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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE

(ACNW)

141st MEETING

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TUESDAY,

APRIL 22, 2003

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 10:30 a.m., George M. Hornberger, Chairman, presiding.

COMMITTEE MEMBERS:

GEORGE M. HORNBERGER, Chairman

RAYMOND G. WYMER, Vice Chairman

B. JOHN GARRICK, Member

MILTON N. LEVENSON, Member

MICHAEL T. RYAN, Member

ACNW STAFF PRESENT:

JOHN T. LARKINS, Executive Director, ACRS/ACNW

SHER BAHADUR, Associate Director, ACRS/ACNW

NEIL M. COLEMAN, ACNW Staff

TIMOTHY KOBETZ, ACRS Staff

HOWARD J. LARSON, Special Assistant, ACRS/ACNW

MICHAEL LEE, ACRS Staff

RICHARD K. MAJOR, ACRS/ACNW Staff

ALSO PRESENT:

ROBERT BERNERO

TOM ISAACS

I-N-D-E-X

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

(10:30 a.m.)

CHAIRMAN HORNBERGER: The meeting will come to order. This is the first day of the 141st meeting of the Advisory Committee on Nuclear Waste.

My name is George Hornberger, Chairman of the ACNW. The others members of the committee present are John Garrick, Milt Levenson, and Michael Ryan.

During today's meeting, the committee will: 1) hear presentations and hold discussions with representatives of the National Research Council -- that's the other NRC, the operating arm of the National Academies -- on the development of a proposed HLW repository at Yucca Mountain, Nevada; 2) hear presentations and hold discussions with representatives from the National Research Council on a study it will perform on a broad range of high-level waste transportation matters; 3) hear presentations from and hold discussions with representatives from the State of Nevada regarding its technical concerns with the transportation of spent fuel and high-level waste, as well as issues related to the full-scale testing of transportation casks.

John Larkins is the Designated Federal Official for today's initial session. This meeting is

being conducted in accordance with the provisions of the Federal Advisory Committee Act.

We have received no requests for time to make oral statements from members of the public regarding today's sessions. Should anyone wish to address the committee, please make your wishes known to one of the committee staff. It is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

Before proceeding, I would like to cover some brief items of interest. One, President Bush has named Commissioner Nils J. Diaz as Chairman of the NRC effective April 1, 2003. Dr. Diaz has selected a staff, naming Maria Lopez Otin Executive Assistant, John W. Craig Chief of Staff, Gary M. Holahan as Executive Assistant for Reactors and Research, and Catherine Haney as Executive Assistant for Materials and Security.

The following changes are noted in the ACRS/ACNW technical staff. Mr. Ramin Assa, Senior Staff Engineer, ACRS, was selected for a position with Research as Programs and Communications Liaison Officer. Mr. Ralph Caruso joined the staff as Senior Staff Engineer, ACRS, effective April 7th. Mr. Caruso

comes from NRR, where he served as Chief of the BWR and Nuclear Performance Section.

And finally, this is to inform all of you that one of our valued senior staff engineers, Tim Kobetz, has been selected for a project manager position with the Division of Waste Management, NMSS. I'm sure members of both the ACRS and ACNW will miss his technical support and advice and wish him well on his next assignment as he prepares to enter full-time the challenging tasks associated with the Yucca Mountain project.

Okay. With that, we will proceed to our item of business, our first item of business today. We are here to hear some presentations on the report -- the National Academy's recent report on phased repository development, the report entitled "One Step at a Time." The report was prepared under the Academy's Board on Radioactive Waste Management.

Today we're pleased to have Bob Bernero back to visit us, and Tom Isaacs also, with no black hat --

(Laughter.)

-- representing the Report Committee. Also here we have Barbara Pastina, Study Director; Kevin Crowley is Staff Director of the Board on

Radioactive Waste Management; and Joseph Morris of the technical staff.

And, Bob, I understand that you and Tom are going to do the tag team.

MR. BERNERO: Tom will --

CHAIRMAN HORNBERGER: Tom is going to start?

MR. ISAACS: Right. Thank you very much, George. It's a pleasure to be here. Nice to see some old friends in the crowd.

Bob and I were part of this National Research Council Committee looking at the staged development of geologic repositories, and we represent but 2 of 14 members who labored for about a year and a half on the statement of task regarding how things should be carried forward.

I want to start by making just a couple of overarching comments, if I can. The first is that this was a generic approach. We are looking not at repositories only in the United States, but at the development of repositories in a number of countries around the world who have very different technical, social, institutional settings.

And so we were trying to provide a set of insights, findings, and recommendations that would

have generic appeal in the progress of the implementation of such programs. We also took care to try and make some specific recommendations with regard to Yucca Mountain, but we did have both in our minds.

A second thing that I think it's important to recognize is that we were not focused necessarily or exclusively on how to meet a regulation or how a repository should obtain a license. But, really, what's the appropriate way to -- for an implementer to create, develop, and carry forward a successful program.

And a successful program is one that not only has to have the necessary science and technology and performance assessment and TSPA, and all of the other things, it has to be institutionally appropriate, it has to meet societal acceptance, it has to have the ability to carry itself forward over generations, through which this program will -- in every country will undoubtedly occur, and it has to be flexible enough to meet the needs that will unfold that are unknowable today to any set of implementers, regulators, or the public.

That broad scope caused us to have members from other countries on the committee, and it even caused us to search early on to have non-technical

people, as well as technical people, both from here and abroad, address the committee and hear their views to help us with understanding the full dimensions of this difficult problem.

If I could have the next slide, please.

It's important to recognize that it was the Department of Energy that was the -- we had a hydrologic incident here, and my papers are now --

(Laughter.)

-- together, and my notes are blurred.

It's important to recognize that we were tasked by the Department of Energy to do this task, and that most of the findings and recommendations are addressed to repository implementers and to the Department of Energy.

We're not bashful about saying that we think there are some insights there that need to be addressed, particularly in regard to the relationship between the implementer and the regulator, which in this case could be Yucca Mountain Repository Program and the NRC, but it's really broader than that.

And we were reflecting on standing on the shoulders of a lot of other reports that have been done over the last decade or more that have shown worldwide interest in the idea that if you're going to

take a program which even if it stays on schedule is going to last a century or more, it's a good idea to have a little bit of humility, and it's a good idea to probably take a step-by-step approach and recognize that flexibility is a virtue.

And that for a program that's going to operate for that length of time and then have to perform for millennia, it's important to recognize that over those kinds of times it's not science and technology and also institutional considerations, politics, social settings, and public acceptance, and all of those kinds of things are going to change in ways that can't be anticipated.

And, therefore, the way one puts a program like this together has to put some recognition to the fact that this is really a unique challenge and one that cannot be carried out sort of the way you would do if you were to build the hundredth version of some facility that you've already built 99 of, where you're simply going to build it in a set of prescribed steps. It really does take some understanding that things are likely to change.

And lastly, that if you're going to have a program last that long, you really need to concentrate on public and institutional considerations

as well, and that the step-by-step process lends itself very well to that.

There's nothing that breeds confidence in people than when you promise something and then deliver -- promise something and then deliver. And by having a sequential set of decisions, and delivering on those decisions in a meaningful and transparent and way with integrity. That goes a long way, in our view, toward building the kind of confidence for sustainability that's going to be required.

If I could have the next slide, please.

The statement of task was very specific, and it asked us to do the following things. First, it asked us to give a definition of staging. A lot of people had been using the term, and other terms like phasing or step by step, in a variety of ways.

And our report looked at it and finally wound up designating two ways of thinking about staging, one which we called linear staging, which is essentially a step-by-step process toward a predefined end, something where you kind of know ahead of time where the end will be, and you've probably been there before with other facilities and you're going to move forward in a phased manner.

We came up with a term called adaptive

staging to suggest a different, more flexible learn-as-you-go approach, which I'll talk about in a minute.

We were asked to look at the technical, policy, and societal objectives and risks. And I think that was a very important thing. And, in fact, it was so important that at the first meeting the committee decided to ask the Academy to add two non-technical members to the group, which they did.

We recognize that you can't simply separate the institutional and societal aspects from the programmatic development. It's not a question of holding a public relations campaign or a public information program after the fact or above the fact that's going to lead to the kind of confidence and acceptance, whether it be by the administration after administration of the Congress or the state or local people, or what have you, anybody who has an interested and affected role. That the societal aspect needs to be built into the way you think about organizing the program.

Having done that, we were to look at potential impacts, and making any changes always carries with it risks, and we hope benefits that, on balance, outweigh those risks. It also is true that going to a staged approach has potential implications

-- in fact, real implications -- for the rest of the system.

And so we looked at issues such as the impacts on storage, on transportation, on security, and how a staged approach might affect the needs for those various aspects to be considered.

We looked at strategies -- that is, how could one carry forward such a program. There are a number of ways to do that, including looking at the monitoring requirements for carrying the program forward. And we have a whole section -- and time will preclude me from going into great detail -- on the role of monitoring and how important we think it is.

We were asked to look at knowledge gaps. That is, what don't we know that we need to know, whether or not we go to some kind of staged approach. And we put forward a number of items there, particularly in the social science area, of things we think need to be looked into in order to improve the efficiency of the program.

And then, lastly, and one that should be of great interest I'm sure to this group is that we have to look at the potential incompatibilities with licensing. We are very lucky to have Bob Bernero on the task, so if we ever have occasion to wander Bob

would bring us back quite quickly and professionally to the tasks.

And the issue of are there incompatibilities with licensing was discussed long and hard. I think our conclusion was, no, there aren't incompatibilities with licensing. There may be effects, there may be impacts, there may be things that need to be done by the implementer and the regulator, but we don't see any fundamental incompatibilities, nor did we intend to create any fundamental incompatibilities.

We did, however, look at things like public attitudes and institutional trust and public acceptance and stakeholder participation, and those issues as well as trying to determine whether a TSPA meets some preordained level of exposure or not, we felt were as important to the implementing and regulatory side of the societal decision that the NRC is enchartered to make.

And so we think that's very important not just to DOE but to the NRC, that they think through the entire implications of not just what the technical consequences are of putting a repository at, for example, Yucca Mountain, but how to carry that program forward in a way that leads to a societal and public

acceptance that's enduring.

Next slide, please.

So we've decided to recommend something we called adaptive staging. I don't think adaptive staging is that much different from the collection of things that a prudent program manager would do in a case like this anyway.

This is a first of a kind probably, in some senses one of a kind, highly controversial program that's going to last for many, many decades, and has to perform for many, many millennia in an atmosphere where, as we all know, things nuclear provoke a lot of contention, and repositories, in particular, are probably as contentious as any issue you can have. And so we looked at both the technical and the institutional aspects of this thing.

The major elements there, as I've said, are not that different from one -- what one might expect in any program that had some of those kind of characteristics -- a commitment to systematic learning and iterative review. This is the first time we are going to put high-level waste into a repository.

And in the preclosure, as well as the post-closure, we expect that there will be things to be learned. There may be unanticipated things. There

may be -- things might go just exactly as planned, but that's probably unlikely to depend on.

And so we think a commitment to systematic learning and a continuing focus on how well we understand the safety, and can we understand it better and reduce the residual uncertainties, reduce the residual risks, is something that makes sense.

We think flexibility is a virtue, and reversibility is something that needs to be encountered. This is both for the technical reasons and also for the institutional reasons. We need to be able to demonstrate first and foremost, at all times, that safety, not schedule, not cost, safety is the most important objective of the program. And the program needs to be conducted in a way in which it's clear that both the implementer and the regulator keep it at that place, and we think that flexibility and reversibility are key to that aspect.

We think that a cautious startup -- that is, recommending something along the lines of a pilot scale -- makes a lot of sense. It's important to -- we're not recommending changes in the licensing procedure.

We are still recommending -- and Bob will talk about this in a minute -- we are still

recommending that DOE go for a license to construct and then a license to emplace, receive and emplace, and both of those should be based upon the full 70,000 metric ton projected inventory. But that once those things are received, we believe that a pilot scale is the right thing to do.

Both of those licenses are received before any radioactive waste is emplaced in the ground. So the license to construct and the license to receive and emplace are both done without any in situ experience with these very hot, very heavy, very radioactive cans.

And I think that we believe -- and the next licensing -- license to be granted occurs a couple generations later, after all of the waste is in the ground. We think it's prudent to think about going in stages. And the first stage is not the only stage. The stages should be developed by the implementer, in consultation with the regulator.

The first stage should be some sort of a pilot scale. We don't say how big it should be. We don't say how long it should be. We think there should be a pilot scale to learn about preclosure and post-closure.

You know, it's interesting, when I was in

the program, when I was wearing the black hat, one of the interesting things about evaluating repositories back then was that it was likely that we were going to do more damage during preclosure than post-closure. Even though all of the focus is on post-closure, if you -- post-closure goes as well as we hope, there is going to be very little impact on public health and safety. That's not necessarily the case in preclosure.

And, therefore, just looking at pilot to understand how best to conduct preclosure -- and we think you will learn things about post-closure as well -- seemed to us to have lots going for it.

We think that by staging the repository in a number of steps that allows for broad participation -- and we think broad participation is crucial to getting not just public understanding but public acceptance and buy-in in a way that makes sense for the generational commitments that are going to be required.

And lastly, we think that there should be some decision points made in adaptive staging. What that means is that every once in a while one ought to stop, collect oneself, take a look, and redo the safety case, whether or not it's at a licensing step,

certainly at a licensing step, but also at points that are appropriate within the program itself, and say, have we learned anything here that causes us to change our mind about how much we understand and how much we don't understand about preclosure, what's going on, and post-closure, what's going on, and should we do something different?

And if what we do is recommend something that's enough different, then some consideration needs to be given to whether or not there's another licensing step. If things are going just as well as they had been anticipated, then perhaps not.

Next slide, please.

So our generic findings, based upon that approach, were, one, that we think adaptive staging, as I briefly described it -- and I apologize for doing it so quickly -- is a promising approach. It's an approach that we think, from a generic point of view -- that is, not just for the United States but across the board -- makes sense for serious consideration, and that iteration of the safety case is essential.

And the safety case here is more than, for example, conducting a total system performance assessment. It's more than taking a volume of data, putting it into some models that attempt to

characterize the way the real world works, putting it into some high-end computers and spitting out performance.

It has to do with what -- the question of: what is the story behind why the implementer believes that the repository is safe? In English, in ways that can be described. And I think the committee would feel that if we asked each of you to take a piece of paper right now and write down in English why you believe that repository is likely to be safe, my suspicion is you wouldn't get the same story.

And we ought to be moving in a direction where it's fairly clear, whatever that story is, why we believe that the repository is indeed safe and secure. That's not a criticism. It's just a way of building a common understanding of what the objectives are beyond simply total system performance assessment.

And we believe by iterating the safety case not only can we reduce -- target ourselves to gain the kind of information that might help us reduce risks or reduce uncertainties, but it also may have opportunity to help the program do things like reduce costs or improve schedule or reduce exposure during emplacement.

So the iteration of the safety case, both

preclosure and post-closure, has a number of potential benefits that transcend -- go beyond -- the requirement to do certain things just for the license. I hope I characterized that well. We are in no way saying that what's required in order to be -- is sufficient.

We think it's absolutely the right thing to do. There is no question that from our point of view the NRC requirements for the technical understanding in order to get a license is appropriate within the NRC context. And if there's some question about that, we'll discuss it some further. We didn't intend to -- we do see a broader societal opportunity there to do things that we think will work even better in terms of program performance.

And so the combination of keeping safety central and this attitude of we can learn and improve we think also together demonstrates that the program is well intentioned. And having good intentions and communicating that the intentions are appropriate is probably the bedrock of getting public confidence.

People have public confidence when they think you know what you're doing and that you have their best interests at heart. And that's the focus of this particular thing.

Lastly, can it be -- it can be compatible with regulatory systems, and I've already described, to the best that I can in the short time we have, that our view was that the NRC system is totally appropriate. We have no recommendations with regard to changing any kind of licensing procedures.

We do think that there should be some conversations and dialogue and understanding between the implementer and the regulator to assure the understanding at what points in time changes in various program features might require either a licensing hearing or some other kind of appropriate approach, and in which cases it doesn't.

The last thing on generic is recommendations, pretty much synergistic with the findings. That's not unusual in Academy reports, and the recommendations are keep the emphasis on an iterative review of safety. Go into it with an understanding that over the many decades that this program is going to fulfill itself you are going to learn more.

It's likely that in 2050 you will look back on the year 2003 and say, "Boy, it's hard to believe that they were going to do it that way." There will be improvements, there will be insights,

and we ought to just take advantage of that. The program ought to anticipate that, so that when there are changes it isn't looked on as if something failed before but as a natural progress that occurs when one puts their attentions on the science and technology and institutional investments that you have to do in this kind of way.

What this leads to is a couple of things generically, and it really leads to a different definition of success. Instead of success being the day you put the cork back in the bottle with all of the waste inside, the definition of success goes more to the fact that you have a site that you feel good about, that you've taken it through the full licensing process, that you have the technical and societal conclusion that it's appropriate to go forward, that you've started emplacement, that you have some waste in the ground, that you have a place to keep the rest of the waste in the meantime, that you conduct the kind of tests that are necessary to begin getting experience and to begin learning, and that you have the opportunity to put the rest of the waste in the ground in a timely way, if, based upon that information, that appears to you to be the right thing to do, and at the same time you have the right to stop

and even reverse if things happen over the course of those many generations that would cause you to do something different.

With regard to Yucca Mountain -- next slide, please -- DOE has recognized the potential advantages of staging. It has a number of elements. It's now considering a pilot plant that certainly makes information readily available to all parties who are interested, which we think are very important. So it has a number of elements that we think are quite reasonable with regard to the way a staged program ought to go forward.

It also has an understandable, but noticeable, fixation on schedule. And we think that that needs to be balanced by communicating to people the importance of safety as well as meeting arbitrary induced schedules. And I used to be part of those. We used to pick schedules and then hang to them for dear life.

And there are all kinds of good reasons to do that, I'm not saying there aren't, and we need to keep doing it. But we need to recognize the balance there, that the program is more than about meeting those schedules. And we think that the regulatory system can indeed adapt itself, and that's why we're

here -- we hope that's the case -- to the implementation of such a program.

I know the NRC has itself said that it believes that there are aspects of incremental learning, and that when -- for example, when the license is docketed that the license will have all of the information that is appropriate to have and adequate to have at that point in time.

I think it anticipates that there will be more information as more experience is gained. So we think that's it.

So our specific recommendations -- DOE should adopt adaptive staging. I've already talked about that. We think there should be a pilot. We think a test facility is also an appropriate thing to do -- that is not in conflict with the pilot. A place where one might run tests on various kinds of other materials and other kinds of emplacement schemes on a variety of other materials, to see whether or not there are improvements that can be made or insights that can be gained to reduce risks or reduce uncertainties.

We recommended the creation of an independent scientific oversight group, much like the EEG group in New Mexico oversees things more to

reflect the concerns of the state and the local community, and, therefore, not in conflict with the NWTRB, for example, but in parallel.

Often the concerns of the local population, which are as legitimate or more legitimate than anybody else's, might be quite different than those seen from the science center in Washington, D.C. And so we recommend a science oversight group and a stakeholder advisory board to bring some of that stakeholder concern into the creation of how the program is run and even into the design itself.

And as I've said earlier, we think the safety case should be based on the full inventory, even though we're recommending they start with a pilot plant.

Next?

We think DOE and NRC should engage in some dialogue to make sure that the regulatory processes that are carried forward anticipate this kind of staged approach, and allow for the application of adaptive staging, and that means clarifying the kinds of tests and design changes and things that would require another license, for example, where those things that could be carried forward without another licensing hearing, so that there is clarity as to the

implications there, and, of course, to consider the impact of adaptive staging on the overall system.

If you go with a staged approach, if you go with an approach where you don't necessarily know at what date you will completely fill the repository, it has impacts on buffer storage, for example. It has impacts on transportation, for example. It might have impacts on security, for example, and we think those things need to be carried through.

Next slide, please.

So some open issues. Some people think that adaptive staging will cause delays. That may be the case. The sentiment of the committee was that it was unlikely to do so, that we think that an adaptive approach is likely to minimize the chance for costly mistakes early in the process, which would then have to be undone, which would take more time and even more money.

And so while the cost impacts of such an approach might rise in some people's minds, again, it is the consideration of the committee that, in fact, when all is said and done, particularly taking into account the long timeframe of carrying out this program -- and we are talking about many decades at least. If one does things right and sensibly early in

the process, it's likely to lead to getting waste in the ground ultimately sooner and for less money than the current approach.

Now, we can't prove that. We don't maintain that we can prove that. But it is the collective judgment of the group that conducting it in this way, that by the time you look back 70,000 metric tons later, that it's likely that you will have gotten waste in the ground quite quickly and maybe even more quickly.

As I mentioned earlier, the specifics of the pilot scale, we're not trying to say how big it should be or how long it should run. We see it as something big enough to be representative of a full-scale operation, but long -- and long enough to gain some experience, but probably a few years is the kind of thing we're thinking about, and maybe a few hundred metric tons. These are not specified, but that's the kind of order.

I already talked about the buffer storage and whether it would require some kind of buffer storage at or near the site, which could decouple waste acceptance from the utilities from waste emplacement -- something that's been talked about for a long, long time.

We already talked about the proposal for the oversight groups. That's very difficult, since the State of Nevada has traditionally resisted, creating such groups. We are saying you ought to go ahead anyway, DOE, and create such groups and do everything you can to bring the state and the counties and the local people involved, but we think that some kind of group representing the local community is something that's long overdue.

We recommend a long-term science and technology program -- a program that is decoupled from the moment-to-moment, crisis-to-crisis, milestone-to-milestone aspect that this program has had since it started in 1982. I joined the program -- I was, you know, on that side in 1984 through the early '90s. And there was no time that -- six weeks was not the crisis point in that program, for the last 18 years.

Six weeks is always the crisis of whether a program is going to continue or not. And, therefore, it's very difficult to take the long view as to how to anticipate making this program better if you're worried about the next milestone and you're worried about the next congressional hearing and you're worried about the next budget cycle.

And so we think some -- and Margaret Chu

has done this, and we support it -- this idea of taking some investment and focusing it on some key issues that, if resolved, will improve the program. It shouldn't be just long-term science and technology for its own sake.

It ought to have a definitive set of objectives. But if it can make us understand things better, improve performance, reduce risk, reduce cost, those kinds of things, we think the long-term science and technology program should be carried forward.

We're here talking to you because of this issue about the NRC licensing and this issue of what is a safety case and how does that relate to the NRC?

And with that, I will stop and turn it over to Bob Bernero, who will kind of carry forward a couple of questions that have been raised previously in reflection of the report as to how we should yield.

Thank you.

MR. BERNERO: There was a meeting of the Commission with staff on March 3, 2003, and in that meeting concerns were raised or issues raised about this report and what it suggested about the licensing process.

We looked at the transcript of that meeting and developed two basic questions that we

discerned from the context and from the discussion. The first question: does adaptive staging imply adding an extra licensing step? This is a very important question, because the whole tone of adaptive staging is iteration.

And the answer to that question is: it depends. If new information warrants, it may, indeed, add an extra step.

The second question concerned the safety case. It appears the fact that the committee repeatedly used the term "safety case," which is not used by NRC, it perhaps implied to some that the committee was proposing a new regulatory requirement in the safety case. The simple answer to that is, no, the committee is not proposing a new regulatory requirement.

May I have the next slide? I'd like to point to two attributes that are quotations from the report -- the definition of flexibility, and note that I've added emphasis, that flexibility is the opportunity to reevaluate earlier decisions and turn around to change, if new information warrants it.

Similarly, reversibility says the same thing, that you can change your course of action, reverse, go another pathway, if new information

warrants. And looking at that, we sought in the NRC licensing process, is there the flexibility built in to accommodate adaptive staging? And certainly, the NRC licensing process is filled with opportunities and clarifications of the regulation that enable iterative decision-making.

If you go to Part 63.44, you have the detailed conditions under which changes, tests, and experiments can be conducted without NRC advance approval. If you go to 63.32, on amendments, and the subsequent parts, you see the distinction of different changes and those which would be so serious as to warrant opportunity for prior hearing, those which would not warrant opportunity for prior hearing, and some which would be conducted on the authority of the implementer, with due notice to NRC and the NRC opportunity to say, "No, don't go forward with that until we have a chance to review and approve it."

So a lot of flexibility is there in the regulatory system, but this committee could not compose the license application. We're not in a position to do that.

What we are in a position to do, and did, is to recommend that DOE look carefully at that, and explore with NRC openly a licensing strategy, those

decisions and processes taking advantage of the flexibility that already exists in that.

The committee focused its recommendation on a pilot stage.

May I have the next slide, please?

And we tried to illustrate in an example in -- on page 113 of the report is where the example starts. It was a -- sort of a vision of how this might proceed in order to explain what we've envisioned for the steps of pilot operations, what would be learned from them, and the possible use of new knowledge as it appeared.

The first step would be, as the regulations require, a complete application for a construction authorization accompanied by the environmental impact statement, and supported by full repository safety analysis.

