generally divvied those up into three areas; national, those that are of unique concern to the affected units of local government, and the last, generally program-related that relate to the management of the program. The last thing I'm going to talk about is emergency response.

I'm not going to read this to you. I want to just talk about the bottom line is this last bullet here. The Department of Energy's draft environmental impact statement for the Yucca Mountain project did not address the shipment of low level waste and other kinds of waste to the Nevada Test Site. The reason this is especially important to us is because, as you know, the Waste Management Programmatic EIS was--a record of decision of that was published last year and we are now expecting very, very, very increased volumes of waste will be now shipped to the Nevada Test Site.

When we received the Nevada Test Site's EIS, we noticed that it did not comment on the shipment of waste to Yucca Mountain, and we made that comment. We said you're not talking about this other waste stream and what its likely impacts are. The response we got was, well, it will be in the Yucca Mountain EIS.

When we reviewed the Waste Management Programmatic EIS, there was no comment in there of the shipments to Yucca Mountain. When we commented on that, the response we got back from the Department of Energy was, well, that will also be in the Yucca Mountain EIS.

It was not in either. The Department of Energy has a lamentably consistent way of doing EIS's, and this is certainly an example of that.

The reason these impacts are substantial, this map doesn't come up very well in black and white, last year we reached the end of a seven year process of we thought was a cooperative effort between ourselves in Clark County, other affected units of local government, the state of Nevada, and the Department of Energy to try and reach conclusions and to get some kind of consistent routing for low level radioactive waste.

Jim earlier mentioned the frustration that local governments had because of dealing with the different DOE facilities and trying to get some kind of consistent policy out of them. We have been unable to do so.

Last year, we thought we finally reached that moment where we would be able to cooperate with the DOE and they would address concerns that are especially important to Nevada.

A couple weeks ago, we got the report for the second quarter of low level waste shipments to the Nevada Test Site. It now turns out that we had waste travelling on city streets in three of the five most dangerous traffic areas in the state, all in violation of the agreement that we thought we had with the Department of Energy.

If the Department of Energy wanted to antagonize elected officials in Southern Nevada, particularly Clark County, if they had set out to do that, they could not have done it in a better way than they have done.

Now, to move to the DEIS concerns, I'm not going to read all these bullets. The first one I want to talk about is the single route strategy. This was something that Bob Halstead kind of alluded to in his presentation. We think that the Department would have been much better advised had they assumed different routing alternatives that would have (a) spread the risk of the waste movements a little bit more equitable, as well as avoided weather and other conditions that, frankly, the industry has no experience transporting waste in.

There's very little experience transporting waste in winter weather, very inclement weather, and these are things that they should have thought about. We think it indicates a very shallow analysis on their part.

The other bullet I want to highlight here is for 20 years, scholars have been studying the impact of human error, institutional failure on risk. For 15 years, the state as well as the affected units of local government have been advising the Department of Energy that they need to consider this in their risk analysis.

In the DEIS, they allude to it and then proceed to ignore it. We think that's a major failing. We hope that now that the Forest Service has actually burned down a part of a national lab, the Department of Energy may be spurred into action on this particular topic.

Some AULG concerns, I'm going to flog a dead horse here. DOE called it an implementing alternative. The fact is that until there's a definite route that has been defined through Nevada, we're all left hanging. We don't know which areas to analyze. We don't know which of the affected units of local government will be most impacted. It keeps the doubt out there.

Additionally, once again, it corrodes trust in the Department. In 1985 in the EA for Yucca Mountain, we were told that in the EIS, the final route selection would be made. In 1995, the Department of Energy released this report that said the final route selection will be made in the EIS, and that the AULGs will have a part in selecting that route. None of that happened. None of that was even alluded to in the EIS. Once again, this is something that elected officials look at and use to gauge the reliability and trustworthiness of the Department.

The other bullet I want to talk about here is that the proposed action in the DEIS is extremely complex and deserved much greater attention to detail and some in depth thought. I was prepared to do highway capacity software analysis and lane congestion analysis and all sorts of other efforts to get--as a part of reviewing this EIS. None of it was necessary because the details weren't there.

It is possible that the Department doesn't think that there is a significant impact from this action, but it hardly seems credible. I want you to imagine a frontage road, not much different than the road in front of this hotel, carrying a 200 foot long heavy haul tractor trailer, escorts on either end, 300 feet long total, with a 125 ton rail cask on top of it, up and down four times a day, two empty, two full, with 20,000 other cars during the morning and evening rush hour. Do you think there would be some impact with that? Do you think that's something the Department of Energy should have anticipated? We think they should have looked at that.