Now, that full repository safety analysis is required by the regulations, and by that it means as if you built that repository to that design, and filled it with waste to that design, and have justified the safety sufficiently for the NRC to authorize its construction. So it's --

CHAIRMAN HORNBERGER: Just a clarification. I thought I heard Tom Isaacs say --

make a distinction that the safety case was some kind of a plain English narrative to convey safety. And it seems to me now that you're changing and using this more in the traditional sense of a safety case with a full-blown performance assessment and analysis.

MR. BERNERO: No. No. What Tom was saying is the part of the safety case that is not contained in the NRC safety analysis requirements is that transparent, suitable for a broad audience, that part of explanation of safety. The NRC regulations require extensive information, fully consistent with the term "collection of arguments" to support safety, but the way it's laid out in the regulations it's tuned to the expertise level of the NRC, of the licensing process.

MEMBER GARRICK: So you don't think the SER achieves that.

MR. BERNERO: I doubt it. I would add this was not part of the committee work, but at your last meeting I heard Tim McCartin giving a talk on an attempt to get some transparent idea of what does the -- how does the repository work? How does it -- it's not a licensing basis. It's an exploration, and that's the only part.

So the safety case, in the fullest sense,

includes the transparent part for the broad audience. This is the responsibility of DOE, not NRC.

MEMBER GARRICK: But there's nothing that would prevent them from writing the safety evaluation report --

MR. BERNERO: Right.

MEMBER GARRICK: -- such that it accommodates what you're --

MR. BERNERO: Oh, yes. Yes. And, in fact, as I recall, somewhere in the report we encourage that -- that that would be very helpful. And considering that the NRC staff is initiating transparency efforts, it would be useful.

The next step --

MEMBER LEVENSON: Bob, would you perceive that the safety case would include any information not in the license application?

MR. BERNERO: No, I -- no. I'm well aware of what's required in the license application. It goes on and on and on, and it includes many things that are beyond the TSPA. You know, the quality assurance program, the performance confirmation program, so many things that are pervasive requirements.

And so the only thing that we don't see,

or we did not see evident, in the safety analysis and environmental impact statement combination that is needed for the application is this transparent part, this understandable part.

MR. ISAACS: I might just add that we heard from representatives from a number of countries, and I'm sure you have as well. And there are examples, I believe, of other places where more attention has been paid to trying to connect up to the local population. I think there are lessons to be learned in how to do that, in both writing and in the way in which one involves themselves with the affected communities.

MEMBER LEVENSON: I guess I'm just trying to clarify whether you perceive that this is additional information or is it just a matter of additional -- of a different presentation that is simpler and clearer.

MR. ISAACS: More the latter, I would say.

MR. BERNERO: Yes. Yes. Again, something that can be understood by a less expert audience would be extremely helpful.

Now, this application we urge -- in recommending a pilot facility, we urge emphasis on the learning cycles, especially with the first part of the

repository, whatever would be selected for pilot operations.

May I have step two?

The review and adjudication of this entire application, we fully expect there will be a host of contentions that will be screened and finally selected for the litigation. And this review -- this is the one the statute speaks of that's three years, and, if need be, an extension of an additional year. And this would be the main licensing process for the construction authorization.

Step three is the construction authorization is received, presumably, and the construction of initial surface and underground facilities per the design approved in that adjudication.

Now, the design in the application may be modified -- may be modified significantly through the adjudicatory process. Well, through the review process for that matter. But once authorized, we expect the construction of the initial surface facilities, not full scope but buffer storage receipt and storage of spent fuel, high-level waste forms, construction of the handling and packaging facilities, construction of packages per that design, and, of

course, construction of the surface and underground facilities for the emplacement of waste.

Then, if we go to the next slide, please, the application for license amendment would come as the next step. Now, this is something clearly envisioned in the licensing process. It is an amendment, actually, an application for an amendment to replace waste and update of the application.

It would include all of the new information, and there will be a lot of information. Presuming the pilot stage has some substantial size to it, there would be the experience of construction, checkout, and test, and, for instance, the surface facilities for handling spent fuel and other forms of high-level waste.

These are state-of-the-art things that don't pose a lot of unknowns, but the packages will be fabricated. There will be some of these C-22 or whatever alloy packages, and there will be welding equipment, automatic welding equipment, that has to be made and qualified.

There will be -- assuming present design parameters prevail, there will be stress relief mechanisms, laser peening or some other mechanism for stress relief. Those will be checked out, tried,

qualified.

And then, of course, the emplacement of the high-level waste -- at this stage all you can do is build the equipment, but you can certainly use mock-ups of some sort to go through the motions of moving this equipment into its semi-remote and remote-handled modes, to get it down into the drifts located, set on the inverts, testing the mechanical aspects of installing drip shields over it in sequence and backing out -- this is to me -- I use an analogy sometimes, it's a hot cell with the back doors open.

And this is a major radiological, mechanical challenge, this sort of thing. And this can -- this -- you will have experience in construction and checkout of that equipment for emplacement.

As drifts are excavated, there will be in situ monitoring and testing. The performance confirmation program will be active at this stage. So a lot of information should be available there, and there should be data and analysis from external activities.

And I would remind you that external activities will include not only things that are explicitly part of the performance confirmation

program but other publicly accessible information, dialogue with the Nuclear Waste Technical Review Board.

As I understand it, the Nuclear Waste Technical Review Board will be active until one year after waste is emplaced, and they will be conducting their activities, reviews, questions, so there's a lot of external source for that.

May I have the next slide, please?

So we foresee that step five, that the NRC -- we know the NRC will offer an opportunity for prior hearing, and we expect that people will seek a prior hearing, and they will be able to look at all of that information that is now available and draw from it some contentions that are arguably acceptable for that hearing. And we just presume that the NRC will grant that prior hearing.

I might add one of the Commissioners remarked in the March 3rd meeting that he expected a prior hearing for that. So that hearing and adjudication we expect would occur. It probably wouldn't be as lengthy as the first hearing, because it has a narrower scope than the first hearing, but it would occur.

And step six, it would be reviewed and

adjudicated in order to grant the license to receive and emplace waste. So up until this time, step six, this is tracking just what's in the licensing documents, Part 63 and related documents.

Now, step seven, there would be now authorized the receipt of waste into buffer storage, and the authorization to package and emplace waste in the pilot scale, the first part, with the focus on gaining operational test experience.

As was said before, the committee couldn't write the application or compose a credible application, but we are urging this pilot operation to look for things that can be learned. So step seven is this receipt of waste and buffer storage and progress with the packaging and emplacement at a more measurable or slower pace.

And in the report there is discussion of the uncoupling of the rate of receipt and the rate of emplacement. This is a repository. This is not an MRS. So it will have -- under the statute it will have the authority to build up buffer storage to receive waste at a higher rate than it is emplaced, but it should not just stop emplacing or stop emplacement testing in order to receive waste.

May I have the next slide, please?

Now, here is a reevaluation. Step eight, reevaluate the licensed repository design, which is now in use in hot operational tests, and there is a lot of information to be gained from there.

The hot operational test experience, actual package fabrication, welding, emplacement -- I remind, again, the radiological testing -- you know, I remember when reactor steam generators were first being replaced, and the boiling water reactor -- reactor coolant recirculating piping, when they were first replaced the radiation doses were really significant.

And ALARA programs were very effective in cutting that down and optimizing those operations to control occupational exposure. And I think there's a role for that here, very important role.

There will be more in situ monitoring and testing, and that recommended science and technology program, by this time -- mind you, this is maybe even 10 years hence from today. That program will have a role as one of the sources, external sources, of activity. And the final steps of the TRB may be significant in the role, although a year after the waste begins to emplace is the authorized life of the TRB.

So step nine, this is the additional licensing step if the information warrants. If DOE at this stage has overwhelming confirmation of the reference or baseline design that has gotten through to this stage, well, certainly they would conclude it's not worth changing it, and they could continue scheduling.

They might prudently look to another milestone for reevaluation, but they could conclude to proceed. We don't think that would happen. We think there is enough to be learned that a reevaluation is warranted, and that reevaluation would indicate appropriate changes.

They might be improvements for better handling, better cost. They might be improvements to reduce uncertainty. And certainly, anywhere along the line if new information revealed something adverse to the safety argument, that would have to be brought into the process immediately, because it would upset the previous conclusions and authorizations.

So, next slide, please.

There is an additional step, if the information warrants. And as to iteration of the safety case and what we were discussing just a little while earlier, the committee has used the collection

of arguments description for the safety case.

The NRC does not explicitly use that term in the regulations, although in the last version of the Yucca Mountain Review Plan the term was used. But the NRC content, the technical content of the application requirements to be complete, in the committee's view satisfies the full spectrum of the collection of arguments for a safety case, except for that simple-to-understand transparent one. And that's not explicitly required, but it would be very helpful in the license application.

So we use the plural because the NRC license application carefully distinguishes between preclosure safety to justify a finding with reasonable assurance and post-closure safety to justify a finding with reasonable expectation. And we just recognize that there's a duality of form, so we use the term "safety cases" for preclosure and post-closure.

So that is the end of our presentation, and we'd be happy to answer questions.

CHAIRMAN HORNBERGER: Thank you, Tom and Bob. Mike?

MEMBER RYAN: Thank you both very much. It was an interesting presentation. I guess I'll direct my question to either of you or both. You

know, having been a licensee in a couple of different lifetimes, the process you described in particular, Bob, is one that's common to all licenses.

You know, you get an initial license after some submittal and evaluation, and then, based on the licensed activity, there's a process for updating information about the activity and then modifying the license in some way, usually called an amendment. You know, some licenses I've worked with have 107 amendments over the course of 20 years. So it's temporally the same.

In other words, it happens periodically over time based on changes in conditions, and then it happens, you know, based on specific information or changes in operations, those kinds of things. I'm sure that's true in reactors and other NMSS licensees, and so forth.

What's different about this? I really don't see where this isn't the same animal with a slightly different set of definitions. I'm trying to understand, is there something new and different here that hasn't been done? And I will accept that one exception of the simplified descriptive material that's for a broader audience. What's new here? Is there anything new?

MR. BERNERO: No. No. No, there isn't really. That's why the committee concluded that the NRC licensing structure was compatible with this. As I mentioned earlier, if you go in and study the theology of licensing and 63.32, 63.33, and on, and 63.44, they duplicate many of the opportunities that are available for any license. That is, you are authorized by license to do something under a host of conditions and with an approved design, and --

MEMBER RYAN: So adaptive staging, then, is just kind of a different buzz word?

MR. BERNERO: Adaptive staging is just trying to build in the learning process, because you have to recall this committee started its work in early 2001. And the baseline design and schedule for DOE at that time was what we characterized as linear staging. And Tom -- Tom is very familiar with that.

He says, "Here's the whole thing, and we're going to start applying for this license and apply to emplace waste as soon as we can. And we're going to get the shipment waste up to 3,000 tons a year, and put it in the ground." You know, it's a linear process, just --

MR. ISAACS: I would just add to your point that from a licensing perspective I think you're

absolutely right. And as I mentioned early, most of the focus -- and, in fact, the customer for this was the implementer, and it's a difference in the recommendations to the implementer and how they approach overall implementing -- designing, creating, and implementing this program, of which licensing is an important but not sole part of the steps that are necessary in order for it to be successful ultimately. And I think that's the distinction.

MEMBER RYAN: And I appreciate the communication and public involvement aspects of your recommendations as -- as different from the licensing aspects, clearly, but -- and I think you just made an important point that the advice isn't about licensing; it's about how to apply for a license. Is that really what the difference is?

MR. ISAACS: You know, I often say it's less what you say and it's more how you behave, if you want to go to these things. And what we're trying to do is engender some recommendations about how DOE and the program should behave in terms of carrying this program forward, in terms of putting focus on learning, putting focus on safety, being less schedule-driven, being less concerned that they might learn something along the way that would cause them to

want to adapt, and that that might take some additional time.

It's that approach of how they behave, how they interact with other parties that have a stake in this, that we think is important. We were glad to see that we didn't see a need for any major change in the licensing process in order for DOE to do that.

MEMBER RYAN: Thank you.

CHAIRMAN HORNBERGER: John?

MEMBER GARRICK: I have a lot of questions, and I'm not going to get to them, but I'll hit you with a few. I'm a great believer in evidence-based decision-making, and right now I'm wrestling with, what is the evidence that your report doesn't become the manual for how to accommodate indecision in project management? And that worries me a good deal.

You use the word "safety case," and if you take the proposed applicant's safety case as it now stands -- and certainly we have not reached any kind of decision on it, and I'm talking only about ACNW, not about the NRC -- you would have to say that there's not much of a safety issue here. So why monkey around with it, especially if you put it in the context of the global issues of risk that we, as a society, have to worry about.

We're not going to -- if you can accept the performance assessment and the other elements of the safety case, this is not a big deal. So I worry a little bit about the implications of this on a project that has the potential of getting through the review process and not being much of a burden on society from a safety case, and especially in comparison with other things that we face.

And I wonder about the timing. You say that this was motivated for the much broader question of high-level waste repository design than the Yucca Mountain, but you're fooling yourself. This is all going to be about Yucca Mountain, and it -- whatever impact it's going to have is going to be on Yucca Mountain. It's a singularity issue.

So I just wonder at this point in time, when they're about to submit a license application, if the suggestion of a whole new approach -- and we're trying to rationalize here as we discuss this that this is nothing new, that the current licensing system can accommodate it, but I'd have to be convinced of that.

I think that the one thing I've learned in managing engineering projects and advising on large engineering operations is the one aspect that we don't

do enough analysis of is the downside of any change that we make. And I just am curious if you've really thought about the implications and the downside that this might have in terms of this project.

You know, there's enough complications as it is. And I don't see anything different here, frankly, that's not accommodated by the current mechanisms that are in place. On the other hand, I worry about how it's going to be used and whether it could be used as an instrument of delay, an instrument of confusion, that could further complicate.

What you're doing -- a colleague and I wrote a paper a couple of years ago on the decision-making process associated with Yucca Mountain. And we had in this decision analysis diagram a new information loop. And what you're talking about here is the ability to accommodate that information loop, that recycling loop, and, in principle, that's a very nice idea.

But I do have some real concerns about the timing of it, about how it's going to be -- you know, it may be intended for one group, but it's probably going to be used by another group. And I just wonder if you've had the kind of discussion that is necessary to understand the full implications of something like

this, because you're an important body. There's a lot of people looking for mechanisms to further frustrate this complicated project. And this certainly looks to me like it has the potential to do a great deal of that.

MR. ISAACS: Yes. I mean, I don't disagree with a lot of your concerns, first of all, and the committee had lots of discussion, and, in fact, was required to and did include a fairly extensive section on potential downsides of this approach, nor are we saying that this is somehow so intuitively obvious that only a fool would recognize that this is the way to go. I mean, we recognize that there is some risk inherent.

On the other hand, we see a somewhat different balance I think than some of the things that you put forward here. From a purely technical point of view, there are a lot of folks who would argue that this thing is of such low risk that why worry about it at all? Nonetheless, it's going to be licensed, and it's going to have huge controversy associated with it. And it's not about only determining what the risk is.

It's a societal decision, and that societal decision in other countries has wreaked havoc

in a number of cases because they haven't carried out the program in a way that brought along the other institutional factors successfully. So we have to at least look at not just what we think the risk is.

It wasn't that long ago, you know, that we thought the groundwater travel time to Yucca Mountain was many tens of thousands of years. We now know it's different, and so we are suggesting that it is possible -- we're not saying it's likely -- it is possible that we might learn something early on in this process, either for preclosure or post-closure, that might cause us to say, "You know something? We really ought to think about this carefully."

If everything is going exactly the way we anticipate, we don't see any large delay in this program. I think we see something that doesn't get anticipated.

MEMBER GARRICK: Well, I --

MR. ISAACS: And let me just make one last point, because you said this is Yucca Mountain alone. I don't think it is. We tend to be very parochial here, but there are a lot of folks in other countries who are looking very carefully and who were involved in this Academy report.

We had representatives from other

countries -- from Europe and Japan -- on the panel. They are also very interested, because some of them are doing quite well, as you know, and others are doing rather unwell in terms of carrying forward programs. So we really were trying to help not just the Yucca Mountain program, although largely the Yucca Mountain program, but to build a generic case for the kind of principles that would help across the globe.

MEMBER GARRICK: Yes. The one thing that I wanted to comment on was the public outreach business, because I think that is very important. And if there was anything the Academy could do to enhance that exercise, I think everybody would appreciate it.

But I have to say that in the five or six years that we've been having public fora meetings on Yucca Mountain, and trying different venues and trying different methods of creating interest in the public, in my opinion it's been very unsuccessful. And I don't know what this would add to it.

It's been unsuccessful in the sense that the same people show up every time. They're professional public representatives, and one doesn't get the feeling that we're reaching out to -- we're getting the public at all.

And if you -- we're getting institutions

and we're getting representation, but it's the same people all the time and the amount of interest is extremely small, limited, and I'm just curious about how this is going to change that.

But if it is something that could change that, that would be a major contribution. But, again, I think we get all hung up in the policy and institutional things, and I sit back and I ask, "Well, what are they contributing to make this a safer facility?" And I have to say that I don't see it.

MR. ISAACS: If I had more time -- let me -- if I had more time, I'd be happy to go into it in detail. Part of the problem I believe on the public -- acceptance of public information is you're spending all of your time on that small group of people, trying to convince them through argument to change their mind. And I don't think that's necessarily the focus of what it means to --

MEMBER GARRICK: We don't try to convince them to change their mind. That's an absolute incorrect statement. We let them express their views very much as they want, and we're not challenging those views. We --

MR. ISAACS: Yes. But you seem to be focused on that small group of people. And what I

suggest is that providing public information -- and even public participation -- is not at the heart of bringing around public acceptability. There are other things that folks can do, and one needs to look to other countries, for example, that can be done.

Just to give you a shorthand -- people have confidence when somebody that they are looking to they believe is competent and has their best interests at heart. When you get on the airplane it isn't because somebody has told you how the airplane works. It's because you have confidence in the pilot, that he's competent, and the people who put the plane together --

MEMBER GARRICK: Tom, I don't need those kind of speeches. I know that.

MR. ISAACS: Okay.

MR. BERNERO: John, I would like to address your earlier remarks with a couple of comments. One is this committee was told what is fairly obvious to many people -- we were told by the DOE leadership at our August meeting last year that the cost of this program is exorbitant.

You know, that adding things like titanium drip shields to reduce uncertainty has a price tag, and one of the avowed objectives is to have a more

reasonable approach. That's why a science and technology program is recommended and followed.

But if you look at the adaptive staging recommendation, where you suspected there might be a pitfall in the timing, in that example I cited that we have in the report the first step is essentially what has to be done anyway to get the license.

There is a nuance of focus on the early learning from the pilot stage, but you're going to check package fabrication and weld annealing or stress relief anyway.

And the second step, the authorization to emplace waste, is also exactly or essentially what's in the regulations. It has to be done anyway. And that's why, as Tom said in his earlier presentation, in the long run this committee believes that this is the most effective way to proceed from a timing point of view and cost point of view, to get waste into the ground in a sound manner.

CHAIRMAN HORNBERGER: Milt?

MEMBER LEVENSON: I guess I've got a couple of questions. One is the difference in perception from what you've said, in a sense. You've said it's very much like what we are doing now, that the original license application would have to include

all of the information over the total lifetime of the repository.

But somehow when you read the tone of the staging there's an implication of something quite different. I think this is part of the problem of what we're talking about. For instance, on your slide you have the existing system is -- amendments can be done any time information becomes available, either positive or negative.

There's an implication in one of your slides -- it says stages separated by decision points. Now, in response to John's comment, in many engineering projects a decision point is a hold point. So I guess my question is: what do you mean by "stages separated by decision points"? Are these points identified in advance where things do have to stop and be reevaluated, which would be a significant change from what we do now.

MR. ISAACS: We state in the report -- first of all, keep in mind that a lot of those decision points are not regulatory decision points. They are internal programmatic decision points. Some of them are contiguous with the regulatory.

The second one was we point out in the report that a decision point does not necessarily mean

a stop in the program. It can, if the implementer decides it's in their best interest. But if things are going well, and things are going as anticipated, then it is entirely possible and it is reflected in the report that a decision point could go forward and be considered while the program continues forward in its implementation. So it does not require a stoppage in the point.

It simply says let's take stock at certain points in this program. It's not, let's get a license and then spend 30 years putting 70,000 metric tons in the ground and we'll see you 30 years later. It's let's take stock on a routine basis, see how things are going, see whether they're going well, are there things we can improve, and continue in the meantime.

MEMBER LEVENSON: So if you're advocating fixed decision points, that is quite different than the existing system.

MR. ISAACS: I don't know what you mean by "fixed decision points."

MEMBER LEVENSON: Originally, in the submission, would you say that this is stage one and there's a decision point there, and this is stage two and there's a decision point there, this is stage three --

MR. ISAACS: They may have no regulatory impact, these decision points. They may be internal to the implementer.

MEMBER LEVENSON: I'm not talking about the word "may." I'm talking about in the original application, as you envision this, would there be specific decision points specified as stages?

MR. BERNERO: Yes. There would be an overall strategy of what would be addressed, and, if possible, a delineation of even the things that would be done without NRC review and approval.

MEMBER LEVENSON: Yes, but --

MR. BERNERO: The 63.44, to get as much flesh on those bones in the application.

MEMBER LEVENSON: Well, I guess my problem is we see so much paper that if you're telling me something has no regulatory impact, why is it in the application? We don't need extra paper.

MR. ISAACS: Again, it's -- many of these decision points will be for the implementer to carry out their program.

MEMBER LEVENSON: Then they don't necessarily need to be in the license if they don't have regulatory implications.

MR. ISAACS: It may not be -- in some

cases, they may not be in the license.

MEMBER LEVENSON: That's what I'm trying to sort out is -- is what your guidance is to the people doing something isn't directly relevant to this committee. We're focused on the regulatory --

MR. ISAACS: I believe the answer -- in some cases a decision point might be to go forward after receiving a construction authorization and constructing might be to go back and ask for a license to receive and emplace. That would be a decision point. It would clearly have impact on the licensing process and on the NRC.

Assuming they get that, they would go forward with a pilot. If the pilot showed that everything was going just the way people anticipated and we didn't anticipate changing anything, that would be a decision point, to come to that conclusion. It would not necessarily have any impact on the licensing process. The program would continue forward.

It would simply be a marker to the implementer that this is an appropriate thing to think about after doing initial emplacement. If something untoward were to happen, yes, they would go forward to the NRC.

MEMBER RYAN: I guess I'm struggling with,

why is that different than the way a licensee in any licensed facility behaves now?

MR. ISAACS: I don't --

MEMBER RYAN: I mean, you're putting a lot of emphasis on decision points and, you know, these kind of buzzy words about adaptive staging and decision points. But that's no different than what's done now.

MR. ISAACS: Well, I would maintain that if you look at the way the program up until very recently had been organized, it was to receive a license to emplace, and then proceed to ramp up rather quickly to emplace 3,000 metric tons a year for 23 years. That was the only anticipation.

There was no anticipation of any take-stock in between. There was no anticipation of any regulatory position in between a license, at which point in time there had been no waste in the ground and a license at closure some 30 years later when 70,000 metric tons are in the ground. We are simply trying to say there probably is a set of -- there are a set of steps that might be prudent to think about, and the implementer ought to think about them in that interim stage. That's one example.

MEMBER RYAN: But that's not different

than anybody submitting an application for any facility and then having it developed through the license review process into a license with a set of operating conditions.

MR. ISAACS: I think we're in violent agreement. I don't think we're arguing here.

(Laughter.)

MEMBER RYAN: Okay.

CHAIRMAN HORNBERGER: Milt? We are going to have to break in just a minute, and so I'll try to be brief. Both of you recall, I think -- Bob, you were wearing a white hat and Tom was wearing a black hat at a meeting in Santa Barbara in 1989 that resulted in our rethinking a document from the Board on Radioactive Waste Management.

And for years, of course, I have been a supporter of -- and I think that's true of all of us -- of what we might call a learn-as-you-go kind of approach.

So to the extent that we are all in violent agreement, as you said, what I'm still trying to sort out -- and I think that's what we all are -- is exactly what's different here. And so it strikes me that what I've heard -- and you can tell me whether I'm right or wrong -- is that you envision, first of

all, that there are these explicit -- explicit steps with decision points, whatever those words may mean, but they are explicit in the upfront planning.

And second of all, you have what we might call an EEG-type group. That doesn't exist now, and you're recommending that for Yucca Mountain.

Are they the two main things that you see as different from what is going on now?

MR. ISAACS: I think that's not a bad call. I think if you had the other members of this committee in the room they would have a variety of things that they hold near and dear to their heart as key elements in this program.

There are a number of people on the committee, for example, who felt very strongly that a periodic iteration of the safety case -- whether or not it was required by the license or the regulator at any point in time -- was very important to the process. Okay. So there would be people who would have argued very strongly.

There are people, for example, who were brought into this from a social science point of view and a political science point of view who are not technical people who argued very long and strenuously and effectively on how to shape this program in order

to engender the kind of public confidence and public acceptance that we feel is necessary for this program to be successful, not just to get the license but the broader context. They would probably argue that that aspect of it was also important.

MR. BERNERO: Yes, I would agree with your characterization, George, except I would say rather than the explicit or open decision points that the difference is an explicit learning-driven process rather than what we characterized in the report as the linear process of the baseline design. Just here's the design, authorize it, build it, emplace it, and close it. That's the difference. That's what's different.

CHAIRMAN HORNBERGER: I suppose that we never anticipated that such a linear process -- I mean, again, in 1989 we started out saying, "No, you can't design this like you design an airplane, because that just doesn't work that way." So I never -- we never anticipated that that's the way it would work at all.

Just one clarification on something you said, and then we do have to break. When you say a periodic iteration of the safety case, how periodic? Annual updates of the -- and this would be the whole

TSPA as well as this plain English narrative. Annually? Every three years? Every five years?

MR. BERNERO: Well, it's as warranted.

CHAIRMAN HORNBERGER: Okay.

MR. BERNERO: As warranted. There's no need -- we had active discussions of whether you should put a period on it. If nothing else has happened, NRC current regulations require I think it's every two years an update of information.

CHAIRMAN HORNBERGER: Yes.

MR. BERNERO: You know, if there's no amendment or something else. So it's as warranted.

MEMBER LEVENSON: One other comment on this. The linear may be something that you talked about within DOE, but that I think just represents the inexperience of DOE as being a licensee, because if we look at WIPP they started down exactly that same road. NRC has a very small role in WIPP. It's only the shipping containers, but they are now on amendment either 21 or 22, when originally there was no intentions to do anything.

And I think that the project -- what we're talking about, as Mike points out, it's pretty common to almost everything that's licensed. It's just NRC has almost had nothing licensed, and they've got a

learning curve.

MR. ISAACS: Just on the last comment, one, I think I agree entirely with George that we were trying to put programmatic flesh around the bones of rethinking high-level waste. Nobody here was intending to do anything different. And in some cases, perhaps transmitting the obvious to the implementer is an important thing to do when the implementer has had no experience.

CHAIRMAN HORNBERGER: As interesting as this is, and we could obviously carry on for another hour, but we can't, because we have a hard constraint. We have to reconvene downstairs in the auditorium promptly at 12:30, so we are going to break for lunch now. We're in break.

(Whereupon, at 11:49 a.m., the proceedings in the foregoing matter went off the record until 12:33 p.m.)

CHAIRMAN HORNBERGER: The meeting will come to order.

This is our session. It's a followup session on the Transportation Working Group that we ran last November. And our cognizant member -- that is, the person who is in charge of this working group -- is Milt Levenson, and I'm going to turn the meeting

over to Milt.

MEMBER LEVENSON: Good afternoon. I'm Milt Levenson, the Chairman of the ACNW's Transportation Working Group. The working group, in this case, is made up of all four ACNW committee members.

Today's meeting is a follow-on to the working group's November meeting and will feature presentations by representatives of the State of Nevada, and, in addition, staff from the National Academy of Sciences will present an overview of a study it proposes to perform on the risks associated with the transportation of spent fuel.

While the transportation of radioactive materials has a number of aspects, Congress has divided the responsibility for those aspects between Department of Energy, the Nuclear Regulatory Commission, the Department of Transportation, states, and now the Office of Homeland Security.

The working group is limited to addressing those issues for which the NRC is responsible.

As with the November meeting, we again plan to focus on the technical aspects of spent fuel transportation package design, analysis, and testing methods, and transportation experience to determine

whether sufficient evidence exists or additional evidence needs to be obtained to substantiate that spent fuel can be transported safely.

The ACNW will use this information to make recommendations to the Commission as necessary on the technical aspects of the transportation of spent fuel. Relevant experience for obvious reasons that has not been addressed by the working group is the experience gained from shipping tens of thousands of nuclear weapons multiple times around the country.

I want to caution all participants in today's session that we intend to stick strictly to the time schedule in order to allow time for comments and questions from the public before the break and at the end of the day.

It is requested that when speaking you first identify yourself, use one of the microphones, and speak with clarity and volume so you can be heard not only by us but by the court stenographer.

We have received no requests for time to make oral statements and have received no written comments from members of the public regarding today's meeting. I would like to thank all of today's participants for taking the time and making the effort to participate in this meeting.

We will now proceed, and I will call upon Mr. Kevin Crowley, Director of the Board on Radioactive Waste Management, the other NRC.

MR. CROWLEY: The first NRC.

(Laughter.)

I'd like to introduce my colleague, Joe Morris. Joe is a senior staff officer in the Transportation Research Board. The study that I'm about to describe for you is a joint project between the Board on Radioactive Waste Management and the Transportation Research Board.

The overheads that I have prepared are fairly self-contained, and so given the limited time what I'm going to do is just skip through them and hit some high points. So why don't we go directly to the next set of slides.

This is a self-initiated study of the National Academies, and we initiated this study because we believe that transportation of spent fuel and high-level waste could, in fact, turn out to be the rate-limiting step, not only in the United States but in any other country, of efforts to dispose of radioactive waste.

With respect to the U.S. program, many decisions with respect to transportation have yet to

be made in terms of modes, routes, and schedules. As you all know, potentially affected parties, including corridor states and Nevada, are concerned about the potential impacts of a large-scale transportation program.

The future initiation of a program to transport spent fuel and high-level waste to Yucca Mountain is at least seven years into the future, and probably closer to a decade. And, therefore, there is still a lot of time to have an impact on any plans that DOE has to transport spent fuel and high-level waste, and that's the reason that we thought that starting a study now would be timely.

Next slide, please.

This slide outlines the various steps that we went through in developing the study. Let me just point out a couple of things. That the Board on Radioactive Waste Management and Transportation Research Board held a workshop at one of its meetings in September of 2000 where we heard from the federal agencies and we heard from NGOs.

And it was clear from that workshop, as pointed out in the last couple of bullets, that there was what I'm calling here an opinion gap. Originally, I called it a perception gap, but I got a lot of

pushback on that saying, "Well, all you want to do is change perceptions."

So it would appear, to us anyway, that there is a wide range of views out there about the safety and security of spent fuel and high-level waste transportation. There is a group of experts who believe that it has been transported safely in the past and continues to be transported safely in the future.

But there is another group out there that would include some states, certainly Nevada, but also corridor states that say that past experience is not necessarily indicative of future success. That there are other factors that need to be considered that haven't been considered in the studies that have been done to date on the -- particularly on the risks of spent fuel transportation.

Next slide.

So we developed a prospectus for this study, and at the time we were developing that we undertook a survey through our National Academies Press of about three dozen organizations, including states, NGOs, professional organizations, asking them, what are your concerns about a transportation program? What would you like to see addressed in a National

Academy study? And that was -- that helped to inform the prospectus that we put together.

We actually initiated the project in November of last year, and the first step in doing one of our projects is to put together an expert committee. So we solicited nominations for the committee. We received about 250 nominations for about 15 slots.

The committee slate has been approved by Bruce Alberts, who is the Chairman of the National Research Council and President of the National Academy of Sciences. And I was actually hoping to be able to announce the slate today, but unfortunately the paperwork isn't finished. It will be the end of the week before we're able to announce the slate and post it on our website for public comment.

Next slide.

This project is being funded by a wide range of study sponsors, which is something that we like to see on a project. We like to have all sides of the issue involved in the project, through sponsorship if possible. To date, there is the list of the sponsors.

NCHRP is the National Cooperative Highway Research Program, and even Nye County, Nevada, has

committed a small amount of funding for the project. And we're still talking to other potential state and local sponsors.

Next slide.

We have a formal statement of task for this study, but I thought that rather than putting that up I would just pose for you in simple language some of the questions that we hope to address in the study.

The first one is: what are the risks for spent fuel and high-level waste transportation, both in terms of accidents, terrorism, and also from what you might call routine exposures? How well do we know those risks, and how do they compare with other societal risks? I think this comparative approach is going to be very important.

What are the principal technical and societal concerns for transporting spent nuclear fuel, high-level waste over the next couple of decades? In terms of the technical concerns, something that might be of interest to this body is that one of the things we'll be looking at is the package performance study that is being done now by the Nuclear Regulatory Commission.

The third bullet, what can or should be

done to address these concerns? And also, I didn't point out before, but the study has a U.S. focus. We do have one foreign committee member on the committee, and we will look at the experiences that have come out of foreign spent fuel transportation programs. But in terms of the focus of this report, it's on spent fuel and high-level waste transportation in the United States.

Next slide.

All right. This just lists some of the transportation issues that we hope to address in this study. I'm not going to read these to you. I would point out, though, that intermingled here is technical issues, policy issues, and institutional issues.

What can the study accomplish? Well, these are the things that we hope will come out of this study. It can help make the risk analyses transparent for -- I don't know about the rest of you, but I've looked at some of the reports that have been done. They're pretty opaque. I hope we can help make those reports a little more transparent.

I hope we will be able to suggest changes to transportation systems to improve both their technical soundness and their safety, and suggest ways to improve public participation and trust-building

activities. We started talking about those in the last session before lunch.

Certainly, the public participation, trust-building, the societal confidence issue is a very important issue for radioactive waste transportation.

Next slide.

Well, I can't tell you who is on the committee, but I can tell you the kinds of expertise represented by the 15 committee members. It was a very difficult committee to put together, in part because we had so many good nominations, in part because in addition to trying to balance expertise we were also trying to balance biases, which is very difficult to do, because this is a very contentious issue.

Next slide.

But in terms of how we tried to balance the committee, these are some of the attributes that we looked for. For the chair, we have a strong leader with national policy experience who is not associated with either nuclear waste or transportation issues. We wanted somebody who understood very broadly how national policy is made and how technical issues contribute to national policy. But we also didn't

want to have anybody who was perceived to have a stake in the outcome of the study.

The vice chair is a very strong leader who is a nationally-recognized transportation expert, but also who is not associated with transportation of nuclear waste. And then, we had these other committee balance factors. We do have a number of committee members who have nuclear experience, but we also have committee members who don't. And so we tried to achieve a balance that way rather than trying to make sure that all sides of the transportation question were represented on the committee.

Next slide.

We're planning to do the study in two years. We'll have seven or eight committee meetings. We're planning for seven, with an eighth contingency meeting.

The first organizational meeting will be held on Friday, May 16th, and Saturday, May 17th, here in Washington, D.C., at our building on 500 Fifth Street. The 16th will be an open session, and we're going to be inviting study sponsors and other interested groups to come in and talk to the committee about the study.

We have not scheduled any of the other

committee meetings at this point. The second meeting will likely be held in Las Vegas, but we don't have a date for that yet. And we're planning to issue the final report in early 2005.

Next slide.

Okay. I want to close by mentioning another study that some of you may have heard about. It actually came as a bit of a surprise to us. In the fiscal year '03 Omnibus Appropriations Act, there was a congressional request to the National Academies for a study of the procedures by which the Department of Energy uses to select routes for transportation of research reactor spent nuclear fuel.

This request was not put in by us. It was put in by a concerned Senator. It originally appeared in the energy bill which failed, and when that bill failed we had assumed that this was the end of it, and then it popped up again in this Omnibus Act.

It is to be a six-month study. It is to be funded by the Department of Transportation, who is to get us funding within a month. Now it's been about, what, six weeks since the Act was passed, and we haven't seen any funding yet. But we're prepared to begin that study once DOT provides funding.

We had originally thought about perhaps

trying to fold it into this study that I just told you about, our broader study, but we decided that would be a distraction. So what we're planning to do at this point is to appoint a panel that might include some of the members of our broader committee, plus some other people, to do this study. We'll get this done, and then the results of the study will be provided to Congress, and it will feed into this broader study that we're doing.

Last slide.

This is mainly for the audience, because I have the staff for the ACNW on our contact list. But for those of you who are interested in learning more about this study, if you send an e-mail message to Mrs. Laura Llanos, she can put you on our electronic notification list to get copies of agendas, meeting dates, and that sort of thing.

And if you like, you can check our current projects database, which also lists all of the committee meeting dates once we have them, and we'll list meeting agendas, and also we'll list abbreviated minutes from the closed sessions that the committee has.

And that's all I have to say. Thank you.

MEMBER LEVENSON: Thank you, Kevin.

George, any questions?

CHAIRMAN HORNBERGER: Kevin, you mentioned that it's a U.S. focus, but you have at least one member that is a foreign national I guess. So your view, though, is just to use the international experience with transportation to basically see how it applies to the tasks at hand, rather than to do an in-depth study of international experience? I wasn't quite sure exactly what depth you were going to pursue that.

MR. CROWLEY: I think the report has a U.S. focus in that the findings and recommendations that will be offered will be focused on, how can we improve the U.S. program? And probably it's hard to know exactly at this point, because we haven't really had any committee meetings yet, but it will probably be focused on things that DOE needs to do to improve its program.

Now, in order to do that, there's a lot of -- there's a wealth of experience out there, not only in the United States but abroad. And that experience includes not only direct experience with transporting fuel, but there are also good studies that have been done. There have been safety studies done, terrorism studies that have been done abroad, and I hope that

we'll be able to take advantage of that material as well.

CHAIRMAN HORNBERGER: The other thing that occurred to me, it strikes me that to a certain extent terrorism issues are best discussed not in public meetings. And you're not going to be able to do that, so I guess to a certain extent you're going to sort of take a broad brush approach there.

MR. CROWLEY: Four or five -- I think five members of our committee have the appropriate clearances, as do the staff, to look at classified documentation, if there's a need to do that. I suspect that we will have a need to do that during the study.

There are no plans to produce a classified report, but we recognize that if we're going to do an appropriate job in the security area we're going to have -- we may have to look at some classified material.

CHAIRMAN HORNBERGER: My final question -- the timing, you plan to issue a report in 2005. And to a certain extent, I guess that builds in enough time to get your whole committee up to speed. It strikes me that this committee, like lots of research committees, has to balance things, and you basically

go after people who don't have nuclear knowledge.

And so to a certain level, we're tying our hands by not being able to take advantage of people's expertise at the -- but gaining, of course, by engaging people who don't have that background. But it's also going to take some time to spin the study up.

MR. CROWLEY: I think it will. I would like to think of it in a slightly different way, George. The people that we're putting on the committee have -- they all have expertise, their expertise in things that are related to nuclear waste transportation, but they don't have experience with nuclear waste transportation.

For example, many of our transportation experts are truly transportation experts. And if you went into the transportation community and said, "Have you ever heard of this person?" they'd say, "Oh, yes, this guy is a leader in the field."

When you get smart people like that on committees, it doesn't take them very long to come up to speed on the details of, okay, I know transportation, what more do I need to know to know -- to be able to, you know, have informed judgments about transportation of radioactive waste?

The other reason, though, that we need to allow some time is, if you remember the list of expertise areas that I put up, this is an extraordinarily diverse committee. We have policy experts, technical experts, and social scientists. And as you know, just getting those people to talk to one another in a way that is understandable, so that they use -- they mean the same things when they use the same words, that takes time.

MEMBER GARRICK: Kevin, this is going to be a very important piece of work. We're looking forward to it.

I wanted to ask you if you could elaborate a little bit on the form that you intend to employ for answering some of these questions, particularly you say, what are the risks for spent nuclear fuel, high-level waste transportation? And how do we know them, and how do they compare with other societal risks?

Is this going to be kind of a qualitative list of contributor to risk? And are you going to attempt to make some sort of an importance ranking of them? Just what you envision at this point as the figures of merit that you're going to employ.

MR. CROWLEY: Boy, I sure hope we can do more than just a qualitative ranking of risks. I hope

-- we have very -- we have appointed some very quantitative risk analysts to our committee. In fact, we've got three very quantitative risk analysts. And I hope that we can do a quantitative job on that. Of course, it's always a little hard to know going in, but that's our hope.

MEMBER GARRICK: Right. And the problem is that a lot of these risks have not been quantified. You can't expect the committee to carry out that assignment. But to the extent that you can characterize these risks in a quantitative form, you intend to do that.

MR. CROWLEY: Yes.

MEMBER GARRICK: Thank you.

MEMBER LEVENSON: Mike, you're next.

MEMBER RYAN: I second John's comment. I think it will be a real important study. Is one aim of the study to try and pull together what our fractionated pieces of the database on transportation risks and accident information, or --

MR. CROWLEY: Yes, that's part of it. And also, it's not only fractionated, but it's fairly opaque. And I have found -- because we've already started pulling together a lot of the information. And, in fact, some of the sessions that this committee

had a couple of months back were very useful in helping us to jump-start that.

The other thing I found is that some of the data are pretty squishy. When you start to push on them, you say, "Well, what do you mean you've had 3,000 trips?" Is that 3,000 casks? You know, exactly what does that mean? So making sense of all of that is going to take some time.

MEMBER RYAN: That was really my second question is that there really is an uncommon coinage for a lot of this information. If you can put some rationale to that with a common denominator, that would be a big help.

MR. CROWLEY: I agree.

MEMBER LEVENSON: Well, I want to thank you, Kevin. I think that the questions John asked -- you're going to find that there is no common metric when you try to compare waste -- risks in the -- not just transportation, but risks associated with radiation have various metrics. We have dose, we have etcetera. You get out into the field of other risks, good luck.

MR. CROWLEY: We talked to one of our committee members about this. He said, "Well, maybe the first thing we should do is a harmonization study.

And then, once we do that, then we should do the transportation study." I said, "We only have two years to do the whole thing."

No, I agree. It's going to be very difficult to do it, and we may not get all the way there. But I think if we can make some sense out of this, that in itself would be a tremendous contribution, especially if we could put it into a form that could be understood by people who aren't experts in this area.

MEMBER LEVENSON: Well, I think, you know, we would prefer to not see just qualitative things, but even an identification and some sort of qualitative ranking would be useful.

Thank you. I also want to thank you for staying on schedule -- two minutes early.

MR. CROWLEY: I had an incentive.

(Laughter.)

MEMBER LEVENSON: We'll now proceed to the presentation from the State of Nevada, and our first speaker is Bob Loux, who will give an overview and introduction.

Kevin? I apologize. I didn't realize he was leaving right away, and I apologize to those people in the audience that might have had questions

for Kevin. It was my intent to give you that opportunity, and I apologize.

MR. LOUX: Good afternoon. I'm Bob Loux, and I'm the Director of the State of Nevada's Agency for Nuclear Projects. It's in the Governor's office, and, as you may know, we -- and including myself -- have been at this for 20 years or so. And so we have a wealth of information, knowledge, and interest, obviously, in the topics you're talking about today.

I would like to thank you at the outset for your invitation. I'd like to thank Tim for working with Bob and myself in trying to put this together. It's been a very cooperative and helpful situation, and I hope that we can add to your discussion and analysis of some of these issues associated with transportation.

Before I actually get started in the presentation, I wanted to make two quick remarks, and I want first to bring you up to date on some of the other actions that are going on. As you may know, the State of Nevada has four cases that are currently in the U.S. Court of Appeals in Washington, D.C., regarding the program -- case against the Department of Energy, one against the NRC, one against the Environmental Protection Agency, and, lastly, we have

a constitutional case that's challenging the entire Act, including the joint resolution by Congress.

All four of these cases are nearing closure in terms of the briefing schedule and are scheduled to be heard in tandem by the court sometime in September of this year. We expect some decisions in those cases probably by the close of the year, early January, or somewhere in that timeframe. Our experience has been somewhere in the six to -- four- to six-month range for decision from courts of appeals. And we feel, obviously, very good and confident about those cases.

I want to call your attention also to another action that we have recently taken. We have filed a petition with the -- for rulemaking with the Commission to establish what we believe are fair procedures in the licensing hearing for a Yucca Mountain facility. And just two of those I'd like to touch on briefly.

One is that we are asking the Commission to appoint administrative law judges from outside the Commission, experts in the various fields that are concerned with Yucca Mountain, people that have unique and specialized knowledge in those arenas. We think that would be very helpful in a very complex licensing

hearing that this is likely to be.

And the second one is that we've asked that the staff be removed as a party advocate in the proceeding. We are very concerned that the -- at the minimum public perception, if not reality, is that when the staff advocates for the applicant, as is the case, then the notion or the perspective that somehow the Commission is unbiased in their review of this license application is somewhat tarnished.

I know that the public is -- Nevada is quite concerned about this, as we are, having witnessed the activities that took place with the licensing of PFS in Utah. Many Nevadans went to those hearings and saw how the Commission staff acted and operated in those hearings, and it certainly told them and suggested to us that the Commission is far from being neutral and objective in that proceeding, at least at the staff level. And so we've asked for them to be removed as a party advocate, and that petition is pending as we speak.

Having said those remarks, let me say that the State of Nevada, as it relates to transportation, contends that DOE should have fully and adequately addressed transportation of spent fuel and high-level waste to Yucca Mountain in the final Yucca Mountain

EIS. Instead, it's our belief that the transportation analysis, as well as other parts of the EIS, are legally and substantially deficient and entirely inadequate.

We contend that the only acceptable vehicle for planning this kind of campaign in Nevada nationally is the process set forward in NEPA and its implementing regulations, which we don't believe have been done to date. That means to us that DOE must commit to the preparation of an EIS for the transportation program. EIS must encompass an integrated transportation program that covers both a national system as well as the transportation system in Nevada.

It must show how these two components -- the national and Nevada component -- function, are interrelated, how decisions with respect to the national system affect the Nevada system, and vice versa.

What DOE appears to be doing instead is kind of a piecemeal approach to planning and crafting different messages to fit different audiences at different times depending on whatever is going on at the particular time.

That being said, let me say that the State

of Nevada, as I mentioned at the outset, has been involved for better than two decades in this issue and has consistently and repeatedly recommended a very specific, comprehensive measure that the federal government should take to manage risks associated with the transportation of spent fuel and high-level waste.

The State of Nevada has virtually taken every possible opportunity to make constructive proposals to DOE, to the NRC, and DOT. And, in addition, the Western Interstate Energy Board and the Western Governors Association, which we're a part of, of course, have done extensive work on nuclear waste transportation, provided DOE with detailed and substantial guidance over the last 15 years.

Western Interstate Energy Board has developed an extensive high-level waste transportation primer that provided DOE the comprehensive framework for an adequate transportation system. In addition, WGA has passed numerous resolutions urging DOE to adopt an integrated, comprehensive approach to transportation planning, including adequate preparations that deal with terrorism or prevent catastrophic accidents through meaningful cask testing.

The goal of both of these organizations

has been the safe and uneventful shipping campaign of any materials that might travel through the west. And Nevada has been a very key player in both of those organizations, and, in fact, DOE has even funded the Western Interstate Energy Board to produce this primer.

Since 1997, our recommendations regarding the high-level waste transportation risk management program have focused on four areas. Number one, we believe there needs to be a comprehensive approach to risk management, risk assessment, and risk communication. Two, we believe there needs to be a development of a preferred national transportation system. Three, full-scale physical testing of shipping casks. And, fourthly, an accident prevention and emergency response program.

The presentations you are going to hear today from the experts in this field from Nevada will address the specific Nevada issues and recommendations in more detail. But let me point out the basis for any meaningful spent fuel and high-level waste transportation planning must be veracity and accuracy in disclosing the nature, scope, and extent of the effort.

And, unfortunately, DOE's pronouncements

to date on the transportation program have appeared more designed to obscure and minimize the challenges for political reasons, other than really trying to illuminate them.

And let me just briefly provide two examples for you. Last spring, or a year ago about this time, the Secretary of Energy, at the announcement of the recommendation of the Yucca Mountain site, made estimates of 175 shipments per year to a Yucca Mountain repository. We know the reasons why those pronouncements were made, but they serve to undercut the veracity and the accuracy of any program. They're not only inaccurate, but they grossly underestimate the nature, magnitude, and scope of the campaign required to support the program.

To realize these kind of numbers, DOE, among other things, would have to ship over 90 percent of the spent fuel by rail, assure that each shipment is made up of at least three rail cars per train, make thousands of barge and heavy haul truck shipments to move spent fuel from reactor sites without rail access to rail heads, create staging areas in rail yards and ports around the country, in order to assemble the trains and then construct a three- to four hundred mile rail line across Nevada at a cost probably

exceeding a billion dollars.

On the other hand, Nevada has reviewed carefully the estimates of the shipping campaign in the final environmental impact statement. I believe those numbers are far more realistic than the numbers DOE is at least verbalizing to the secretary at any rate.

We conclude that estimates of projected shipments to Yucca Mountain must continue to consider a range of modal scenarios and shipment numbers. Equally as disturbing is DOE's assumption that at this point in time the shipping campaign will involve mostly rail to Yucca Mountain.

At present, as you know, there is no rail access to the site. Construction of a new rail spur, anywhere from 100 to 344 miles, could take 10 years and cost well in excess of a billion. The alternative rail spur construction is delivery of thousands of large rail casks by 220-foot long heavy haul trucks over distances of 112 to 330 miles on public highways in Nevada, most of which is likely not feasible.

Maximum utilization for rail for cross-country transportation in the FEIS appears unlikely. Even if DOE was able to assemble rail access to Yucca Mountain, the knowledge -- the objective of shipping

90 percent of the commercial spent fuel by rail is unrealistic. DOE knows that perhaps a third of the reactor sites cannot ship by rail. In Nevada, studies show that could be as many as 32 sites.

In the end, if rail access to Yucca Mountain, all of the other impediments to rail transport can be resolved, mostly rail would involve no more than 60 percent of the commercial spent fuel, the remainder by legal weight truck.