One of the things that local governments do a lot of, and they do it very well, is they look at impact analysis. It's bread and butter. And, frankly, if you were constructing a Burger King in Nevada, you'd have to do a better job and a more penetrating analysis than was done in this EIS.

Some program concerns. There's that dead horse again. Once more, we've been left out in the cold on implementing alternatives. We just don't know which route will be chosen through Nevada. Another interesting question is, as we saw in this other slide, the Department indicated that they would identify criteria by which to evaluate routes. Presumably one of those is human health risk. This goes partly to the question you asked, Dr. Bullen, now that we know--or let's say we get very good, reliable human health risks, how will those be weighted against other factors like cost and other potential considerations? That's unclear in the EIS.

Three years ago--let me talk about this bullet here--three years ago, I was at the State of Nevada Committee on Roads and Highways. These are the legislators who oversee the expenditure, construction and maintenance of our highway system.

A DOE staff member was there briefing them on the Yucca Mountain program. He had detailed engineering drawings that showed curve cuts and all the different things that would be required to move heavy haul vehicles. One of those things would have been to tear down the oldest adobe structure in Nevada. All of this detail had been thought through.

When he finished his presentation, the legislators asked him some questions. Who will build this? Who will maintain it? Where will the money come from? The DOE official had no answer for that.

My boss was sitting next to me. He was my then boss. He was the Director of the Department of Transportation. He jumped right up, grabbed the microphone, and said we're not building any of this. The Department is going to have to build it themselves, because we're not going to build it. Here again, the Department has not thought through how they're going to do this.

Bob talked about the additional costs of this. We agree with the state and we believe the Department has grossly under estimated what it's going to cost. One of the things they didn't include in their cost estimates was the cost to acquire right-of-way.

In one particular case, let me give you an example, the City of Las Vegas has pinned all of its hopes for future growth on the Las Vegas Town Center. It's going to be a densely developed industrial and commercial area at the intersection of US 95 and the northern beltway. To acquire right-of-way to expand to an extra wide lane that would accommodate a heavy haul truck is going to be extremely expensive. And here again, the Department did not consider that.

Another aspect of this is Las Vegas, nor surprisingly, has air quality problems, and so for the construction of any of these facilities that they mention in the DEIS, an air quality conformity finding is going to have to be done, and it's going to have to fit into the regional transportation plan. No thought of those interactions was considered in the EIS, and we think those are substantial weaknesses.

Finally, this quote is kind of a popular bullet. It's been attributed to Dorothy Parking talking about Oakland. She could have been talking about the DEIS. There are three pieces of information related to emergency management in the DEIS. The number of people that die, they die of latent cancer fatalities for a truck accident, a rail accident, and the circumference of a spill, 100 to 300 feet. That's it.

We took the DEIS to our statement emergency response committee, to our local emergency planning committee, and we said what would you need to respond to this accident? They came back to us and said we have no clue. There is not enough information.

This goes to your question, and the question that you asked Jim Reed earlier, we're not even at the point where we could begin to estimate what those dollars might be, or even what the time sequence might be, because we don't have a design accident, which is the maximum reasonably foreseeable accident. That is mentioned in the EIS, but nowhere described. We think that's a substantial weakness.

The whole reason for doing an EIS is to establish the basis for mitigation negotiations. That's why you do it. And that means that the information has to be presented to the people who are affected by it, and that information is not in the EIS, and we think the EIS will not be sufficient until after many other changes are made, but especially this one.

So to conclude, I've got a request for the NWTRB and a recommendation. The request is that we would ask you to insist that the DOE address the NRC comments. The AULG comments are very good. The NRC comments were also very good, and we would be very, very pleased if the Department would respond to the NRC comments. That would give us a lot of confidence.

We agree with Bob that the NRC's public involvement program over the modal study has been just a watershed, and they are doing a great job. They did a great job on the DEIS, and we would like to see them answer those comments.

So my recommendation is to Don Doherty, and that is to build the extension to that shed, because frankly, the Department of Energy has given--handed opponents to this project 15 years worth of ammunition from a litigation standpoint.

So with that, I'll answer any questions.

ARENDT: Any questions? Comments?

(No response.)

ARENDT: Well, then we've reached the end of our session. I want to thank each of the participants for some very good presentations.

We have no questions and comments from the public, so in the absence of that, I will ask anybody here in the audience, anybody who would like to make any comment?

(No response.)

ARENDT: And hearing or seeing that there isn't anyone, I move that we adjourn. And thank you all for coming.

(Whereupon, at 4:25 p.m., the meeting was adjourned.)