The DOE mostly legal weight truck scenario in the EIS is really the only national transportation scenario that's currently feasible, the one that Nevada believes is most likely in the event that Yucca Mountain goes forward. All 72 powerplants and all DOE sites can ship by legal weight truck.

Lastly, let me say Nevada, together with other Western states, regional groups, has long advocated for full-scale testing of shipping casks as a part of the cask certification process. In light of new threats facing the nation and unprecedented nature and scope of planned Yucca Mountain shipping campaign, it's imperative that the NRC immediately address this issue, and we're gratified the Commission staff is moving ahead with the package performance study.

The Nevada experts have been, and will

continue to be, closely involved in this effort. We remain concerned, however, that the Commission has yet to take action on the State of Nevada's rulemaking petition, asking the NRC to assess and strengthen protections against terrorism with respect to the spent fuel shipments.

That petition was filed in September 1999, and to date no action has taken place, despite the increased urgency that we're all aware of.

I would like to close and say I hope you find the information useful and helpful. I appreciate your willingness to hear from us today. I know that the fellows in front of you have a wealth of information and knowledge that they'd like to share with you, and I really appreciate your opportunity to have us be here and hear from them.

Let me apologize at the conclusion that I will not be here for the entire presentation. I have a plane later on this afternoon to catch, so I'll be kind of ducking out. It doesn't mean I'm not interested, but press of other business is going to draw me away.

But with that, thank you very much.

MEMBER LEVENSON: Thank you.

George, do you have any questions? John?

Just one comment, Bob, and that is, if you attended any of the committee meetings you might find that this group opinion of DOE is maybe not too distant from yours. But if you attended our letter-writing sessions, which are also open, you realize that one of the things we have to cope with is not only we don't have a responsibility, but we're more or less forbidden from providing advice to DOE. It's an advisory committee to the NRC. Many of the issues raised are appropriate issues, but they're not within the scope of this committee.

MR. LOUX: I'm aware of that. I have reviewed the transcripts of nearly all of your meetings and am familiar with the activities that have been taking place. And I appreciate your comment.

MEMBER LEVENSON: One of our committee members has another meeting, the burden of being involved.

With that, we'll take Mr. Halstead as our next speaker.

MR. HALSTEAD: Tim, I need some help on doing the slide advance. Okay. So I need to indicate here the slide change? Very good.

Well, good afternoon, and thank you for the opportunity to be here. I am going to take off my

jacket and get comfortable. I want to begin by thanking Tim Kobetz, who has provided unusually meaningful support to us, not only in preparing for this meeting which is a given, but Tim has attended many of the recent NRC meetings on the package performance study, where we have been very much involved, offering an alternative proposal to the Commission's approach to cask testing.

And I'm very appreciative of the fact that in the technical discussions that we've had, particularly about ways that fire tests might be designed, we've benefitted a lot from Tim's comments on -- particularly his review comments on the presentations that we've given.

So thank you very much for that, Tim.

Now, I want to begin by introducing the people at the table with me, and so that everyone knows for starters why they're here, everyone who is here at the table with me is a paid consultant to the State of Nevada. And most I think, if not all of them, also have other paid consultants.

So it's important that we understand that any associations they have with other clients or other organizations have been set aside at the door. And our commentary today reflects the work that they are

doing on transportation, risk assessment, and risk management for the State of Nevada.

Beginning on my left, Dr. Marvin Resnikoff advises the state on the consequences of transportation accidents and terrorism sabotage incidents, and also on shipping cask testing. Dr. Resnikoff is a nuclear physicist by training, and has 28 years of experience as a nuclear waste consultant.

Next to Dr. Resnikoff is Jim Hall, who is advising the state on transportation safety regulations and policy. Jim is a former chairman of the National Transportation Safety Board. He is currently a member of the National Academy of Engineering Panel on Homeland Security Issues, and he is a lawyer by training.

Next to Jim is Dr. Meritt Birky, who advises the state on fire analysis and cask testing. Meritt is a thermal chemistry by training. He has recently retired from the National Transportation Safety Board, where for 18 years he was their technical advisor, specializing in fire and explosion investigations, and we want to make clear that the relationship that Dr. Birky has with the state regarding the analysis of the Baltimore Tunnel fire and the development of fire test protocols under the

PPS, that that is separate from his work now as a consultant for the National Transportation Safety Board.

Next to Meritt is Hank Collins, who advises the state on radiation health effects and spent fuel behavior. Hank is a registered professional engineer and certified health physicist. He is a physicist and nuclear engineer by training, and he is closely associated with his health analysis work for the Mel Chew firm, which is located in Livermore, California.

And Bob has introduced himself.

My name is Bob Halstead. For the past 15 years, I've been transportation adviser to the State of Nevada Agency for Nuclear Projects. I have 25 years of experience in energy facility and siting. Most of my practice has been in impact assessment, both of fixed facilities and transportation systems, and I am an environmental historian by training.

Now, there are three important contributors who aren't here at the table with us today, mostly because of schedule conflicts. Fred Dilger, who I've listed on the authorship spot of this slide, works for the Nuclear Waste Division of Clark County in Nevada. He is an environmental planner and

geographic information specialist.

Additional help was presented by Lindsey Audin, who is an energy engineer and energy conservation consultant who has a firm that goes by the name of Energy Wiz located in Croton, New York.

And we've also received considerable assistance and will receive more assistance in preparation of our comments on the PPS from Dr. Miles Greiner, who is a professor of mechanical engineering, although he's primarily a thermal engineer, and he teaches and does research at the University of Nevada in Reno. And as I said, he has advised us both on fire analysis and on cask testing.

Next slide, please.

This is a terribly long presentation that I've set in front of you, and I want to say at the beginning that we're going to move rapidly through some groups of slides here. I want to provide some both overview and in-depth information to the committee and those attending the meeting.

I think it's better to put more information in the handout than we plan to talk about. So certainly, anything that we move through quickly in order to keep on schedule we're certainly prepared to discuss with you during question and answer period.

At the outset, let me state for the record what we would like the committee to consider. What would we like to see come out of this exchange of ideas? We understand the limits on what the committee can recommend to the Commission, and we respect that.

What we're asking is your consideration. And as we move through these four general areas of my presentation, we're going to be providing you specific information that relates to transportation difficulties in access to Yucca Mountain. We're going to give you an overview of our identified concerns regarding shipment modes, numbers, and routes.

We're going to give an all-too-brief overview of the radiological risk issues. And we'll conclude by talking about the state's risk management recommendations, which are grouped into four areas.

And the first area where I'm asking for the committee's consideration is that you consider and evaluate the way that we have grouped our recommendations for safety enhancement into four areas, which have to do, one, with the use and misuse of probabilistic risk analysis and our recommendations for a broader, more comprehensive approach to risk assessment.

Secondly, we'd ask that you consider our

recommendations for the construction of a preferred transportation system, one that is designed to reduce and manage risk.

Third, we'll ask you to consider our specific recommendations on full-scale cask testing, but we won't go into much detail on that in this presentation because that's what the second set of presentations focuses upon.

And, third, we'll ask you to consider -- or, fourth, we'll ask you to consider our specific recommendations on accident prevention and emergency response.

A second area where we will ask for your consideration regards simply the information that we are providing regarding site-specific transportation issues associated with Yucca Mountain. There really isn't an action we can ask you to take here.

What we're asking is that when you hear glib assurances from the Department or any other party that they know exactly how the transportation system for Yucca Mountain will work and how many shipments there will be, that you take that with a grain of salt and remember that most, if not all, of the important decisions are yet to be made.

And, third, there are three other related

issues that Tim Kobetz and I discussed at some length as to whether they should be addressed in the presentation, and we felt that if we developed them in depth they would either be distracting or they would not leave us enough time to speak at length about the cask testing issues.

So let me briefly describe those other three issues, and offer at some future date to come back and discuss them with the committee. Or certainly, we can discuss them in question and answer as well.

First of all, we are specifically concerned about the way that a recent NRC contractor report, NUREG/CR-6672, which purports to be a reexamination of spent fuel transportation risks -- we are concerned both about the procedural way that that report was developed.

We are concerned about the substantive research and findings that are reported in the document. And we are concerned about the way that both the Commission and other parties who practice before the Commission are using this report.

Secondly, we remain concerned that our petition for rulemaking, PRM 73-10, filed with the Commission in June of 1999 asking the Commission to

review its counterterrorism safeguards regulations and also asking the Commission to conduct a new and updated reexamination of the risks of a successful terrorist attack on a spent fuel shipping cask.

We are concerned not only about the substantive issues that we have presented. We are concerned procedurally about the way the Department is handling this petition for rulemaking.

Now, we understand how the world was changed on September 11th, with the attacks in Washington, D.C. and in the District of Columbia. But understand, when those attacks occurred, the Commission had had our petition in hand for 26 months.

Now, my understanding from discussion with rulemaking staff is that they normally try to process a petition for rulemaking within 12 months after receiving it.

So we're not only concerned about the substantive issues, we're concerned about why the only thing we've heard now in three years on that petition is a letter last fall advising us that the Commission staff is looking at it and they're now more concerned about certain issues in the light of September 11th.

I will note while we can't talk about it in great detail because of the security issues that in

some ways some of the actions that Nevada had requested as an immediate response, changes in the regulations, have been addressed by the Commission through emergency orders to licensees.

A third issue that, again, we won't talk about at length but that Jim Hall will address in an overview fashion in his presentation is the way that the NRC is apparently interpreting its responsibility for the regulation of DOE's transportation system.

Many of you have at least heard about the May 10 exchange of correspondence between former Chairman Meserve and Senator Durbin of Illinois. And in that May 10th letter, basically Chairman Meserve says that if DOE accepts title to spent fuel at the reactors, which is the operative assumption for the program, then the only portion of the NRC transportation regulations that specifically apply to DOE's transportation program lie in the area of cask certification. Specifically, the requirement that all DOE shipments be made in NRC-certified casks.

We believe that there are profound implications from this minimalist approach by the Commission to its regulatory responsibility. I happen to have been one of the people who helped develop the language in the federal legislation in 1982 and in

1987. I believe there is a clear record that congressional intent was that the Commission fully regulate DOE's transportation program as if it were a utility licensee.

So that's a third issue that we'll not go into in great detail but that obviously has a lot of implication for the way that the Department of Energy's transportation system would operate and the way that that system would be interfaced with the NRC's regulatory system.

Well, that's too much background introduction, I suppose. Let's go to the next slide, please.

I want to talk for the next few minutes about the issue of rail access to Yucca Mountain. And I put this bar graph up to show the most obvious reason why most transportation planners and safety experts believe that rail is the mode of choice for the operation of either a national repository or a national storage facility.

It's primarily because it reduces the number of shipments by a factor of four or a factor of five, depending on the comparisons between the specific casks. And we don't need to go into them in great detail except to note, again, that if there is

no rail access to Yucca Mountain, and everything is shipped by legal weight truck, you're talking about 109,000 shipments over 38 years, or approximately 2,900 per year.

Under an optimized rail system, an unrealistically optimized one, I must say, this gets down to a total of 22,000 shipments combined rail and truck -- that's cask shipments -- over the course of 38 years.

There are some other issues that we can talk about in Q&A that are probably worth mentioning. In addition to reducing the number of shipments, most people looking at technical safety issues will stress the fact that keeping as much of the waste on the railroads as possible keeps it on a privately-controlled system, quite different than the interstate highway system.

And, secondly, it gives us the option of adding additional safety enhancements through the use of dedicated trains, other safety protocols that have been developed by the Association of American Railroads, and, indeed, allows us to take advantage of the latest technology in the design of a rolling stock, specifically designing the special cars that are needed to carry large casks and buffer cars.

And, of course, this committee was briefed very well on those issues at the November 19th meeting by Bob Fronzack from the Association of American Railroads. So we don't need to go into that in detail, but there is more to this than just the issue of reducing the number of shipments.

Now, on the opposite side, we must say that there is no free lunch in the risk business, and there are a couple of other issues you have to look at if you move towards a heavily rail system. It means you're concentrating a lot of curies in every package, and it also means that if you're shipping in dedicated trains you're creating the possibility for accidents that may involve multiple heavy cars. And one of the few manmade things that we think might damage a large rail cask in an accident is contact with another large rail cask.

So there are still some rail safety issues that need to be addressed, but as a general rule most people who have studied transportation safety for a large system like a repository all pretty much agree that rail is desirable.

And, indeed -- next slide, please -- this was recognized early on in all of the planning documents from the late '70s and early '80s. It was

addressed in the 1986 environmental assessments that compared the first five repository sites.

Next slide, please.

And the results I've summarized here show that part of the reason that the Department has a problem accessing Yucca Mountain now is that they've known for the last -- certainly since the mid '80s that Yucca Mountain was the most difficult site to run a new rail spur to.

Next slide, please.

Now, DOE's current approach to developing rail access is somewhat ambiguous. It was laid out in the final environmental impact statement last year. DOE identified five potential rail corridors, but then said that the EIS was essentially an information document and they hadn't made any decisions.

And they had previously said, beginning last summer with some statements by Margaret Chu, that their schedule was sometime for the December 2002/March 2003 timeframe to issue a record of decision formalizing their preference for rail. Well, those dates have come and gone. No ROD has been issued, unless I missed it yesterday or Friday.

And to further compound this issue, at the end of March press stories began to emerge that DOE

was thinking for budgetary reasons of either delaying or deferring the whole issue of planning rail access to Yucca Mountain.

Next slide, please.

This slide, for your information, summarizes the information on the five corridors identified in the EIS.

Next slide, please.

And this map gives you an overview. Put simply, there are two short rail corridors that go through Clark County, the Valley route and the Jean/Sloan route. There are two long routes, the Caliente route and the Carlin route, each of which would be over 300 miles.

And there is a version of the Caliente route that would go through Chalk Mountain, through what we call the back door to the test site. Many of you have heard about this area in association with Groom Lake and purported extraterrestrial activities.

I can't do anything to elucidate the rumors about that, but I will tell you that this is a big point of contention between the Air Force and DOE, that the Air Force is adamant that DOE will not be able to use that route.

Now, DOE has kept that route in their

planning documents because there are some people, particularly in Lincoln County, Nevada, who are advocating that approach. But DOE has identified this as a non-preferred option.

Next slide, please.

Let me briefly show you some of the problems that have occurred with the development of these routes. Since the time that DOE first indicated an interest in the Valley route through northern Las Vegas, the Bureau of Land Management has transferred these lands along the corridor, and they have now been sold and are in the process of being developed commercially and residentially. This route is almost certainly no longer available to DOE.

Next slide, please.

A similar dilemma has occurred in this strip of I-15. It's basically the last 25 miles before you enter California, and there are a couple of different options for rail access there. Conflicts there include a new regional airport, casino and hotel development, and large-scale residential development.

That's not to say, again, that it's completely impossible that DOE would go through these routes, but now they are no longer talking about transfer of Bureau of Land Management federally-owned

land. They actually would have conflicts with privately-owned lands.

We believe for those reasons that the two short routes to Yucca Mountain are just not feasible any more.

Next slide, please.

This map simply shows you the way that the Chalk Mountain variation of the Caliente route goes across the Nellis Ranges.

Next slide, please.

Now that leaves us to consider the feasibility of the two long rail routes to Yucca Mountain -- Caliente and Carlin. And, in fact, there are a couple of different variations of the Caliente route. It originally followed existing U.S. highways, U.S. 93 and State Route 373, and it was abandoned in 1990, or at least deferred, because you had to go through high mountain passes like Hancock Summit.

Next slide, please.

And there are also a number of pristine environmental areas. Yes, I say this often -- I hope people don't get tired of hearing it -- but I know there are many people that think all of Nevada looks like the Sahara Desert as portrayed in a 1930s black and white movie about the French Foreign Legion.

And, indeed, there are some parts of Nevada that look like that, but there are also a large number -- 12 to 15 at least -- of these delicate oasis environments that are located along the routes that DOE has identified. And these are going to be an extremely difficult problem, both from the standpoint of environmental approvals and land acquisition.

And, indeed, partly to avoid Hancock Summit and partly to avoid this particular area, which is Crystal Springs near Hico Canyon -- next slide, please -- they moved the whole original Caliente route 40 miles to the north. And that solved some of their problems but created others, like now having to go through seven major high mountain passes, including Bennett Pass -- next slide, please -- and Timber Mountain Pass.

And in addition to the high mountain passing, this is the White River -- and because of the potential for catastrophic surface flooding this will not only involve a long series of well-designed curves to keep the proper curvature and grade going up to the pass, but also will consider a very robust bridge structure to handle the potential flooding that occurs in that area.

And, really, these slides typify the

difficulty of going east-west in Nevada where the mountains run north and south.

Next slide, please.

Now, the one route that DOE is considering that runs primarily north to south is the Carlin route, which would come off of the Union Pacific main line near Beowawe. This is Beowawe, and this is Crescent Valley, which is a long valley almost 100 miles long.

Next slide, please.

And the one advantage from a construction standpoint of this route is that most of this route runs north-south with the mountain valleys than across them. On the other hand -- next slide, please -- there are also some very, very difficult issues with the Carlin route that have to do with impacts on private property, and particularly very rich mining plains which would be subdivided by the land acquisition for the railroad.

On this slide, we've summarized, as best we can -- generalize about the difficulty of rail access. All of these rail corridors identified by DOE have problems, but the short ones we believe are clearly out. And the Caliente and Carlin routes would be the longest new rail construction since the '30s,

possibly before. In each case, there are very significant terrain and environmental challenges.

We haven't even talked in detail about the almost certain -- I've said potential here -- conflicts with Native American cultural sites and land claims. And, frankly, this billion dollar construction cost is low. If we assumed that a rail line, if it's built, is going to have to be for shared uses, have a weigh station, and be operated with computerized train control, operated with state-of-the-art safety systems, it could easily cost $2 billion based on the state's assessment, which was last done in 1998.

So perhaps the specific details are less important. The bottom line conclusion here is DOE has not demonstrated that it can build a rail spur to Yucca Mountain, and at least two, probably three of their five corridors are clearly infeasible, and the two that are remaining have grave problems.

Next slide, please.

Now, DOE has proposed an innovative alternative, and some weeks they tell us that it's still a live alternative, and other people -- and other weeks their people tell us that it is no longer a live alternative. And that's an alternative that

involves putting heavy rail casks -- rail casks up to 160 tons -- on large, heavy haul trucks.

Now, in Nevada, we license a few -- we permit a few of these types of rigs every year because in the mining industry we move large pieces of equipment like autoclaves. But even in a state like Nevada with a lot of mining, it's fairly rare that rigs of this size would be used. Maybe two, three, or four times a year our Department of Transportation issues a permit for the whole state.

So what DOE's rig looks like is something that's about 70 meters long. And I like to put this in human scale. I'm a Green Bay Packers fan, and Brett Favre can't throw a football that far from end to end, and Mia Hamm can't kick a soccer ball that far.

Now that doesn't mean that it's absolutely technically impossible.

Next slide. Next slide, please. Two back, please. One more. There. We should have a map in there. There we go.

DOE has actually talked about running these big rigs on the Beltline around Las Vegas from intermodal sites at Valley or Jean. And they've talked about possibly doing this along a route from

Caliente, either around the test site or through the back door of the test site.

We don't believe any of these routes are feasible when you look at the cost of upgrading. Certainly, the longer routes are technically feasible, but you reach a point -- next slide, please -- where the cost of running heavy haul equals or exceeds rail and doesn't provide any benefits. And I've listed here the institutional problems, primarily permit requirements.

Because of the way the system is being planned, the state will have no legal obligation to actually issue permits for these rigs, because it's the shipper who has decided to use a large package. It's not a situation where you meet the separability or divisibility definitions in 49 CFR that govern whether a state is required to issue these permits. And there are a number of other issues that we don't need to go into in detail.

Now, again, I've included this discussion not because I think this is feasible, but because it's in the EIS and it's discussed every once in a while. And I was told at the waste management conference in Tucson that DOE had abandoned heavy haul, and I was told that again at a Western Governors Association

meeting on April 3rd. But then, a couple weeks ago, we heard that DOE may be reconsidering it again.

Next slide, please.

Another aspect of difficult rail access involves shipments through Las Vegas. Again, I don't want to read the whole slide. There are eight ways to ship waste to Nevada by rail, and seven of them go through downtown Las Vegas.

Next slide, please.

And the percentage of shipments that could go through downtown Las Vegas are as high as 85 percent. Let's look at where the Union Pacific main line is if we're in the stratosphere looking towards California. It's right here. You can actually see a train on the track here. The strip is over here.

Obviously, this is a big concern to people in Las Vegas. Now, remember, we're not talking about building a new spur here. We're talking about the possibility that even development of the Caliente spur could be linked to the national rail system through thru shipments through downtown Las Vegas.

Next slide, please.

Now, on the east side looking towards the Arizona-Utah line, you can see the Union Pacific continuing. This is the Clark County government

building. This is one of the nearest casinos. Indeed, we have numbers of instances where parking lots and commercial buildings are within 20 to 30 meters of the side of a cask, if these routes were to be used.

Next slide, please.

And in the half-mile corridor centered on the rail our evacuation planning tells us that at any hour of the day over that 32-mile corridor we've got about 85,000 people in that area.

Next slide, please.

So my summary is, when you hear that it's all going to be by rail, I hope you'll remember how difficult rail access is going to be.

Next slide, please.

I'm going to move quickly through some numbers. Kevin made a good point in the previous presentation about the uncertainty about almost every scrap of data that's used in analysis of past and future shipments. Fred Dilger and I have made an effort to review the existing databases, and we have provided for you our summary of what the past shipments of spent fuel have been.

Next slide, please.

And we've compared these with three

scenarios -- DOE's mostly truck -- next slide, please -- and here I've summarized the factors that Bob Loux mentioned that would favor legal weight truck, and we don't need to go into those details, but I'll be happy to answer questions about them.

Next slide, please.

And this is DOE's very optimistic, mostly rail scenario.

Next slide, please.

And based on 10 years of our own independent study, here is what we think is the most probable scenario if DOE is able to build a rail spur. We think the most probable scenario would be about two-thirds of the spent fuel by rail and one-third by truck.

Next slide, please.

And here we've compared the past shipments with future shipments, giving the full spread of those three scenarios.

I think the thing I'd like you to remember here is that when we say, in meetings where industry and DOE representatives say, "Well, we've had all these shipments in the past, and we've not had any problems; we've had a few accidents but no releases," our argument is the future shipments are going to be

very different. There will be a lot more, and the shipment characteristics will be a lot different. And some of these differences have very direct technical implications for risk assessment and risk management.

Next slide, please.

This is the map of representative highway routes that DOE included in their EIS. They call them representative routes. We actually think they are the most likely routes based on our studies and DOE's studies over the last 15 years.

The point I want to make to you is there will be major funneling impacts in urban areas, like Chicago, St. Louis, Salt Lake City, L.A., San Bernardino, Atlanta, Cleveland, so the issue of shipments through urban areas will likely have to be confronted and confronted both in a technical risk assessment manner and in meetings with the affected community.

Similarly -- next slide, please -- there are similar, perhaps even greater, funneling effects at rail interchange points in Cleveland, Chicago, St. Louis, Kansas City. In fact, an irony here in Chicago -- one out of every three rail casks to Yucca Mountain go through downtown Chicago to reach the UP's Proviso yard, which is just south of O'Hare Airport.

Next slide, please.

And there are going to be a lot of affected jurisdictions and populations. This is our best summary. Regardless of which approach is used, you're talking about up to 45 states, 700 counties, and 50 Indian reservations, 100 million to 120 million people living in the impacted counties, and, based on our latest GIS analysis, more than 11 -- perhaps as many as 15 million people living within one-half mile of a potential highway route.

Next slide, please.

The third area that I'd like to call to your attention -- radiological risk issues -- has to do with the fact that the age or cooling time of spent fuel is a critical driver in the way that the radiological risks of a transportation campaign shake out.

Now, this is an old table, but it's one of my favorite ones, because it goes back to the days when the Department of Energy wasn't squeamish about laying hard facts out on the table. This is from the Department of Energy's filing in the 1980 waste confidence proceeding before the Commission.

The important point is this, two important points. One is that even after 50 years there is

still a considerable total inventory and a very considerable surface dose rate in average spent fuel. And most of this dropoff or a significant dropoff occurs in the first 10 years. And then, it's fairly significant where you're making your decision in here, as to how -- what you specify the average spent fuel age will be for the shipments.

Next slide, please.

Now, DOE has assumed for its planning purposes an average spent fuel age of about 23 to 24 years. In their accident analysis they use a somewhat hotter fuel -- 14 to 15 years out of reactor. But, in fact, the NRC regulations allow five year-old fuel to be shipped in truck casks with dry interiors, and they allow 10 year-old fuel to be shipped in rail casks.

The point I want to make here simply is that every one of the new high-capacity casks represents an enormous inventory not only of a wide range of radionuclides, but particularly a large amount of Cesium-137.

Next slide, please.

And it's particularly the Cesium-137, which is a major gamma radiation source, that produces these routine radiation concerns. Again, I don't want to belabor these points, but I want to list them for

your reference.

We think the primary concerns in routine radiation have to do with exposures to workers, and there are some categories of workers who can potentially receive high enough doses to actually have a concernable statistical impact on cancer possibilities.

In particular, the analysis that DOE has said, that without administrative controls safety inspectors could receive a dose that would give you about a 10 percent increase in lifetime cancer fatality probability, even using the dose risk conversion factors that DOE uses, which we don't think are appropriate, and the possibility of a 40 percent increase in other types of health effects.

We're particularly concerned, however, about a type of exposure that hasn't been addressed much in the literature. Most of the literature that looks at people along routes has focused on potential doses to people along the route.

And while that's certainly a potential concern, we believe an additional concern is that where you have unique local conditions, where routes would funnel in Nevada, you create situations where large numbers of recurrent shipments create the

equivalent of an elevated radiation exposure dose on people's private property. Let me give you two examples.

Next slide, please.

This is a potential highway route in the city of Ely, where U.S. 93 and U.S. 6 come together, and trucks would be required to make a left-hand turn stopping at this stoplight anywhere from 30 to 90 seconds.

Next slide, please.

Perhaps the greatest potential for exposures is in the town of Goldfield, along U.S. 95, which is both a potential legal weight truck route and a potential heavy haul truck route. And we're talking about situations here where the dose is small but not trivial, where an additional 30 to 200 millirem might be put on this area along the routes.

Next slide, please.

I'm going to race very quickly through our projections of expected accidents. If we take the historical accident rates for spent fuel shipments over the last 38 years and project them forward, we get large numbers of projected accidents and incidents. Does that mean there will be a very severe accident? No. But it does mean that the past

accident experience is basically only average compared to other traffic on the highways and rails.

Next slide, please.

Both DOE and Nevada have assessed the consequences of an accident involving a release. I'll be happy to answer any questions for you about the way that DOE calculated their consequences.

Next slide.

And Dr. Resnikoff and I can explain how Nevada has calculated these. Similarly -- next slide -- Nevada has calculated the consequences of a successful terrorist attack on a shipping cask. I was told that the committee was not comfortable discussing these issues in this meeting. I won't go into them in great detail except to say that DOE acknowledges this risk. Nevada believes that the consequences would be considerably higher.

But in this analysis for the Yucca Mountain EIS, this is the first time that DOE has in great detail addressed the terrorism consequence.

Next slide, please.

Now those four slides summarizing the recommendations that I promised you. Let me summarize these points. Nevada believes that there certainly is an appropriate application for probabilistic risk

analysis regarding transportation. But we also feel that probabilistic risk analysis has been repeatedly misused.

We prefer a comprehensive approach, which we call comprehensive risk assessment. It's based on a document that Golding and White from Clark University prepared for us in 1990. And where did they draw their conclusions about how risk assessment should be done? They went back and they looked at the NRC's reactor safety studies that were prepared in the 1980s in the aftermath of Three Mile Island.

And we find those to be very illuminating, and we find a lot of guidance there that tells you the proper and improper ways to use probabilities, particularly in areas where you're uncertain about the data that's available. Maybe most importantly we believe in developing life of project -- life of project structures for risk assessment, continuous risk analysis, and risk communication.

Next slide, please.

We have also outlined what we believe would be a preferred transportation system designed to manage risks. This would involve, first of all, using dual purpose casks and, second, shipping oldest fuel first. Those are important program principles that

have an unclear status at DOE right now. The original plan was to ship oldest fuel first. That's probably the easiest way overall to manage radiological risk.

But now both because of some design controversy at the repository about the super hot repository emplacement horizon, and some other issues that have to do with the way that utilities are interpreting their contracts, there is uncertainty about that.

Almost without saying, as I said earlier, maximum use of rail -- understanding that Nevada is much more realistic about this. If two-thirds of the spent fuel moves by rail, we think that's an enormous accomplishment. The other issues I discussed -- some basically planning this system in cooperation with the carriers and the affected states.

Next slide, please.

We'll talk in more detail in the next session about our specific proposal for full-scale physical cask testing.

Finally, we believe -- next slide, please -- we believe that accident prevention and emergency response are extremely important. There have actually been some good experiences in this area of cooperation between DOE and the affected states and tribes. There

have been some other areas, frankly, in the way that DOE has proposed to privatize the system that we feel are completely wrong.

In particular, we believe that DOE's selection of managing contractors for transportation services should emphasize safety and public acceptance. And low bid contractor selection is not the approach to use in this important area.

Well, as I said at the beginning, we would like the committee to give some consideration to these four areas of recommendation. We would hope also that you would give some consideration to the site-specific transportation difficulties that we've described, and at your convenience we would be happy to come on another occasion and speak in detail about the three additional issues having to do with the specifics of probabilistic risk assessment applied to transportation, the petition for rulemaking process, and the way that the NRC has chosen its approach to regulate the Department of Energy.

I thank you so much for giving me the opportunity to lay out a large number of points. And I'm sorry that I haven't been able to do it in a more entertaining fashion, but I appreciate the fact that you've all stayed with me.

And I don't know if we want to take questions now, Tim, or defer them until after Marvin's presentation. But I'm happy to go either way.

Thank you very much.

MEMBER LEVENSON: Just one comment. We do our entertainment after hours.

(Laughter.)

John, you have a comment?

MEMBER GARRICK: We'll probably ask more questions later, but I wanted to ask you about one area. You have made a considerable amount of study on what appears to -- at least on first glance to be the risk of a nuclear -- spent nuclear fuel transportation system.

Have you made any attempts to put this in context with the risk of hazardous materials that go down through Las Vegas and all of the cities that we know about? And have you --

MR. HALSTEAD: Yes, that's --

MEMBER GARRICK: -- attempted to template onto that any kind of a risk-benefit perspective to sort of serve as a normalizing vector, if you wish, for the whole process?

MR. HALSTEAD: Well, that's a question that properly requires a very long answer. Let me

give you the short answer. I work on other hazardous materials, have for a long time. And I'm very much aware of those other risks.

I think we need to state at the beginning that there is a difference of opinion on the part of the Nevada studies and other people's studies looking at the consequences of accidents. The rule of thumb for a severe accident involving a gasoline tanker or a propane tanker in an urban area is 5 to 10 dead and $5- to $10 million in damages, and you start cleaning up the next day.

And the potential consequence from a credible, but not necessarily worst case spent fuel accident is very much more severe. So from the standpoint of consequences, our argument is that these risks are properly seen in a way that puts much stricter regulation on nuclear waste shipments.

And we respect the fact that the -- both in statute and in regulation this differential between other types of hazardous materials and spent fuel is recognized.

Now, admittedly, every once in a while we find, for example, that rail tank car construction isn't appropriate, and the National Research Council and the National Transportation Board have to look at

specific issues.

But in general, we feel that the differential regulation, which is much stricter, reflects the consequences.

Now, when we relate these to probabilities, you will find, because of the frequency of certain types of shipments like gasoline, that the per person annualized risk will look much greater for other types of hazardous materials. I will acknowledge this. If you do this on a strictly statistical basis, you will scratch your head and say, "Well, why are we regulating spent nuclear fuel this way?" We would argue it's appropriately more strictly regulated because of the greater consequence.

Now, secondly, let me tell you about some of the experiences the State of Nevada has had and how we come up against federal preemption. There is a famous case from the '70s of an effort by the State of Nevada, because we have a lot of mining companies shipping a lot of explosives that we think are quite dangerous, and some of the industry practices involve things like leaving boxcars full of explosives unguarded in unsecured locations along sitings in urban areas.

We went through a long effort where our

state attempted to require security for boxcars of explosives parked in urban areas. And after about three years we lost that case in a consistency determination by the U.S. Department of Transportation.

I could lay other examples for you, but I want to make clear nuclear waste is not the only dangerous goods that the State of Nevada is aware of, and has attempted to regulate.

I would say at this point we are taking a very open-minded approach to this comparative societal hazards assessment that the NAS study is -- and I very much appreciate the fact that several of you on the committee made clear your expectation that in order for that study to be helpful to us on addressing just this issue we're going to need some sound quantification.

So I understand the concern you have that we not -- that we not base public policy on an unsubstantiated view of what the different risks of different materials are. I know that's a long-winded answer. If there's a way that I can be more specific about it --

MEMBER GARRICK: Well, if there's one lesson that we've learned from large scope

quantitative risk assessments, it has been the folly of putting too much focus on consequence analysis. And I think that's -- I think every time we've done a quantitative risk assessment on a very large system we have found many surprises in terms of what people are mostly focused on as consequences.

And I think the discipline has matured enough now to know that we can really take the public down the wrong path very carefully, very easily, if we put too much attention on consequence analysis. And I would just caution any kind of general effort in that regard.

I was pleased to see the amount of emphasis you are giving to incorporating the risk thought process in your work, and I agree with you, as everybody would expect me to, that that's a very important step forward. But I think as you do that, you're going to find a lot of surprises in terms of what we tend to get out of an analysis that is principally a consequence analysis.

MR. HALSTEAD: Might I say, Dr. Garrick, that I pretty much agree with the comments you've made. I would hope at some future time that we could set aside the time necessary to have a full discussion of these general issues looking at a specific

application, and I believe NUREG/CR-6672 would be a good way to focus that discussion.

That was a very, very ambitious undertaking. And when I speak critically of it, I don't speak without respect for the difficulty of doing, in essence, a reworking of the modal study and a reworking of NUREG-0170, which is the basic document that underpins the NRC's transportation regulations going back to 1977.

And our concern about PRA is not an out-of-hand rejection; it is a rejection of the use of PRA to give oversimplified, unjustifiable easy answers.

It has to do with the debate of whether if you use an expected value approach to report a finding you need also to talk about the uncertainties associated with the data sets and the analysis, and it also goes to an approach that says in many cases there are raging methodological debates about what values to use even when you have good data.

And I'll just give you an example. We've, in the past, commissioned very detailed accident rate studies on the highways in Nevada. And I was quite surprised that even with certain high accident locations and high accident route segments you find enormous variation in the year-to-year accident rate.

So do you use 3-year averages, 5-year averages, 10-year averages, 30- or 40-year averages, to reflect the time period? So understand there is not a rejection of probabilistic risk analysis on our part. It's a dissatisfaction with the way that these PRA efforts have been conducted, and we would really look forward to an opportunity to bring some of the same people and some different people and really get at those issues in detail.

And I thank you very much for your comments.

MEMBER GARRICK: Thank you.

MEMBER LEVENSON: I just have one question, and hopefully we can have a short answer. You included something important to safety -- the use of dedicated trains.

At our first workshop on shipping/transportation, the Navy -- that is not notorious for saving money -- came to the conclusion that there was no advantage to dedicated trains. In fact, from a security and safety standpoint, they felt it was disadvantaged. And so they don't use dedicated trains at all in any of their shipments.

I wondered why this difference of opinion between you and the Navy. Since it doesn't involve

us, it's an easy question to ask.

MR. HALSTEAD: Oh, wait. Well, first, it is a longer answer, I'm sorry, but the reason -- well, first of all, let's understand that the Department of Energy is the only player in this game who is opposed to dedicated trains. Almost all of the affected states want them to be used. The industry has only used dedicated trains for the last few decades.

The railroads are adamant they will be used to say that the Nuclear Energy Institute has recently endorsed the use of dedicated trains for civilian spent fuel. Now, what about this Navy experience?

First of all, let's remember that Navy fuel is very different than commercial fuel. It's designed for use in battlefield conditions. And, secondly, it's shipped in very large, robust, rail containers. So both the physical configuration of the fuel and the casks are, frankly, of less concern to us from the standpoint both of accident releases and terrorist attacks.

Secondly, my understanding is that the Navy is adamant about a 35 mile per hour speed limit on those trains. And that has always been their prevailing approach to safety as opposed to requiring

dedicated trains.

And, finally, railroad people have told me that in a number of instances they have accommodated the Navy by moving those casks either in dedicated trains or short trains, because the weight of the large casks can potentially have adverse impacts on train dynamics.

That said, I would love to see all of the data -- it would have to be done in some secured arena -- on the Navy fuel shipments, which I believe are -- there is claimed to be about a million shipment miles of experience and about, as I recall, 700 to 800 cross-country shipments. And I certainly think we should look at that experience and see if there is something in particular with the security requirements there.

But the main reason we haven't included them in our analysis is that the statistical information is not readily available.

MEMBER LEVENSON: Of course, it is the largest database. I think there are a couple of issues. One is their burn-up is much, much, much higher than anything we're talking about.

MR. HALSTEAD: Right.

MEMBER LEVENSON: So the source term is

potentially very much higher. And, secondly, I'm not sure their rail cars are any more robust, because I've not seen a comparative analysis between that and the proposed DOE --

MR. HALSTEAD: Well, when I say that, I'm talking about the current ones. The current Navy rail cask compared to an IF300 is quite substantially different. And, indeed, the new MPCs that the Navy is proposing are, I believe, more robust than any of the other cask designs. I feel comfortable making that general statement.

But nonetheless, I would agree that we need to look at the Navy experience. And the problem, until very recently -- it's only recently that the Navy was willing to release that shipment mile figure, because I've asked for this data for 10 years.

MEMBER LEVENSON: Okay. Thank you. I guess we'll move on to Dr. Resnikoff.

DR. RESNIKOFF: Thank you, Mr. Chairman.

I'm going to talk about the Baltimore Tunnel fire, which the State of Nevada has asked us to investigate. I'm going to also catch up on some time, so we can get back to the schedule.

Why should we investigate the Baltimore Tunnel fire? It looked to us that the length and

temperature of the fire appeared to exceed design requirements for shipping casks. The fire lasted for five days. It reached flame temperatures of 1,800 degrees Fahrenheit. Also, we've seen in the study by Southwest Research Institute that perhaps the flame -- perhaps the temperature could have been much higher than 1,800 degrees Fahrenheit. They quote a figure of up to 2,600 degrees Fahrenheit.

It's not an empty exercise in the sense that fuel from the Calvert Cliffs reactor would actually travel through the same tunnel that had the fire. The fire also has important implications for accident probability and risk estimates used in the Rad Tran program.

So state, therefore, asked us to look at the environmental and economic implications of the Baltimore Tunnel fire. In this slide, I just show some of the rail routes. One rail -- let's see, the purple dot there is Baltimore. The rail routes -- the rail routes from Calvert Cliffs go through Baltimore, as you can see.

The chronology of the fire -- next slide -- is the following. This fire occurred on July 18th, the year 2001. Approximately 3:00 in the afternoon, the train began to enter the tunnel traveling 23 miles

an hour. It was a 60-car, mixed freight train. It entered at the Howard Street tunnel.

The next details are a little unclear, and the National Transportation Safety Board hopefully is going to inform us as to the actual details. But it appears that the train derailed within the tunnel. The 52nd car of a 60-car train derailed within the tunnel. Emergency brakes were activated.

One car contained approximately 28,000 gallons of tripropylene, and that caught fire. Following that, the train crew uncoupled the engines, drove out of the tunnel, and called the train dispatcher.

For some reason, they weren't able to reach the train dispatcher right away, and not until 3:25, which is 18 minutes after the accident, because they reached the train dispatcher and for some reason at 4:15 the fire department finally arrived. But they couldn't enter the tunnel at that time. There was too much smoke coming from the tunnel. The tunnel was too hot.

This shows what it looked like. This is the south portal, and the south portal is the lower end of the tunnel. The tunnel is on a .8 percent grade, so this is the lower end of the tunnel near

Camden Yards ballpark. And this entrance is approximately 2,400 feet from the derailment. Firefighters are just standing on the outside.

This is the north portal, which is the higher end, and you can see much more smoke is coming out of this end of the tunnel. North portal is higher. And this portal is about 5,800 feet from the derailment, a mile and a half tunnel.

About 5:00 to 6:00 in the afternoon, in the midst of rush hour, the Howard Street -- Howard Street itself was closed. This tunnel runs under Howard Street in Baltimore.

Three hours into the accident a 40-inch water main located in the ceiling of the tunnel ruptures pouring water into the tunnel. It's not clear exactly why the water main broke, whether it was due to the heat of the fire or some of the stresses when some of the metal softened.

Essentially, this water main acted as a sprinkler system and put out the fire -- put out the tripropylene fire, it's believed. There was a difference in the smoke that came out of the tunnel following three hours after the accident.

Finally, seven hours after the accident, the firefighters were able to enter the tunnel but not

yet put out the fire. They were able to enter the south portal, the lower end. And finally, the next day, workers began removing all but some of the burning cars. Some cars had paper goods and other goods that were still burning.

When we did the analysis -- you can't see this red arrow too well. When we did the analysis, the prime issue for us was, what was the temperature of the fire? And how did it relate to the cask design which is a half-hour fire at 1,475 degrees Fahrenheit?

The only information we had at the time is an eyewitness account, a fireman's eyewitness account. A fireman saw -- seven hours after the initiation of the fire, he saw, when he entered the tunnel, metal glowing with a deep orange color. And from that we could get a temperature reading seven hours after the initiation of the fire.

And we surmised that the fire temperature at the height of the rail cars was somewhere between 1,500 and 1,650 degrees Fahrenheit. As I said, Southwest Research Institute has examined the components of the -- of the cars, in particular they looked at brake shoes, which had an alloy that fused, and they estimated that that -- the temperature for that to have happened was 2,400 degrees Fahrenheit.

So perhaps the flame temperature was higher, and that brake shoe was exactly in the flame itself.

The National Institute of Health -- excuse me, National Institute of Standards and Technology used a computer model to simulate the fire. They have a computer model which actually looked -- and they've actually benchmarked this computer model with a tunnel in West Virginia. And they've estimated a peak flame temperature of 1,800 degrees Fahrenheit, which lasted for three hours. That is the time before the water main broke.

They took into account the availability of oxygen within the tunnel, and some of the higher temperatures were located near the roof of the tunnel. The tunnel itself is lined with about three feet of brick, and the brick essentially acted as an oven or kiln.

In other words, the fire heated up the brick, and so it's not just a three-hour fire that has to be considered, it's a three-hour fire at a certain temperature, and then a continuing afterheat in the brick itself. Any modeling of cask response has to take that into account.

The temperatures calculated by NIST don't

differ so much from the observations of the fireman who came into the tunnel.

The next slide shows what are the regulatory tests for a cask? I'm sure you know this already, but let me just repeat. There are certain regulatory tests that are required. I should repeat what Bob said. None of the casks have actually -- that are in use, or certified, have actually been physically tested, though the NRC is planning for such a test.

The regulatory test consists of a drop puncture submersion test, but the one that interests me is the 30-minute fire at 1,475 degrees Fahrenheit. The conditions in the Baltimore Tunnel greatly exceeded the cask design requirements, in that the fire reached temperatures of 1,800 degrees Fahrenheit for three hours, not 1,475 for 30 minutes. And the tunnel continued to stay hot.

The issue posed by the State of Nevada is, what are the implications if a rail cask were involved in a fire similar to the Baltimore Tunnel fire? In other words, if the cask was in a mixed freight train containing other materials, hazardous materials?

Looking at -- this is a closeup of the potential accident scene. This is the Howard Street

tunnel, and these are the calculations that we did assuming a certain amount of material came out. Assuming this was a certain severity accident, the dots, which aren't easily seen, but the smallest circle, the blue circle, is a dose -- an immediate dose of five rem.

And some of these other lines are lesser doses, but the area is much greater. Some encompass some of these stadiums. The PCINet Stadium is where the Baltimore Ravens play. This accident happened in between a day and night doubleheader in Camden Yards, and people were evacuated at that time.

If the fire occurred -- if such a fire like this occurred in the tunnel, material would adhere to the tunnel walls. So there would be a gamma dose that would be rather high that would come from the walls itself. We didn't estimate that. We just looked at the environmental implications outside the tunnel.

CHAIRMAN HORNBERGER: So tell me, are you mobilizing -- how are you mobilizing the inventory?

DR. RESNIKOFF: What did you say?

CHAIRMAN HORNBERGER: How are you mobilizing the inventory? Presumably, you're dispersing this as fine particulate?

DR. RESNIKOFF: No. We're assuming that the material is Cesium-137, essentially Cesium-137, not the particulates themselves, because Cesium-137 is semi-volatile. But the material could then adhere to cooler walls in the tunnel, and that would yield a high gamma dose to emergency personnel.

Also, the cask itself, in calculations -- and I'll talk about that later -- calculations done by Holtec for the HI-STAR cask, assume that neutron shielding is lost, would boil off in high temperatures. Neutron shielding is a resin. It has fairly low temperatures.

And without neutron shielding, the neutron dose would be much higher. We estimate a neutron dose on the order of a half-rem an hour. That also would be of concern to emergency personnel.

The implications we found are the following. There are important implications for cask design. This cask -- all casks are designed to withstand a half-hour of fire at 1,475 degrees Fahrenheit, which is far below the Baltimore Tunnel fire.

The NRC staff has argued that even if the cask is designed to withstand a half-hour fire it can still withstand a fire like the Baltimore Tunnel fire,

and I disagree with that. I don't believe that's correct. I think it would be more honest to say that these casks are not designed to withstand all credible accidents that could happen.

And once you just estimate the probability of these rare accidents -- and perhaps a half-hour fire at 1,475 degrees Fahrenheit is sufficient, but, you know, when one -- taking into account the probability of these kinds of rare accidents -- but, please, not once in a million years, you know, for this kind of accident.

It would be important for emergency personnel to learn from the Baltimore Tunnel fire. I believe communications are poor in a tunnel. The train crew could not communicate until they got out of the tunnel. Radio communication was not possible, cell phones were not possible.

Emergency personnel should be trained and equipped to handle radiation accidents. For instance, they need -- if they are going to have accidents with fires, then they need to have neutron detecting meters, just as they have gamma detectors.

Those are the main points that I want to make. Do you have any questions?

MEMBER LEVENSON: George? John?

I want to thank you.

We're 10 minutes ahead of schedule, but before we break I'd like to ask if there's anyone in the audience who would care to ask a question of the speakers or make a comment.

MR. GRIFFITH: Chairman Levenson, my name is Tom Griffith. I'm with the Naval Nuclear Propulsion Program, and I just wanted to make a couple of clarifying remarks regarding the interchange on the Navy's experience that took place earlier.

First of all, I'd like to thank you both for recognizing that our experience is a positive one, that our design of our naval spent fuel, you know, for battle conditions does make it an excellent candidate for transportation, storage, and disposal, as far as performing those analyses.

As far as the 35 mile an hour speed limit that was mentioned, I would like to point out that that speed limit was invoked for all of our large components that we transport across the country. And that speed limit was invoked, and I'll point out that that's no longer the case. We don't restrict our speed limits. I think we changed that in like 1995 or '96. I'm not sure on the date.

But the reason for that speed limit was to

protect our large components from damage. Specifically, we only have a small fleet of shipping containers. If one, you know, did get hit in a normal condition type event, we didn't want it to be a very high impact collision, things like that.

Similarly, we had one -- you know, one-of-a-kind type components that need to go into ships to support the operational fleet. So that was just a clarifying remark.

We did use the 35 mile an hour speed limit for a long time. The purpose of that was mostly to protect components, so the -- right now, we have 746 completed shipments. Those numbers are available publicly in documents on the Naval Nuclear Propulsion Program that we issue annually.

So if there's additional information that you guys are requiring, please, you know, feel free to submit a request and we'll be able to make sure that what we -- you know, what's out there is available and provide it to you. So if you have any questions, I can take them at this time.

MEMBER LEVENSON: Thank you.

MR. HALSTEAD: Well, I guess -- I really appreciate your offering to make the data available. In past exchanges we had had with Ray English from the

program, there was sensitivity in releasing detailed origin/destination paired data by year, which is what we really need to do in equivalent risk assessment. And I -- maybe there is a way that we can --

MR. GRIFFITH: Yes, there would still be --

MR. HALSTEAD: -- access some of that.

MR. GRIFFITH: There would still be sensitivity to releasing that kind of information. For clarification, Ray English is our transportation officer at our Pittsburgh Naval Reactor Office. And, again, things do change in the climate of, you know -- as things change, you know, we may be able to release more or less information. If you have a standing request, we'd be more than happy to entertain that continuously, so --

MR. HALSTEAD: Thank you.

MEMBER LEVENSON: Okay. Thank you.

Anyone else have a comment or question?

MS. GUE: Thanks. I'm Lisa Gue with Public Citizen.

I just wanted to make a comment on the -- well, the committee has returned several times to the issue of the relative risks, probabilistic weighted relative risks of nuclear waste transportation

compared to other -- compared to the transportation of other hazardous materials.

And it occurs to me that it would be -- it would be interesting for the committee to also examine the way that these different risks interact and affect one another, particularly given that the NRC, of course, doesn't have jurisdiction over the shipment of other hazardous materials, but is contemplating licensing and regulatory decisions that would potentially give rise to unprecedented -- to nuclear waste transportation at unprecedented levels.

And, of course, I think what -- what members of the public are keenly aware of is that accidents involving other hazardous materials do, in fact, happen. And if nuclear waste -- if high-level nuclear waste were on the roads and rails in the -- along the scale contemplated by the Yucca Mountain and private fuel storage proposals, there would not only be a cumulative risk but that there would be interaction between these risks.

And the agency's regulatory standards for nuclear waste transportation casks don't appear to match the kinds of conditions that are attained in a fire involving -- or I should just say an accident condition in general involving other hazardous

materials.

So, you know, for example, what is -- what temperatures do other hazardous materials burn at that are being shipped and that could potentially be involved in a nuclear waste transportation accident? And how does that compare to the regulatory standards for nuclear waste shipping casks?

Thanks.

MEMBER LEVENSON: Thank you. Any other comments or questions?

I'd just like to make one, because it suddenly occurred to me that not everybody is familiar with the details of nuclear power reactor design. While the Navy fuel is certainly very robust, most of our power reactors are designed for very substantial earthquakes. And fuel is not something very, very fragile. It's pretty substantial -- all cases.

Let's take -- we're a couple minutes ahead of schedule. Let's take a break at this time, and be back here at -- five minutes early. We'll come back five minutes early, make sure there's maximum time for questions. We'll reconvene at five to 3:00.

(Whereupon, the proceedings in the foregoing matter went off the record at 2:33 p.m. and went back on the record at 3:00 p.m.)

MR. LEVENSON: Let me just note for the record that for the next five presentations it's been agreed we didn't divide the time up so managing it is up to you. The 5:15 is inviolate because we have another meeting at 5:30 upstairs on another topic. So I leave it up to you to -- I won't cut anybody short. You may lose your last speaker because I'm going to save a few minutes at the end for comments from the public and the audience, but between now and then it's yours.

MR. HALL: Thank you very much, sir. As Mr. Halstead introduced me, my name is Jim Hall and for almost seven years I had the opportunity to serve as the Chairman of the National Transportation Safety Board. Since leaving the NTSB in 2001, I've attempted to lend my voice to important transportation safety and security issues that I believe in.

As the Chairman of the NTSB I repeatedly saw the results of the failure to adequately address safety at the front end of a transportation project. From my work in Tennessee where I served six years as the Director of the State of Tennessee's State Planning Office, which was responsible for overseeing the Department of Energy's cleanup of the Oak Ridge Nuclear Weapons Complex, I got a basic understanding

of the complexity associated with the storage and transportation of spent nuclear fuel.

I'm here today speaking on behalf of the State of Nevada to focus our collective attention on one specific issue associated with potential transportation to Yucca Mountain: The need for full-scale physical testing of the shipping cask. I believe that full-scale testing is essential for both the protection of public health and safety and the promotion of public confidence.

Last summer when Congress was debating the siting of Yucca Mountain as the nation's nuclear repository, I was asked to comment on the safety aspect of DOE's Yucca transportation plan. During that time, I was surprised when Secretary Abraham testified before the Congress and informed them that the Department of Energy is just beginning to formulate its preliminary thoughts about a transportation plan. It has now been more than 14 months since the Secretary of Energy sent the Yucca site recommendation to President Bush, and the Department of Energy has yet to present a transportation plan.

Although a plan has not been presented, DOE has suggested several possible approaches to the

transportation issues in the final EIS, or Environmental Impact Statement, for the Yucca Mountain project. And you've probably already heard the Nevada consultants discussing some of those scenarios earlier today. However, I feel it is important to mention again that as this process continues to move forward, the Department of Energy has not yet even formally declared its stated modal preference.

DOE said in the FEIS that they would issue a record of their decision declaring their commitment to rail. At the current time, DOE does not even have a schedule of when they will make that most basic decision, so when I hear DOE spokesmen saying that there won't be 109,000 truck and 4,000 barge statements, I wonder as a public citizen what I'm missing. Really, we need to remember that it was the Department of Energy who put these scenarios and numbers forward, and it was the Department of Energy that stated in their opinion the risks and impacts of many thousands of truck and barge statements would be legally and socially acceptable.

Finally, when Secretary Abraham and his representatives say there will only be 175 shipments per year, it is important to mention that by all accounts such a number is unrealistic. At the very

least, there would be twice as many shipments per year, and as has been pointed out, there could be as many as 2,900 per year.

One assumption we can make about the Department of Energy's transportation intentions is that the Department of Energy will likely assume title to commercial spent nuclear fuel at the power plants and thus DOE will legally own the fuel and be the shipper of record. The Nuclear Regulatory Commission has clearly concluded that this will be the case. Of course DOE already owns the thousands of tons of high-level radioactive waste from defense activities and a large amount of spent fuel from civilian defense and naval reactor operations. Now, why is this significant? The Department of Energy's ownership at the time of shipment is significant because it limits the degree of the NRC regulation, and that is no small matter.

Last May, Senator Durbin of Illinois wrote to the NRC asking, and I quote from his letter, "What role would your agency play in the transportation of spent fuel if Congress approves Yucca Mountain?" Then NRC Chairman Meserve responded in his letter response, and I quote, "If DOE takes custody of the spent fuel at the licensee site, DOE regulations would control

the actual spent fuel shipment. Under such circumstances, the NRC's primary role in transportation of spent fuel to a repository would be the certification of the packages used for transport," end of his quote.

Senator Durbin asked a second question, "How would your agency be involved in selecting modes and routes for the relocation of nuclear waste if Congress approves Yucca Mountain?" Meserve again stated, "The only involvement NRC will have in the transport will be the certification of the transport cask."

The outgoing Chairman of the Commission has clearly taken the position that cask certification is the only aspect of DOE's transportation to Yucca Mountain that would be regulated by the NRC. Over the course of the past five weeks, Commission staff have repeated this position at public meetings on the Package Performance Study here in Rockville, in Las Vegas and Nevada, as well as Chicago. This underscores the importance of the Commission's decision regarding full-scale testing -- excuse me, full-scale cask testing, since cask testing certification is really the only area in which the Commission will be directly involved in the Yucca

Mountain safety planning.

Other representatives of the State of Nevada are here today to offer the specifics of the state's proposal for full-scale testing. They will also discuss reasons why the full-scale cask testing plan proposed by the NRC staff and contractors is not only technically questionable and very costly but is also unlikely to result in increased public confidence. It is not of course the NRC's responsibility to promote public confidence in the Department of Energy's transportation activities. The NRC should not approach the full-scale testing issue with public confidence as its objectives. It can and must approach this testing with the protection of public and health safety and the environment as its objective. If the testing is done properly, public confidence will logically follow.

For the past 25 years opponents of full-scale testing have focused upon cost. Indeed, full-scale testing will be expensive. NRC staff have stated that their program to test one truck cask and one rail cask will cost more than $20 million. Nevada analysts believe that the NRC proposal could cost as much as $30 million. Nevada has proposed a plan to test all of the cask types that would be used for

Yucca Mountain shipments if the repository goes forward. That means testing one truck cask and four rail casks plus additional testing and analysis at a total estimated cost of $45 to $70 million.

To put these costs in perspective, the cost of Nevada's more effective full-scale testing program would be small compared to the overall cost of the Yucca Mountain transportation system. The Department of Energy estimates that transportation system costs would be about $8.4 billion over 38 years. The State of Nevada has estimated approximately $9.2 billion for the same period. So Nevada's testing program is less than one percent of the projected transportation expenditures.

Another way to put testing costs in perspective is to compare that to the cost of cleanup after a worse-case transportation accident involving the release of radioactive materials. DOE acknowledges that cleanup could cost up to $10 billion, and that is for one accident. State of Nevada analysts have run the same DOE computer models and concluded that the worse-case accident or successful terrorist attack could involve cleanup costs in excess of $10 billion. Again, whichever figure we use, Nevada's comprehensive cask testing

program would cost less than one percent of the projected cleanup cost of a worse-case accident of our terrorist scenario.

In conclusion, I'd like to thank this panel for the opportunity to share my views and experiences with you and also the willingness of each of you gentlemen to offer your expertise to this important Committee. It will take cooperation at every level of this effort to make safety the primary concern, and it is vital that we all remember that it is the decision-making and performance of individuals, sometimes acting alone, sometimes acting as members of a team or committee, that directly determines how safe an organization or an operation is. Thank you, sir. I'll be glad to take questions or wait until we have the other presentations.

MR. LEVENSON: Mike, do you have any questions?

DR. RYAN: No.

MR. LEVENSON: John?

DR. GARRICK: Jim, just one. You, of course, have a tremendous amount of experience dealing with transportation systems and accidents and investigations and what have you. And of course DOE doesn't have much experience in instituting a

transportation system of this type. Is there any example in the background of the field of transportation and transportation safety that there could be an activity that would be a source of lessons learned here that would be anywhere close to an analog of what's being -- what the problem is?

MR. HALL: Well, John, I think obviously that we can look, as you pointed earlier, to the experience we've had in transporting hazardous materials in this country, and we have had tragic accidents on our highways and in our rail systems, with our pipelines systems and our refineries in trying to handle dangerous products. And of course we have the background and experience at our nuclear facilities and the existing experience to draw on from the successful transport of nuclear material up to this -- nuclear waste material up to this point.

One of my primary concerns here, and one of the reasons that I'm here to emphasize the importance of casks, is my experience at the NTSB has taught me any time you have several organizations responsible for the same activity it is a cause for concern.

DR. GARRICK: Yes.

MR. HALL: And I think that's the case,

whether you see that in the private sector or whether you see it in the public sector. And I have been trying to work at the State of Tennessee when I had this experience for the oversight of Oak Ridge and working here trying to advise the State of Nevada, and I have a great deal of respect for people with lots of expertise in this area, which I do not have, but my common sense tells me that we don't really have clear lines of accountability in this area.

DR. GARRICK: Yes. I think --

MR. HALL: And I think that's why then the testing of the cask itself becomes so important.

DR. GARRICK: Yes. This Committee has expressed concern on several occasions to the NRC Chairman about who's in charge when a transportation accident happens involving nuclear materials. And you're absolutely right, there's multiple agencies and multiple organizations, and it has been a problem not only for the Yucca Mountain project but it was a major consideration in the WIPP project as well.

It's getting at with the experience base here of something that might be an analog to what we're addressing is whether or not there's experience there with respect to the testing of containers and systems for handling the material that would be

similar to what all of you are suggesting for Yucca Mountain.

MR. HALL: I think some of the other presenters are going to cover that subject, sir.

DR. GARRICK: Okay. Very good. Thank you.

MR. LEVENSON: Well, let me -- your last statement, I guess, follow up on John's question, from your background, are you aware of any cases where when decisions were made to starting shipping things like fluorene or hydrogen or other very dangerous and toxic materials were full-scale tests of rail cars ever performed or done routinely when new types of materials were to be shipped?

MR. HALL: Prior to my time at the NTSB, you had the accident, and I'm trying to remember where it was, down in Tennessee, absolutely devastated one whole town down there that ended up with your head shields being placed on your rail cars and there is of course testing and requirements of tank cars. I am not --

MR. LEVENSON: None of that is crash testing --

MR. HALL: There's been of course crash testing in the aviation area, and we've had several --

MR. LEVENSON: No. I'm not talking -- I'm talking about railroads.

MR. HALL: Right.

MR. LEVENSON: Okay. Thank you.

MR. HALL: Okay.

MR. HALSTEAD: Well, given the Chairman's wise counsel that we attempt to stay on time, I'm going to -- am I on with the mic? Okay. Is that coming through? I'm Bob Halstead, for the record, Transportation Advisor to the State of Nevada Agency for Nuclear Projects. The presentation that I'm going to give you now is an attempt to outline the State of Nevada's current position on full-scale testing, but I also want to tell you that this is a position that is in progress right now, because we're trying to, first of all, find ways to dovetail our approach to full-scale cask testing with the approach that's been suggested in NUREG-1768, the draft testing protocols for the PPS.

And, secondly, in the process of participating in the Package Performance Study meetings and in reviewing NUREG-1768 as is always the case I think when you carry out a good technical review, some things that we thought we totally understood we've realized we didn't understand as well

as we thought we did.

So it's been an educational experience. And the comment I made at the beginning of the meeting that my back and forth exchanges with Tim Kobetz had been helpful in making me understand where there were some issues particularly with the fire testing that either we had not thought through sufficiently or we weren't communicating clearly.

So with that said, I also want to acknowledge that Fred Dilger of Clark County has been my colleague on this task of developing a proposal for the state, and let's go to the next slide, please. Just an overview, outline, of what we'll be talking about. And then if we can go to the next slide.

I think it's useful to review the current situation which is that the NRC doesn't require physical testing full scale. There are currently 16 shipping casks certified in this country. None of the currently certified U.S. casks has been tested full scale to demonstrate compliance with 10 CFR 71 performance standards. Two truck cask designs have been subjected with half-scale replica models to the drop test. Three rail cask designs have been subjected to the drop test, and more than half of the tests of the casks have been subjected to scale model

impact limiter tests. That's the sum of the testing that has been done. No full-scale testing and pretty much limited scale model testing and a lot of reliance on analysis. Next slide, please.

For years, we've argued the advantages of full-scale testing and organized the arguments in various ways. When I went back over files I found an old report that Sandia National Labs did for the Department of Energy in 1993, and I don't usually like to do large quotations from other people's work, but in fact I've never seen a clearer statement of the advantages of full-scale testing than are provided in this 1993 Sandia report. And I offer them to you.

The first and most obvious one is direct demonstration of compliance with the regulations. And remember here now referencing the focus of Nevada's proposal on regulatory, confirmatory testing. And we'll talk about extra regulatory testing separately. Secondly, while there are some issues that can be addressed through half-scale model testing, there's certainly a clarity of characterization when you're using a full-scale model. And one of the issues that's been brought to our attention by the cask manufacturers in the PPS meetings is that in fact there may not be that much of a cost savings in using

a half-scale replica model. There are other advantages in terms of being able to look at the operation of the closure and the seal as a total package. Next slide, please.

It's also important to remember that with the new generation of casks designed for Yucca Mountain where to my knowledge one unit of the Holtec cask has been produced but there haven't been any orders yet, so in fact we don't have any fabrication experience with these new cask designs. And advantage of full-scale testing would be that it would require the manufacturers to actually get some early lessons learned in preparing a prototype, acknowledging that preparing a prototype is somewhat different than producing 50 units under a large contract. Eliminating the need for scaling and providing direct visual evidence are other important advantages.

Frankly, the only disadvantage that I have ever heard anyone say in this context is cost -- the cost of fabrication and testing, the cost of handling the test article and so forth. And as I'll say in my concluding remarks at the end of this session when we talk about lessons learned, indeed what we know about full-scale testing is, a, it's expensive, and, b, it's always more expensive than people thought it was going

to be at the beginning of the test program. But the argument we would make is that from a standpoint of regulatory testing while there are clear advantages and no technical disadvantages to full-scale testing, cost clearly can be seen as a disadvantage. Next slide, please.

Nevada's approach to regulatory testing has five components: a strong stakeholder involvement, actual full-scale sequential testing according to the NRC performance standards, preferably prior to NRC certification but since many of the casks we're talking about have been certified already doing this prior to DOE's procurement would serve the same purpose. Importantly, we see the need for additional testing to address the issues that the NRC staff is proposing be addressed in the Package Performance Study, but we're not so sure that full-scale testing is necessary for all of those tests. We do think full-scale testing is necessary for the fire test, but a combination of simulations, scale models and full-scale component testing may be just as effective, may be more effective in determining -- in particular in determining failure thresholds.

Finally, the last two points are things that might grow out of findings, and perhaps we

shouldn't speculate about what the findings would be. I find it gratifying that as the PPS meetings have gone on, the NRC has clarified in response to questions from the public that when they have these tests and they find problems in the NRC regulations, they of course are not going to ignore those findings. Next slide, please.

Nevada argues that this testing should be focused on the casks used for Yucca Mountain shipments of which five of the certified casks have been identified by NRC as likely to be used either in Yucca Mountain shipments or shipments to the private fuel storage facility. And certainly there have been many people -- I don't want to say many -- there have been a number of people who have come to the PPS meetings and have said that they see our approach as deficient because we're not arguing that all the casks should be tested full scale. I recognize that people can make that criticism with validity. Our argument is that the casks we focused on represent at least 95 percent of the spent fuel shipments that are likely to occur over the next four or five decades, including shipments to PFS.

In particular, we think it's important to focus on these new cask designs, because these are the

casks where a combination of new designs, new materials and larger payloads raise new questions that can't be directly answered by looking at the performance of the casks that have been used over the last 20 years. We believe that to a certain extent code benchmarking can be accomplished through these regulatory compliance tests, although we will acknowledge that the test objective should be reflected in the test design and in some ways will limit the applicability of the tests. And, again, I'm going to talk about this at the very end of this session when we review the lessons learned from past full-scale testing.

We think it's an appropriate use of the waste fund. This is going to be an expensive activity, and frankly I think there would be a problem if we were proposing to use money from the waste fund to test casks that weren't going to be used for the Yucca Mountain shipment. Not to say that that perhaps shouldn't be done, but I think we'd have to argue for some other source of funding.

And, finally, the testing that we would like to see done could be required through regulation by NRC and DOT. We believe it could be done through a DOE program decision unilaterally, although some at

DOE would argue that they would need congressional approval. And, certainly, a congressional mandate, either through statute or appropriations conditions, could be used to require such testing.

Now, turning to the area of extra-regulatory testing, we believe the focus should be on fire tests, and, again, I'll be happy to answer questions on this so I don't belabor the points of the -- I'm sorry, next slide, please. The analyses conducted to date by DOE and Nevada generally conclude that accidents that involve long-duration, high-temperature fires are likely to produce the worst consequences. Real-world fires, we believe, are particularly a concern with the new generation of casks, larger payloads and particularly carrying large inventories of Cesium-137.

If you'll review the findings of your November 19 meeting, I think you'll agree with me that the people who spoke there agreed in their statements that in fact there is very little physical data on actual cask performance in severe fires. Certainly, there have been other types of benchmarking exercises with large calorimeters, for example, but we simply haven't done any fire testing with full-scale casks since the 1970s. And a key objective of these tests

would be both to determine failure thresholds and benchmarks codes. Next slide, please.

I've identified five different approaches to the fire test, five options that we're considering, and this will be one of our major tasks over the next five weeks as we send written comments to the NRC on the Package Performance Study draft testing protocols. There is considerable debate among our own technical reviewers, not only over what's desirable to do in a fire test but frankly what is physically possible to do in a fire test. And in particular, our reviewers have raised questions about combining an impact test and a fire test, particularly because prior to the fire test we would like to have instrumentation installed at several points in the cask. And there's a question then if you subject that cask to an impact test, can you reasonably expect your instrumentation, such as thermocouples, to accurately report the temperature data that we see?

So without going into them in detail, there are five combinations of undamaged and damaged casks with different ways of defining -- or different ways of approaching the identification of failure thresholds either by modeling a predicted failure threshold and then creating a test fire that creates

that or the other case which some people on our team suggest is best, particularly for the truck cask, is simply to instrument the cask and take the undamaged cask and run the regulatory fire without a constraint until certain temperature thresholds, usually the agreed upon value is 750 degrees C, are reached in what would be the fuel containment region inside the cask. Next slide, please.

We've estimated costs carefully. We've tried to err by overstating the costs. As I said, this is expensive business. We think that the first effort of doing this testing program on a legal weight cask is going to require a lot of stakeholder involvement, a lot of expensive modeling and a lot of rigorous peer review. And there are also some cost unknowns that have to do with not just the instrumentation but how we will design the dummy or surrogate fuel that would be inside the cask. We've considered some scenarios in which a fresh fuel assembly has been used.

So these costs represent our best estimate to err on the high side. We think, however, that there will be a learning curve after the first truck cask and after the first rail cask is tested. So while we think that a $27 to $30 million cost for the

first two casks is pretty accurate, we certainly think that the larger cask program that we're recommending can be accomplished in the range of $45 to $70 million.

And let me say I think costs are important, and I'm very concerned by the position that the NRC staff has taken, and, again, I'll talk about this in my last presentation, but I believe that anybody who's bold enough to propose a full-scale cask testing program needs to put a sticker price on it, partly because money isn't free and partly because in a world where we're asked to do cost/benefit analysis on everything, it's fair for people to be asked to put a dollar figure on this. Next slide, please -- or this one, I'm sorry.

Issues to be resolved. Well, they're pretty much the same issues that we'll tell the PPS staff and contractors at the NRC they have to address: Develop your protocols for full-scale sequential tests, got to have a good defensible definition of cask and fuel failure, same attention needs to be paid to developing the protocols for the regulatory fires, and we really need to look at some options for extra-regulatory impact tests. As I said, while we think a full-scale test is necessary for the fire test, it's

quite possible that some of the other extra-regulatory issues can be answered with something less than full-scale testing.

There is this outlying issue of the need possibly for other extra-regulatory tests, particularly the puncture, deep immersion and crush tests. The last two, deep immersion and crush, are tests that aren't currently required in the regulations. And, of course, validating cost and schedule estimates, always an important burden that anyone proposing a course of action must carry. Last slide, please.

We have assembled a review team to prepare comments on the package performance draft protocols. Some of those people have been at the table with us today, some of the others I mentioned, in particular Lindsey Audin and Professor Miles Greiner. We've already been working on our comments for the end of May. We hope to have draft comments for our own and external review by the middle of May. Realistically, this is a very big piece of work, and we won't have it done to our satisfaction, putting forth our proposal by May 30. I believe we can meet a target schedule of December 2003, and I also believe that will dovetail with the NRC staff deliberations. I find it hard to

believe that they will be able to evaluate all the comments on the PPS and decide where their next decision goes sometime before the middle of fall 2003. I could be wrong. Thank you very much.

MR. LEVENSON: George?

CHAIRMAN HORNBERGER: It strikes me that you've done a pretty good job of giving us detail on what and how, but I'm still pretty much in the dark as to why; that is, what is it -- you mentioned again costs because we think in terms of cost/benefits, and you haven't given me a clue yet about what the benefits are.

MR. HALSTEAD: Well, sure, let me summarize those. First of all, we have some wonderfully elegant finite analysis codes these days. If you look real hard, you'll find out that there's not a lot of benchmarking. So at the very least I think we've got to do one full-scale rail and full truck cask simply for benchmarking purposes. Now, I understand that the Committee took a different position in their meeting last June and, you know, wrote a pretty-well argued letter. And, frankly, as a risk-informed letter, if I remember, Mr. Chairman, I believe that NUREG/CR-6672 was used where this Committee said, "Look, if the calculated risks of an

accident involving a release are so low, why in the world do we have to do this testing?" And I agree, if you accept NUREG/CR-6672, it's hard to make an argument for full-scale testing.

MR. LEVENSON: I don't think our letter was against full-scale testing. It was against extreme unrealistic conditions.

MR. HALSTEAD: Okay. I'm going to get to that part, though, but I thought your letter, first of all, said from a risk-informed basis you saw no clear need and weren't sure that the benefits were commensurate with the expenditure of doing the test properly. And I, secondly, also agree with you that any extra-regulatory testing that's done has to be well justified either by replication of a realistic worse-case accident or done the other way to define a failure threshold which we can then compare our full body of knowledge about real-world accidents, and say, "Look, there's not a real-world accident that comes halfway near this failure threshold." So there are two ways to approach it.

But let me start by saying that I believe there's an absolute need to do one full-scale rail and one full-scale truck cask for benchmarking purposes simply because we haven't done that with the casks in

this country since the '70s. Secondly, there probably is not a direct need to test more than one truck cask if as we think the GA-4 is going to be the workhorse cask and the GA-4 and the GA-9, the two versions, are so physically similar I don't think there's a case for testing both of them. I certainly would argue against it as being redundant and unnecessary.

With the rail casks it's not so clear. There is some significant variation between the NAC dual purpose cask, for example, and the Holtec Transport System. And this is one of the areas that I think we need some back and forth with the NRC staff on with the PPS and the selection of a cask. Now, maybe we're wrong. Maybe there is a representative new rail cask that for benchmarking purposes will suffice, but it looks to me that there's a good argument for at least two, basically looking at steel-lead-steel casks and then looking at the larger monolithic forged-steel body approach.

Beyond that I would turn the argument around on those people who oppose testing. Go back to that first principle from the 1993 Sandia report. What better evidence -- and again we're talking about confirmatory testing -- what better evidence can there be that you meet the requirements of 10 CFR 71 that

the physical article has been tested and it complies with the leak and radiation test? And of course you'll have to calculate the radiation test because we're not going to test it with live spent fuel in it.

And while I very much support extensive modeling, I think there is an argument here that at some point a symbolic representation of reality is not better than reality. And it's certainly not when we turn to the final -- and I'm uncomfortable making this argument, understand you, because I know how fickle public opinion is, and one of my great nightmares is that Nevada succeeds in getting all the extra-regulatory safety enhancements that we've asked for, that we get those agreed to and they're done and for whatever reason the public still doesn't respond to them.

So I don't think you can say public opinion is the goal, but my experience is this: When you take this issue to the public being able to say that the specific cask being used in a campaign have been tested to demonstrate compliance with the regulations that's very powerful. Now, again, I planned to save that argument for the closing discussion where we do lessons learned.

But, you know, your argument is right on

the point. No one who isn't willing to significant benefits should stand before you and argue that we should take on this as a matter of public policy. And I probably have answered inadequately but some of the answers I plan to give I've saved for the end of the session.

MR. LEVENSON: George? John?

DR. GARRICK: A specific question: What was the basis for the fire option tests that you showed earlier?

MR. HALSTEAD: Coming into our current debate with the NRC and NIST staff over what happened in the Baltimore fire we felt pretty confident that that was a pretty good analog for if not a worst case a very, very severe fire. And now, frankly, that on review of these findings we're beginning to see some evidence maybe the other people who reviewed this didn't see it. But, for example, as we look at the Southwest Regulatory Institute and the Battelle and the NIST findings, we see some evidence that maybe the temperatures in the Baltimore fire got a lot hotter. They might have gotten up to 1600 degrees C. So that said that we're still rethinking this.

Over the last ten years, Dr. Resnikoff and I have looked at a whole range or real-world

accidents. We had the benefit of an assessment that was done in 1986 for the State of Nevada by an expert study team put together by a research team. And we're possibly going to change these temperatures, but right now we feel comfortable laying them out there. And Dr. Birky would like to add a point on this as well.

DR. BIRKY: Well, I think you've raised a very fundamental issues in terms of what fire test or what intensity should one use on testing these casks. And if I may reference about 35 years in fire experiments and testing and accident investigation, you can go through a long litany of examples of accidents in which the resulting fires were more intense or the damage was more intense than one would expect based on existing knowledge.

And I'm afraid, for example, the present regulation that we're talking about for NRC, the cask compliance, is really too low for too short a time for any accidental fire, and the reasons I would suggest that we need to rethink this question of what prior temperature should it endure. Eight-fifty is not a very high temperature when you're talking about a fire, and we've seen them much higher in almost every accident which have involved hazardous materials and of which a fire has ensued as a result.

But let me talk more about more of a general response to the question that was asked earlier about why do we need to -- do we have examples of testing of vehicles, transportation vehicles, and other vehicles prior to their use in transportation. And I would like to reference a couple of accidents that I was involved in that result in rather dramatic changes in the way we do business. But it was the result of an accident that was very, very costly, much more costly than what it takes to test.

And one of those was the Exxon Valdez in which the result of that we ended up with double-hulled tankers. And another one that Jim Hall just mentioned, of course, was the tank cars in which they finally put shields on the front of them to prevent penetration of the tank during collisions. And we've had tanker truck fires and explosions also that have resulted in changes in the way we do business. And this was done after or as a result of an accident and was not done beforehand, and I think we can compile a list of these things that resulted in dramatic changes in the way we do business as a result of tragic accidents rather than doing the studies beforehand to prevent these accidents from happening. Thank you.

DR. GARRICK: Yes. And of course it's

never straightforward because taking your example of the double-hulled tankers. There's still a debate going on as to whether that has resulted in less risk of tanker spills.

I wanted to ask one other question. An issue that we discussed a great deal when it comes to tests is the protocol concept or the basis for the protocol test being test-to-failure versus test-to-reasonable severe conditions. And the concern of test-to-failure is of sending a message out that is very difficult for the public to relate to in terms of the actual system that we're dealing with. And this seems to me to be an issue of risk communication that's kind of important, and I'd like to know what your views are on that whole issue of test-to-failure versus test-to-severe accidents.

MR. HALSTEAD: First, I want to put that in the larger perspective. That is in fact one of the key issues that this team is going to be working on, hopefully having a resolution by May 30 so we can inform the PPS proceeding. It's very difficult to deal with this issue, cask performance, without dealing with the issue of spent fuel performance. And, again, that's one of the things I'm going to talk about at the end, but one of the working definitions,

for example, that we have used for defining cask failure is cask failure would be a condition in which there is a one percent release of the inventory of Cesium-137, and I think it has to be some way precisely defined.

I was disturbed, frankly, to hear at the NRC public meeting in Pahrump, Nevada that people had come to the meeting arguing that cask failure meant that a fuel assembly could pop out of a cask and lay on the road. That is exactly what we don't need to result from this discussion. So for me jumping in first rather than on a specific issue, we're trying to find something that's the equivalence of a performance measure based on a consequence analysis that we think we understand to define what test-to-failure means. I don't have a sufficient answer. I thought I had an answer five weeks ago, but after we discussed this in the context of the PPS meetings, I realized that we need to rethink and be more precise in our definition.

DR. GARRICK: For the sake of science, of course, there's great interest in the consequences of test-to-failure, but we're not talking about science here so much as we're talking about a project and what needs to be done to assure the safety of that project.

One thing I wanted to say for the record,

the same national laboratory that you referenced in terms of pushing for a full-scale test also indicated in that same report that they thought the regulations that were in place now were acceptable and provided the necessary safety. I think it's very important to keep that in perspective.

MR. HALSTEAD: Well, I'll go further and add to that. I'm sure some of my colleagues like John Vincent from NEI and earlier from GPU who has been involved in these discussions with us for years I'm sure they find it quite ironic that Nevada representatives are sitting at the table arguing, you know what? Those hypothetical regulatory accident conditions represent a very severe accident.

DR. GARRICK: Yes.

MR. HALSTEAD: We've always said that. We've always said they don't necessarily represent a worst-case accident, whatever that is, but I think that is an important point, that we're now at the table saying that while we need information on extra-regulatory accidents and the implications of those for the standards, we're not saying that we have a basis to argue that the current standards are inadequate. I do think the fire standard has been one that was flagged as early as 1986, that perhaps the duration

should be increased from 30 minutes to one to two hours and the fire standard increased from 1475 to 2000 to 2000 Fahrenheit. And we've always said we were concerned about the fire standard. But, in general, we've said that's a pretty good regulatory standard. The problem is you're not testing casks to that, and you haven't even done one truck and one rail to benchmark the codes that you're using to enforce that standard.

DR. GARRICK: Yes. My point is we're not saying one is right or one is wrong. I'm just saying that the people that have been advocating casks are also on record as saying that the regulations are adequate in their opinion.

MR. HALSTEAD: Absolutely.

DR. GARRICK: Thank you.

MR. LEVENSON: Mike? I've got a couple of questions for clarification. You listed what you're going to at least tentatively suggest be done in the way of fire tests, and there are a number of them --

MR. HALSTEAD: Could we put the slides back up, please, on this?

MR. LEVENSON: Well, I don't know that we need them.

MR. HALSTEAD: Okay.

MR. LEVENSON: A number of them where you say the fire should continue long enough till the fuel gets to 750 degrees. Are you proposing to have real fuel in the casks while those tests are done?

MR. HALSTEAD: No, absolutely not, sir; good point.

MR. LEVENSON: It's simulated.

MR. HALSTEAD: We're talking about simulated with heaters to represent the internal heat level.

MR. LEVENSON: Okay. My question is if you're not using real fuel or if you're just using simulated fuel, presume the reason for heating the fuel to 750 is to see what happens to the cladding in the fuel?

MR. HALSTEAD: Absolutely. Although that number is subject to refinement.

MR. LEVENSON: Yes, yes. But my point is if what you want to do is find out what happens to the fuel, why do you advocate spending tens of millions when you can do the same thing in a furnace for tens of thousands?

MR. HALSTEAD: Well, in fact we're also advocating that that be done for fuel testing purposes. I think that there are some technical

difficulties of putting instrumentation inside a cask in a full-scale fire test and whether you use some type of transponder technology or whether you have to run wires through the cask which create pathways equivalent to what happens if you look at different parts of the cask in a fire, the drain plug opening, for example. So there are difficult ways to do that, but we would argue that all the information on fire testing with the testing of the CAFE code is based on the premise that you can't scale model fires, and you haven't got the basis yet for benchmarking the codes.

MR. LEVENSON: Yes. Well, I'm not questioning what you're recommending for fire testing of the cask. What I'm saying is that if what you want to study is fuel failure, then the scaling issue doesn't come up and you can do it in a furnace for tens of thousands other than tens of millions.

MR. HALSTEAD: You've correctly raised the issue of why we have some hard thinking about what we're -- because we can only recommend one. You can't recommend some unlimited number of tests, and it's quite possible that pellet testing in a furnace will do the job.

MR. LEVENSON: Well, I'm not talking about just pellet testing. Whatever you wanted to do. If

you wanted to do a full sub-assembly, doing it in a furnace is orders of magnitude cheaper than doing it in a cask.

MR. HALSTEAD: No, I agree. I absolutely agree.

MR. LEVENSON: Good. Okay. Go on.

DR. RESNIKOFF: I think I'm on. I'm back to the Baltimore Tunnel fire, and I'm going to talk specifically -- I'm going to get into the nitty-gritty of actual casks and talk about why it's difficult to generalize from one cask to another.

I'm going to discuss -- each cask has major and subtle differences that make it difficult to generalize and apply the results from one to another. I'm going to focus on the Holtec HI-STAR 100 cask but also discuss the IF-300 cask, the GE cask.

As this slide -- this slide is schematic of the Holtec cask. This is an overpack within which fits this sealed canister, welded shut canister, containing the fuel itself. The overpack is constructed of these concentric steel shells, approximately nine inches thick for gamma attenuation and structural integrity. Some casks use for lead for gamma attenuation, some casks use depleted uranium for gamma attenuation.

Outside the steel shells in this area right here is what's called -- what Holtec calls Holtite, a neutron-absorbing material on the outside. Some casks, such as the IF-300, contain water rather than a resin or plastic. On the end of the cask is an impact limiter which is designed to crush on impact. For the Holtec cask, this impact limiter is made of aluminum in honey comb formation. So it crushes on impact.

Inside the MPC, inside the canister, you have a latticework which holds fuel, either 24 PWR assemblies or 68 BWR assemblies. And this MPC, or internal canister, fits within the transportation overpack or fits within a concrete storage overpack. When fuel is prepared the water is evacuated from the overpack and replaced with helium which is a better heat conductor. And this has been the practice since 1980. Helium also prevents oxidation of uranium in fuel with damaged cladding.

I want to focus on several features of the HI-STAR 100. Points 5 and 8 are plugs that cover valves. And those valves are used to evacuate the overpack, evacuate it of water, replace the water with helium. Helium, as you know, is a better heat conductor than air. The bolt structure at Point 6,

the bolt structure is also important. And I want to talk about that too.

The next slide shows a cross section of the HI-STAR 100 overpack. I want to focus for right now on the neutron-absorbing area on the outside of the cask. In older casks, this section is a water jacket, and in a potential accident the water jacket can be pierced, water is replaced with air, and the outer section serves somewhat as an insulator in a fire, but that's not true for the HI-STAR cask.

Since resin is an insulator, the HI-STAR cask is constructed with radial connectors. Those connectors that you see, the radial connectors are a half-inch thick and are designed to conduct heat out of the cask. They serve as heat conductors. The next slide shows a closeup of the radial channel. Let me show the next slide. And this shows the construction of the radial channel. The Holtite material is located within, and then you have these half-inch thick pieces of iron which conduct the heat out of the cask. Unlike the IF-300, the HI-STAR 100 is not going to serve as an insulator in a fire but actually will conduct the heat into the cask.

The next slide is from the TSAR for the HI-STAR cask and shows how the Holtite performs in a

regulatory fire, a half-hour regulatory fire. You can see the temperature rise for the first half hour and then steeply decline, but if you were to project that up to an 1800 degree fire that lasted for three hours, you can see that the Holtite would quickly evaporate, which is also what Holtec assumes for their cask, that the Holtite material, the neutron-absorbing material would actually evaporate in an accident. And as I mentioned earlier, without that neutron-absorbing material, the dose at the cask surface rises to 500 millirems an hour.

DR. RYAN: Could you expand on that a little bit? That sounds high to me. What's the basis for 500 millirem per hour?

DR. RESNIKOFF: We've actually done -- well, we've actually done the calculation removing the hydrogen which is -- the hydrogen and boron which absorbs the neutrons. We've actually removed that to see what the neutron dose would be on the surface of the cask. We've done calculations to look at neutron attenuation.

DR. RYAN: Tell me about it. My point is how did you get 500? You had to have so much -- I mean where did the neutrons come from? What's in the fuel? I mean what burn-up is it? How do you get 500

millirem neutrons? What's the starting point of your calculation?

DR. RESNIKOFF: The burn-up of the fuel that's assumed in the HI-STAR cask is 40,000 megawatt days per metric ton. The material that gives you the neutrons is --

DR. RYAN: And what age is it?

DR. RESNIKOFF: Oh.

DR. RYAN: I mean, you know, there's a lot of factors that go into that calculation. I'm just trying to understand that, because it sounds very high to me --

DR. RESNIKOFF: Absolutely.

DR. RYAN: -- by a factor of about 20.

DR. RESNIKOFF: It's generally ten-year pooled fuel, and the neutrons come from spontaneous fission --

DR. RYAN: I know where they come from.

DR. RESNIKOFF: -- of curium.

DR. RYAN: Of curium?

DR. RESNIKOFF: Curium.

DR. RYAN: I just wanted to know --

DR. RESNIKOFF: Two-forty-two and 244.

DR. RYAN: -- details of your calculations because, again, I think that's a very high number. If

you look at what's measured for a storage cask today, those rates in the 25 millirem per hour for unshielded parts of large assembly array seem to be about reasonable. That sounds like it's about 20 times too high.

DR. RESNIKOFF: The storage containers have concrete which contains hydrogen.

DR. RYAN: I'm talking about without an absorber.

DR. RESNIKOFF: Which absorber, I'm sorry?

DR. RYAN: I'm talking without an absorber.

DR. RESNIKOFF: I'll be happy to send you the calculations.

DR. RYAN: Please do.

DR. RESNIKOFF: Okay. Finally, the last slide discusses some of the components of the cask, and I've projected some of these lines upward. This is, again, for a half-hour fire at 1475 degrees Fahrenheit. According to the calculations done by Holtec, the closure plate bolts will reach 512 degrees Fahrenheit in a regulatory fire. Their calculations show that. Their calculations show that the accident limit is 600 degrees Fahrenheit. So I've projected plate bolts curve, and it shows that in less than an

hour of a closure plate bolts will exceed the design limit for a fire at 1475 degrees Fahrenheit and less time for a fire at 1800 degrees Fahrenheit. Okay?

Now, I admit this is not -- I haven't done a calculation, I've just projected up a curve, and it would be useful to see that calculation, but this is my conjecture.

DR. RYAN: What's the basis for your projection?

DR. RESNIKOFF: Well, I've just taken the tangent of that curve.

DR. RYAN: I understand what you've done on your graph.

DR. RESNIKOFF: You saw what I did.

DR. RYAN: But what's the physical basis for doing it?

MR. HALSTEAD: Well, it's the assumption that there are real-world fires that can produce those conditions, and it goes to the question of both what happens in the regulatory fire and what happens in an extra-regulatory fire. And it goes, frankly, to an area that we're still working on which is to look at the TSARs for a lot of the currently certified casks.

And I don't mean to jump in here on this but frankly we would have had a much more interesting

discussion if we had looked at the IF-300, which is currently licensed and currently used for shipments in the Carolinas. And in fact you would -- the point we're trying to make is these are the kinds of issues that we believe have not been sufficiently dealt with in the background analysis that supports the PPS approach to testing. We actually want to go and look at the performance of specific currently certified casks under regulatory, slightly higher than regulatory and considerably higher than regulatory conditions and make sure that we have that information in hand before we make decisions on the testing protocols.

And frankly it's a cruel thing to say because I like a lot of the people at Sandia, but I'd have to say right now we can't support the recommendations that are made for testing in NUREG-1768 even though we'd like to be able to support this testing because we've been supporters of it for so many years. Because when we actually look at what we think are the specific technical issues that need to be resolved in the testing, it doesn't seem to us that they've even considered these issues. In the impact area they've looked very closely at some of these issues, but they, for example, have not sufficiently

looked at the issue of bolts, seals and fuel performance in certain temperature ranges.

DR. RYAN: I appreciate the fact that you're expressing your view on a testing protocol, and I accept that you're constructing that view, but I just want to point out that doesn't come from a dotted line on a projection on a graph. It's an independent thing of trying to tie it to what would happen --

DR. RESNIKOFF: I agree with you on that, but I just want to emphasize the point again: A half-hour fire at 1475 has the closure plate bolts reach 512 degrees Fahrenheit. You've raised the issue of do you think they will not reach 600 degrees Fahrenheit if you have a three-hour fire at 1800 degrees Fahrenheit? Another 90 degrees more?

DR. RYAN: I didn't raise that issue. I'm just talking about how you projected this graph. I do appreciate your comment on your developing a protocol kind of from principle.

MR. HALSTEAD: I personally don't like -- I don't put dotted lines on graphs, so there's a little bit of a difference of opinion between Marvin and I as to how to make the point. I think, unfortunately, the way the point is displayed on the graph undercuts the credibility of why we're asking

the question. So occasionally these things occur at the table.

DR. RESNIKOFF: You can shoot me.

DR. RYAN: That answered my question. Thank you.

DR. GARRICK: He may do that.

(Laughter.)

DR. RESNIKOFF: Well, not in public.

MR. LEVENSON: Let me just --

DR. RESNIKOFF: And also, if things get too hot, then Meritt Birky is a thermal chemist and he'll take care of it.

MR. LEVENSON: Let me just point out you have 40 minutes more for your group.

DR. RESNIKOFF: Okay. I'm almost done. I want to point out that once the closure bolts -- the closure bolts are under considerable stress. Once the closure bolts exceed the design limit, helium will be released from the overpack, which also will serve to insulate the MPC somewhat. That's true.

We have asked for the calculations from Battelle. Battelle has done a study of what happens in this kind of fire, the Baltimore Tunnel fire. And yesterday I received some overheads but not a report. Maybe there doesn't exist a report by Battelle. It's

only a two-dimensional study done of a cross-section of a cask. They haven't actually looked at the closure bolts at the end of the cask without the impact limiter there.

This is a difficult study to do because for the case of the Holtec cask the impact limiter can melt; it's aluminum. And therefore the dimensions change over time. The Holtite, the resin within the -- the resin on the outside of the cask can melt. So in other words, the dimensions of your system begin to change, and the materials begin to change. And it's not an easy matter to just model that type of change.

Let me point out some other things. The drain port plug seal I've projected that line as well boldly. And you'll notice that all of those -- the peak in the regulatory fire, the peak is all moved over a little further for some of these other components. In other words, for the drain port plug, the peak is reached right at the end of the regulatory fire, but for the others, the peak is reached a little after, because the cask has so much metal that there is some thermal inertia involved. But that peak also is for a half-hour fire at 1475 degrees Fahrenheit, not for a three-hour fire at 1800.

The Battelle overheads that I've seen also discuss whether the MPC itself -- none of this makes a difference if the MPC -- if the internal canister stays shut. If it stays shut, the only environmental implication is if you lose the neutron absorber. Of course, if the fuel is damaged, that's a problem at DOE's end if you have fuel that has degraded cladding. But if the MPC container itself stays closed, then material will not get out into the environment.

The calculations by Holtec show that for a half-hour fire the temperature rises to -- for the MPC rises to 419 degrees Fahrenheit, and the failure limit is 775 degrees Fahrenheit. So there is some room there, and we encourage the NRC to actually do this kind of analysis to see whether the MPC itself is going to fail at that temperature, is actually going to exceed 775 degrees Fahrenheit.

So I just want to make one final point, which is not all casks have the same construction as the Holtec cask. Not all casks are going to have these radial conductors for heat. Some will have just an empty area or an area filled with water, and all of those casks then have to be modeled. And I don't think it's a simple job, and that's one of the reasons why I'm suggesting that several of these type of casks

be actually tested.

DR. GARRICK: Is your concern here principally loss of shielding with these kind of scenarios?

DR. RESNIKOFF: Well, I'm concerned about loss of neutron shielding, and I'm also concerned for the Holtec cask about the destruction of cladding. That will be a DOE problem at the repository end. And I'm concerned about --

DR. GARRICK: But I mean as far as --

DR. RESNIKOFF: I'm concerned about leak from the MPC container itself if the -- in a long duration fire.

DR. GARRICK: Okay. So what's the pathway for the leak? I can see the direct radiation issue with respect to the loss of the neutron shield, but what's the pathway that you're --

DR. RESNIKOFF: The pathway would be if the welds are loosened.

DR. GARRICK: Okay.

DR. RESNIKOFF: And if there's a leak from the MPC itself. Because the MPC itself is a half-inch thick --

DR. GARRICK: Right.

DR. RESNIKOFF: -- container.

DR. GARRICK: Okay. Thank you.

MR. LEVENSON: George? Mike? Okay. Next speaker.

MR. HALSTEAD: Before I go onto the next presentation, I just want to say while there's no way we would reach closure on this discussion today, it's important to say for the record that NRC staff has scheduled a meeting for May 8 which now probably has to be increased from two hours to four hours where we're going to discuss the findings regarding the Baltimore fire and the application of the fire history based on those findings and how it would affect currently certified casks including the new designs and the designs that are currently in use. And it's frankly one of the reasons why this meeting is helpful to us and helpful to me specifically as a person who's trying to manage what we have to get done in that meeting, that in fact questions that you've raised over the last 20 minutes are very helpful to us and tell us some of the things that we need to resolve in that meeting before we submit our written comments.

Now, turning to the last presentation, and I do promise to keep us on schedule, next slide, please, there are many testing programs that we probably need to review before we put our draft

document at the end of this year, that I promised for December of this year. The ones that we have reviewed in some detail, of course, are the Sandia tests from the '70s, the Central Electricity Generating Board tests on the Magnox cask in the UK. These are often known as the "Operation Smash Hit" test based on the best-selling movie of the same name.

We're somewhat intrigued by innovative approaches to testing, and the approach that was used in certifying the Nupac 125B cask, which many of you are familiar, is the cask that was used for shipping the Three Mile Island debris to Idaho as a test program that we've studied. And, of course, we've studied extensively the TRUPACT-II Program, frankly, for some reasons that have nothing to do with Yucca Mountain, that have to do with the fact that Nevada is both a shipper and a corridor state for shipments to the WIPP facility in New Mexico.

And it's a very difficult thing to look at all of these different types of tests, and there are some British, European and Japanese tests that I need to review that I didn't have time to review before this meeting, to try and draw some lessons learned. But let me tell you what I think those lessons learned are that have some applicability to our proposal and

the NRC staff and contractor proposal, the NUREG-1768.

First of all, full-scale cask testing is expensive and it almost always turns out to be more expensive than the people doing it thought. The best numbers we have are that the UK tests on the Magnox Program were $8 million, 1984 dollars; TRUPACT testing appears to have cost about $5 million in 1989, and I haven't ever seen a full package of costs I was comfortable with on the Sandia testing program, but Bob Jefferson on one occasion told me that he thought the cumulative costs of all those tests, including the terrorism sabotage tests that were done on the IF-200 a few years later, were probably less than the cost of one current generation rail cask at the time, which would save $3 to $4 million.

And remember a big factor in those tests was a constrained budget, and both Yoshima and Jefferson said repeatedly for the record they would have liked to have used current generation casks but at the time the costs they were being quoted were half a million dollars back in 1977 when half a million dollars was half a million dollars for a truck cask and about $3.5 million for a rail cask.

One of the things I find intriguing about the Nupac 125B testing is that there was an innovative

decision by the designers who were under pressure, literally the enticement of financial rewards to get a quick licensing decision out of the Commission, and they not only decided to do full-scale testing of the casks but they decided to build full-scale canisters and test them, arguing that if the full-scale internal canister met the test requirements for the entire package, it was certainly assumable even though it was difficult to model that the entire package would comply with the standard.

And there I think is the issue that Mr. Levenson raised before. An important lesson learned here is before we decide what has to be done full-scale, what has to be done in scale model and what can be done with a component test, we need to do a lot more thinking about that, both to save money and guarantee that we get the results. And in fact I'd take this one step further, not just as a cost issue. I think perhaps there's an argument here that we ought to think about whether in the future the large-scale rail casks whether the welded container shouldn't be seen as a requirement, possibly as a testing requirement.

Point number two, benchmarking of codes. Most of these tests we've talked about here weren't

really designed for benchmarking. The Sandia tests were. They were generally considered successful. The TRUPACT-II testing was, in part, required because in that soft body/large package, the ability to model the heat paths was not well known. So I really don't have much in the way of lessons to report on benchmarking except perhaps it's obvious that you need to decide what your objective is in designing the test. And if your objective is benchmarking, then you're going to design that test differently I think than if regulatory confirmation is the issue. And in particular I'd argue if you're trying to benchmark a fire code, I'm very concerned about the performance of the instrumentation and I maybe have to make a sacrifice. You can't use the same test to benchmark with equal confidence a fire code and an impact code. They may have to be done differently.

Point number three, regulatory compliance. Again, that wasn't part of the Sandia test, but it was a very significant part of the other tests, and the tests were deemed extremely successful. And indeed in the case of the Nupac 125B, probably guaranteed that that cask was licensed in time for the purpose for which it was needed and it probably couldn't have been otherwise licensed.

There's some argument on the TRUPACT testing that as you got into the testing you found more problems, and that required more testing, and so there's some possible argument that the speed of licensing was certainly negative there, but the overall confirmation and public confidence in the cask I think can be seen as counter weight balances to that.

Public acceptance is a very, very difficult issue. First of all, it's always hard to measure. Secondly, to my knowledge, no one has done any opinion survey research or focus group research to see how the public will react to cask testing. This occurred to me in the shower this morning as I was getting ready to come here. My goodness, of all the things we've thought about here, we've got people proposing to spend $20 million on testing at the NRC and people from Nevada proposing to spend $70 million, and nobody has spent $30, $40,000 to do a good basic public opinion survey. I certainly plan to discuss that with our folks.

Let me tell you why we haven't done it in the past. What we have found on the public acceptance issue is that members of the general public that we have sampled unscientifically tend to assume that the

packages that are used have been tested full scale. They either assume this because they assume that that is a principle of regulation in an advanced industrial society -- they certainly have no reason for this but this seems to be why they do this -- or in Nevada, the people who have seen the test films from the Sandia tests assume that the casks that would be used for Yucca Mountain have been --

DR. GARRICK: Bob, do you think it's really a case of assuming that they've been subjected to tests or assuming that there is sufficient evidence in place to have confidence? I mean we don't test the Golden Gate Bridge. There's thousands of engineering projects throughout the world that we don't test, but there's confidence, there's public confidence that they know what they're doing.

MR. HALSTEAD: Well, I agree. I'd say most of those aren't coming through their neighborhoods in Nevada, and there's a voluntary issue of whether you feel safe going up in the Sears Tower or the Stratosphere in downtown Las Vegas, for that matter, which on a windy day is kind of spooky at the top.

The point I'm trying to make here with cask testing is that it simply had not occurred to me

until this morning that there's all this talk about public confidence, and there's actually been some opinion polling on other safety enhancements like specifically for New Mexico is your level of comfort with the WIPP shipments more or less because you know about driver safety programs, because you know about escort requirements. But to my knowledge, nobody has done any polling on the testing issue, and I just throw it out.

What I was trying to explain before, though, is when I asked our polling people how we would go about asking this question the issue that came up was that the first question you would have to ask is something that would disturb people's knowledge, that is to say if someone thinks the casks have been tested full scale and at the beginning of the survey you make it clear to them that they haven't been tested full scale, you've probably biased the rest of the survey. So what I'm trying to say is this is a particularly difficult issue to give you any statistically verifiable opinion data.

What I will tell you from my personal experience is this: The TRUPACT testing was a great success because of the impact it had on the way state officials, emergency responders and law enforcement

people have been trained, because the test program produced honest footage of honest, indeed somewhat boring and repetitive, drop after drop and fire testing. The State of Idaho State Police produced a video called, "Safe Way Out," which we've used in our training programs, and it's been very, very effective. It's effective partly because there's good visual evidence, partly because the package that's actually being used was tested and partly because the people who are normally the great critics of this testing are there at the table saying this package was tested properly.

I think the British claim that they've had similar experience with the Operation Smash Hit testing and not just because they did the locomotive attack but because part of the testing program that is referred to in their publicity work is a series of regulatory tests that were done at Cheddar Gorge. And I think that the Sandia tests are an example of how not to do tests and attempt to use them to influence the public, because all a critic has to do is say those aren't the casks that are going to be used for shipments for Yucca Mountain, and almost immediately, 100 percent of the time, in my experience, those films are then dismissed as either irrelevant or worse a

public relations exercise.

In terms of safety enhancement, that's a difficult argument to make as well because it involves judgment calls. The judgment calls certainly on the part of the people who've done technical reviews for the State of New Mexico, the Environmental Evaluation Group, clearly believe that major safety enhancements to the TRUPACT-II, both in the closure mechanism and the O-ring resulted from the findings of the full-scale test program.

There is some argument that the findings in the Sandia test about the importance of the tiedowns and the importance of designing tiedowns that would break away from either the truck or rail conveyance at the right point were an important finding that the designers hadn't anticipated. And in the CEGB tests, the fact that there was a minor opening below what is allowed under the regulation but that it did result in a redesign of the lid can be argued to be a safety enhancement, although one could argue that it wasn't necessary under the regulations.

The long and the short of it, I guess, is there are limits, severe limits to the lessons learned from past testing that are applicable to what we're planning to do in the current time, but it is worth,

I think, reviewing them, and we intend to review them in writing. Let's turn to the next slide, please.

I've tried to summarize our concerns about spent fuel testing. I've been assisted in this very largely by Hank Collins. Issue Number 1 is simply that the NRC staff and contractors have not told us exactly what they plan to do and perhaps this has been developed in the last few weeks since we discussed this in Chicago, but we don't have a good sense of what the schedule for the spent fuel testing is compared to the cask testing, and it's important to resolve that, particularly because Issue Number 2 -- one of the really big debatable issues out here is what value to use for the gap inventory of Cesium-137, and in shorthand this is what percentage of the total inventory in a spent fuel assembly of Cesium-137, and also 134 but that's a much smaller contributor, is in the tiny gap between the pellet and the cladding and therefore can be assumed to be not only released in a fire environment but even possibly in a serious impact accident that doesn't involve a fire. And the range of values is as low as 0.3 percent and there are some data that indicates for some fuels and some burn-ups that it's over 20 percent. And a range that we've used in our risk calculations that Resnikoff and

company have done is a geometric mean, which is around then.

This is a really important -- I would argue that this is the single most important spent fuel issue to resolve because when you actually look at all of our models, they're all driven by your assumption about what value to use for the gap inventory for Cesium.

There is also the issue of determining temperature and impact limits for burst rupture and certainly the discussion that Dr. Levenson and I had goes right to that. We think the way to do that is through laboratory testing of spent fuel, and that's promised to be part of the Package Performance Study. Similarly, this issue of the size distribution of released particles -- now, this has been more of a -- this particular issue has been more contentious in the debates over the consequences of a sabotaged terrorism incident where you're looking at the blast from a shape charge, possibly releasing a considerable quantity of physical material from the cask and then the size distribution of the particles becomes very important for the consequence assessment, perhaps less important for accident consequent analysis.

We think we know a lot about the behavior

of Cesium-137 in fire environments, but we probably don't know enough in impact environments. And generally we need to know a lot more about what happens to the Strontium. To what extent is it affected by heat and under what circumstances? Again, that issue may be more important for total consequence assessment with the terrorism sabotage work than for an accident. And, certainly, CRUD behavior is an issue that's been noted by virtually all the people who've looked at the areas where we need more data.

And, finally, the implications of higher burn-up, the overall change in industry fuel management practices, which has, generally speaking, over the last 20 years, on average, resulted in about a 50 percent increase in burn-up. DOE to its credit has done a good job of looking at the implications both of burn-up and cooling time on the performance of specific representative spent fuels and accident conditions. But in general the issue of higher burn-up on the physical performance of fuel in accidents is an area that we would highlight. Next slide, please.

Well, we're getting late and I have the advantage of saying that this is work in progress that we're going to provide, and I can see there may be some reason for us to come back in a few months after

the May 8 meeting on the Baltimore fire and after the May 30 filing on NUREG-1768. Let me review some general points.

The NRC has done a splendid job, let me say that again, a splendid job of stakeholder involvement in the first phase of the Package Performance Study as it relates to planning these tests, and I'm very heartened by that. Splendid not only in the way they have presented information but the way that they have allowed pretty much unfettered interaction between a variety of stakeholders -- state government, industry people but also members of the public and their staff at the public meetings that they've held. Our concerns now are whether there's a commitment to an appropriate level of stakeholder participation throughout the conclusion of the program.

Point Number 2, selection of cask to be tested. Of the casks that are currently certified, if you had to test one full scale, I'd say the GA-4 is the logical choice. On the other hand, the selection of the Holtec as the rail cask is open to question on a number of grounds. And, again, without belaboring the point here, this is an area that we will be addressing in our comments. How do you decide what

the best or most representative rail cask is if you're only going to test one?

Selection of test scenarios is an area that we'll also be commenting on. In general, I would give the NRC staff kudos for the way -- I don't know if that comes in the record -- kudos means they get an A grade for the way they have approached the impact scenarios. They unfortunately get an incomplete for the way they've approached the fire testing scenarios. Now, that doesn't mean that I agree with the scenarios or that I'll suggest that our team limit themselves to the two impact scenarios that they've identified, but particularly the willingness to model the backbreaker impact for the truck cask shows a willingness to go where no modelers have been willing to go before. And, frankly, that's the sideways truck impact with the bridge abutment. I can't take credit nor can any of our people take credit. Bill Rhein down at Oak Ridge started arguing that that was an impact scenario that should be evaluated, I believe as early as 1979.

Selection of cask testing facilities, we have some real concerns here with the presumption that Sandia is both going to design the test program and get the contract to carry out the tests. I've been told that there will be some type of competitive

procurement, but I think it's very important for the integrity of this testing program that the people at NRC who make the decision not only look at this issue of whether there's a real or perceived conflict of interest but they make sure that the testing facility that's chosen is the one that's appropriate for the particular set of tests that need to be carried out and also that the test facility is accessible and that their staff are conducive to stakeholder and other witness participation.

Program costs and availability of funding. They've been very shy talking about this. Someone finally got them to admit at the second meeting that more than $20 million was their cost estimate. I think it could be considerably higher than that, perhaps between $25 and $30 million, but I'm just making assumptions based on our own cost analysis. I think they have an obligation to put a cost more precise than more than $20 on what they're proposing.

And, finally, very important is the commitment to carry out the testing program, particularly if this discussion is dragged on for some time. Maybe we've just grown cynical in Nevada but we're quite concerned about a situation where we've raised this issue of testing and now every DOE and

industry and NRC person who cares to says, "Wait a minute. We're going to deal with that testing issue. We've got the Package Performance Study tests." And that's fine if the tests are actually going to go forward, but if there isn't a commitment to carry out these tests, then it just complicates the discussion of testing. And on our part, we can just proceed to take these issues to the Congress and ask for creation of a testing program through congressional means. Next slide, please.

I'm not going to go into any detail here, but I just want to give you four out of my preliminary list of about 100 topic areas for specific comments on NUREG-1768. I think it's a mistake not to define failure thresholds and model them on the part of the people who seem to be willing to model almost failure. And I say again the modeling has been pretty close to failure on the impact analysis, but they've not done the same degree of modeling on fire performance. There also is some previously published work funded by the Department of Energy, carried out by Professor Miles Greiner at UNR. We've provided you with a summary report on some of the performance envelope analysis there. We think that kind of analysis should have been in the report.

It's clear that there's a prioritization of impact versus fire testing and a lack of specificity in the staff and contractor opinion for fire tests. We have concerns about the assumption that the impact tests should be done doing impact limiters. Haven't decided yet which side we're going to come down on. The regulatory nine-meter drop test was done without an impact limiter to assess compliance. Some pretty high accelerations have been considered for the drop test options identified in 1768 using impact limiters. But there is a question. We know a lot about impact limiter performance from our scale model testing, and do we need to do full-scale testing, in effect, to test impact limiters?

Test instrumentation is another big issue, both the reliability of the instrumentation in different combinations of tests and the availability and cost of different alternative ways of reporting and recording the data.

And, finally, the probablistic metric on Page A2/A3 is a classic example of where we don't dispute the effort to approach -- or to apply probablistic analysis, in this case it's an effort by the NRC to argue that the particular impact and fire scenarios they've proposed are realistic based on a

probablistic analysis. My argument is that they have only used one set of numbers and there are a number of different assumptions they should have used for numbers of shipments, accident rates and the values that are assigned to different events in their event trees.

So there is an example of five of the specific types of comments we'll be making. Again, I very much appreciate the opportunity that you've given us today, and I hope it's not the last time that we'll have an opportunity to discuss these issues. Thank you.

MR. LEVENSON: Thank you. Let me just -- so you realize you're not alone, we haven't seen any of the plans for the fuel testing either. But if you stop in -- I don't know whether the program will be anything like the one you're suggesting or not, but if it is, assume they accepted your program absolutely, then it wouldn't involve the same group of people, the same testing facilities or anything else, because it's essentially all with real fuel or with Cesium or with high burn-up so you have CRUD on the surface so that it really wouldn't make any sense to have it part of the same program. It would have to be done by different people, different places, et cetera. But we

haven't seen that yet. Questions?

DR. RYAN: We received a packet of material as background to get us started today, and I just would like to call your attention to one of the papers in that packet and ask a couple of questions about it. It's "Radiologic Impacts of Incident-Free TNR Transportation to Yucca Mountain of Collective and Maximally Exposed Individuals." And in reading this paper I was confused. It looks like you're calculating exposures to a maximum individual and then applying cancer risk factors to that dose. And that doesn't seem to me to be, one, a fair assessment or, two, frankly correct, because the application of a risk estimator, and you quote, for example, the teratogenic risk of birth defects, I think, on Page 6, that doesn't apply to an individual.

No risk estimator from NCRP should be applied to an individual dose. It's just flat-out epidemiologically wrong. So you end up with doses and cancer deaths as you list them. Now, whether the FEIS did that too, I understand they may have just from reading what you've written here, I caution you to think about perhaps a different way to look at that. Maximal individual doses may in fact not be realistic. You should maybe take a look at probablistic kinds of

approaches to what public dose or worker dose or whoever it is might be and then be real careful about the application of cancer risk estimated because in an epidemiologic sense they do not apply to individuals clearly, and they may in fact not apply accurately to small groups.

So I just think that kind of analysis is not helpful in that it may mislead if people don't realize the limitations. And had you listed some of these limitations and artifacts that occur, that would have been one thing, and maybe I missed it, but I didn't see where you had brought all that together. So just a thought as you may reconsider additional analysis of these types.

MR. COLLINS: Bob, do you want me to -- the Committee hasn't heard my dulcet tones yet, but -- or do you want to field this.

MR. HALSTEAD: Let me respond first, generally, then turn you loose, Hank, although I want to warn you we are near the end of the time period. Your comments are very well taken and in particular we were trying to respond, frankly, in a preparation for litigation over NEPA issues with the way the Department had addressed these risks. I agree with some of what you -- certainly, I agree with what you

said about the ability to predict cancer risk in a specific individual, and I think that's a problem in all of the Department's EISs.

And it also relates to the issue of using latent cancer fatality as the measure of radiological health risks. And the process of critiquing them we probably didn't make it clear, certainly as Hank can say, that we have a lot of reservations about those approaches also. I do think it's important to note that with worker doses the key issue here is that there are potential issues depending on certain policy decisions for frankly fairly large routine doses to be delivered to workers.

DR. RYAN: I would also add there's a large body of worker dose evidence you could have drawn on to look at actual work doses for transport units in transport. I mean there is a large body of worker exposure data out there.

MR. HALSTEAD: Agreed.

DR. RYAN: So it's not a theoretical. That's a real one.

MR. HALSTEAD: Right. But data that was absent in the Department's analysis and again what -- again, what I'm saying is what you saw was a very narrowly defined article basically responding to the

way the Department had dealt with these issues in their EIS and is not necessarily the way we would have or should have dealt with those issues in a holistic and general way.

DR. RYAN: I appreciate that, but the fact that you were narrow on purpose is not commented on in the report, and that's frankly a flaw of that approach. If you want to be narrow and you define it that way, I understand how you'd want to do that, but if you want to do as the title says, an accident-free assessment, that's a much broader question.

MR. HALSTEAD: Again, we're running -- I would really like afterwards as a follow-up to the meeting if you would be willing to give us your comments, I would very much be interested in receiving them and working them into our work plan.

DR. RYAN: Thank you. That's all.

MR. COLLINS: I just wanted to echo what Bob said. When we did that, when Bob and I wrote that paper it was basically to compare our results to the FEIS methodology in Appendix J, in Chapter 6, where they did use those peak cancer risks. And thank you for drawing our attention to that, the dubious methodology there.

DR. GARRICK: The only comment that I

think I'd like to make is that I think one of the most important issues here is a sensible protocol for the tests, one that can be anchored to something that indicates that it's realistic and has some rational, technical basis. A lot has been said about the various risk assessments that have been performed in transportation, and while certain elements of the work has been very, very good, the truth is that the transportation risk assessment business is many years behind the quality of risk assessments that were done in the nuclear power plants ten, 15 years ago, particularly behind with respect to identifying specific contributors to risk,behind in terms of coming up with rational and convincing risk metrics, as you say, or risk measures, behind in terms of comprehensiveness of the uncertainty analysis and behind in terms of the scope.

The analyses have been very helpful and useful, but I think that particularly with respect to the cask and the kind of insults that it can receive, but there's still the need for a more comprehensive treatment of that, and I think it would be nice to see that actually in advance of serious decision-making about what the test protocols should be. In the ideal world, what you'd like to see is that if you had a

very comprehensive risk assessment of the transportation system and it would have to be carefully scoped, then you would like to think that there would be a rational mapping that you could do from the results of that analysis to the test protocols. And I think that's very much missing.

It's kind of -- when the PPS came out, members of this Committee were pretty critical of many aspects of it. One of the things we were critical of was the scope of the test, the protocols for the test. Another thing we were critical of was generally the absence of what we would call a comprehensive risk assessment, particularly with regard to uncertainty analysis, because that's where the risk really is. So I'd sure like to see more evidence that whatever we end up as test protocols that they can be anchored to some sort of technical case or analysis that convinces us all that there's real logic and rational thought associated with it.

MR. LEVENSON: George?

CHAIRMAN HORNBERGER: Thanks, Milt. Again, I just probably want to second John's comment just before I make any comment. I think that what I gather the activity that's been going on and the discussions about the PPS appear to have really gotten

the dialogue going, and I think that is good to have all of the discussion to line this out.

I think that from my view, as like John's, some kind of systems approach is really where we need to go and we need to think about this not so much in the narrow sense of exactly what test needs to be done on what cask. For example, Jim made a comment about the institutional, potential institutional problem of someone who's in control here. And when it's not clear, then we have a problem. I don't think that that goes away just because we work on designing a test. I think that that somehow has to be built into our thinking about a test.

By the same token, we don't want to learn from terrible accidents like we have in the past, but by the same token if I think of the Exxon Valdez, I'm not sure exactly even in retrospect what kind of scale model test I would have done to prevent such an accident. I think that what is needed is to just have people think very carefully about the whole system and try to anticipate as best one can as what's going on, what may happen.

So, again, as John said, I think that perhaps in a broader view of the system, particularly taking into account the risks in the context of a risk

analysis may lead us to define a protocol and testing program that may have a better impact overall for the whole program.

MR. BAHADUR: I just had a specific question for Dr. Resnikoff. You conducted a base study on the Baltimore fire and presented your results. Has this study been peer-reviewed?

DR. RESNIKOFF: You mean has it been sent to a journal? We've sent it to other of our peers in the State of Nevada to look over.

MR. BAHADUR: Okay. All right. And their conclusion was also matching with the conclusions that you had made?

DR. RESNIKOFF: Did they concur, is that what you asked?

MR. BAHADUR: Yes.

DR. RESNIKOFF: Yes. They gave us helpful comments that improved the paper, yes.

MR. HALSTEAD: Let me add to that. We've been unfortunately involved in a serious dispute with the NRC over the availability of data and in particular in three areas. First of all, we believe that our contractors were unwisely and perhaps illegally excluded from some meetings between the NRC and NIST back in July and August. Secondly, we

requested reports that were withheld from us. We then filed a Freedom of Information Act action to obtain them, and the bottom line is it took us six or seven months to receive documents that had been completed in August. They weren't made available till February. And, finally, there's a whole range of reports which are claimed to be reports and turned out to be a handful of overheads that were given at a meeting that buttress critical technical points in the NRC's analysis.

Now, we fully intend at some future date to submit the analysis that RWMA has done along with the analysis that some of our other people have done possibly for the PATRAM Conference, possibly for waste management, and there are a number of journals where it would go through the peer review. And we don't always feel the need, frankly, to publish the peer review articles because we're writing things that are going into a review process, say, at the NRC. In this case, I think it is important that we submit that publication -- that we submit this material in a peer-reviewed forum. We haven't done it because we haven't been able to get the rest of the information that we need.

Now, hopefully that meeting on May 8 will

be the first step in resolving this issue, but this has become a terribly difficult political issue that has ended up besmirching the integrity of both sides, both the State of Nevada and the NRC, and we really need to find a better way to resolve technical disputes. That would then allow us to submit the work in a peer-reviewed forum having had access to all the information. It's a very fair comment that in fact we've not submitted the report to what would normally be considered an objective peer review.

MR. LEVENSON: I have one more question. I have one question. Like my colleague Mike here, I sometimes have trouble sleeping so I read all this stuff too. And there's a statement in here I found very interesting and that is that there were not detectable releases of any airborne hazardous materials in the smoke billowing from the tunnel fires, even though hydrochloric acid was in the tank car right next to the fire and leaked.

I don't find that very surprising because I experienced, which in the nuclear business is 60 years this year, covers quite a few accidents, 12 core meltdowns, et cetera. And reaction in played out mechanisms are almost never properly modeled by the modelers. Always have to explain why are they

overpredicting huge consequences.

I wondered if you had given any thought to whether there was anything to be learned from this that might help in doing analysis on tunnel fire? It seems to me that this is a good experiment, ought to get some use out of it.

DR. RESNIKOFF: I think we note that as an issue that we need to address, particularly after our meeting with the NRC consultants on the 8th.

(Off mic to Birky.)

DR. RESNIKOFF: I agree. In our study we assume 50 percent of the volatile materials got out of the tunnel to do an analysis, but that was just a conjecture on our part.

MR. LEVENSON: Yes. That doesn't correspond to any experience or experiment.

MR. KOBETZ: I just wanted to follow up on one thing that Mr. Birky did say earlier in the presentations, and that was that there was a concern that the regulations may not be conservative enough for fire with regard to the fire test. And I guess that's the one thing I haven't heard through all this as far as the safety issue. Does the state feel that there's a current safety issue that the regulations aren't adequate as far as your response to the PPS

test protocols?

MR. HALSTEAD: Yes. I want to answer that first because Tim has made that point very clearly to me on several occasions. There's a point where if we had the technical information in hand to argue that the current standard was inadequate, we're not shy about filing a petition for rulemaking. And I guess that would be the appropriate route to go, and that's -- we've never frankly spent the amount of resources that are necessary to look at that question even though I say as early as 1986 one of our review groups said, "One thing you should think about is the adequacy of the current fire standard, both duration and maximum temperature." So the answer -- at the current time, I don't think we have sufficient information that I would feel would justify challenging the existing regulations.

MR. KOBETZ: Not just the fire but also any of the impact, anything else that they're doing. Because one of your things was talking about actually full-scale testing each of the casks.

MR. HALSTEAD: Well, understand, if you've read PRM 73-10, we're not shy about going into excruciating detail about the deficiencies regarding the vulnerability of casks to attack where shape

charges, so that's kind of the model we would follow. We would have to have done that much of our own analysis to feel that we could stand the heat of scrutiny, and frankly we don't have that information now. That's one of the reasons why we're going to pursue this I think in considerable detail and in depth.

MR. LEVENSON: Any questions or comments from anyone in the audience?

MS. GUE: I know it's the end of the day -- sorry, Lisa Gue with Public Citizen. I know it's the end of the day, but I just wanted to take a moment to thank --

MR. LEVENSON: Do you want to identify yourself, Lisa?

MS. GUE: I did.

MR. LEVENSON: Oh, okay.

MS. GUE: I wanted to take a moment to thank the Committee for holding this meeting and doing so in a public forum and Mr. Chairman for building time into the agenda for public comment. And I also want to appreciate the State of Nevada's persistent technical review of these issues and for bringing them to the attention of the Committee.

Public Citizen, as a public interest

organization, has a long-standing commitment to issues of transportation safety as well as nuclear waste management, so the question of nuclear waste transportation is an interesting nexus for us of issues that we care deeply about and work in coalition with concerned citizen groups across the country. And I think that the Committee and the various agencies involved should have no doubt that this is a matter of significant public concern that cannot be addressed simply through a PR campaign but in fact relates to the question of credibility in terms of the various regulatory agencies involved, their credibility as regulators that protect public health and safety. And, unfortunately, the history with respect to both the NRC and DOE is not particularly inspiring in that regard.

And I think that this Committee actually should be playing a vital role to address that problem. And we were very concerned in the first round of these meetings when the Committee heard exclusively from an industry panel, and in fact we sent you a letter expressing our concerns, which incidentally we received no response to, but we were very happy to see this meeting subsequently scheduled, and we would hope that in the future the Committee

build in this kind of balance to its presentations and perhaps takes more of the lead in addressing some of the questions that do remain about these issues. I think it's vitally important that ACNW as an independent advisory committee demonstrates its commitment to fully exploring dissenting views as well as the well-known positions of the nuclear industry.

On the issue of the Package Performance Study, well, there's a lot to debate in terms of detail, and we've heard some of it today. I think it's clear that this could be a very important study, and we'll of course be submitting comments, and maybe we'll send you a copy. But just to say, first of all, perhaps the -- I think perhaps the Commission could benefit maybe from some thoughts of the Committee in terms of whether this is actually a Yucca Mountain study or whether it's a generic study. I think there's some inconsistencies in how it's been presented, and it's important again in terms of credibility that it be accurately portrayed one way or the other. Thank you again.

MR. LEVENSON: Thank you, Lisa. Let me point out that I won't tell some of the people at the workshop what you said, because the people from DOT and the Railroad Association I think would resent

being included with industry.

MS. GUE: Government and industry.

MR. LEVENSON: Government and industry covers a pretty big percentage of the U.S. population, I'm afraid. Okay. Including the State of Nevada. Okay. I declare the workshop section of this as done, and it's back to you, George.

CHAIRMAN HORNBERGER: Thanks. We will now take a break, and we will reconvene in the room upstairs in 15 minutes.

(Whereupon, at 5:07 p.m., the Transportation Working Group meeting was concluded.)