Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Nuclear Waste
149th Meeting

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Wednesday, April 21, 2004

Work Order No.: NRC-1434 Pages 1-228

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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)

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149th MEETING

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WEDNESDAY,

APRIL 21, 2004

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ROCKVILLE, MARYLAND

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The subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., B. John Garrick, Chairman, presiding.

COMMITTEE MEMBERS:

B. JOHN GARRICK, Chairman

MICHAEL T. RYAN, Vice Chairman

GEORGE M. HORNBERGER, Member

RUTH F. WEINER, Member

ACNW STAFF PRESENT:

JOHN LARKINS, Executive Director, ACRS/ACNW

NEIL M. COLEMAN, ACNW Staff

HOWARD J. LARSON, Special Assistant, ACRS/ACNW

RICHARD K. MAJOR, ACNW Staff

ALSO PRESENT:

DONALD BECKMAN

ADAM CLINGER

TIMOTHY C. GUNTER

GREGORY HATCHETT

CHRISTOPHER McKENNEY

DAN SCHULTHEISZ

JOHN TRAPP

I-N-D-E-X

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

(8:33 a.m.)

CHAIRMAN GARRICK: Good morning. The meeting will come to order. This is the second day of the 149th meeting of the Advisory Committee on Nuclear Waste. My name is John Garrick, Chairman, ACNW. The other members of the committee are Mike Ryan, Vice Chairman; George Hornberger; and Ruth Weiner.

Also present is Jim Clarke, one of our consultants.

Today the committee will hear a briefing from the EPA on its advanced notice of proposed rulemaking titled "Approaches to an Integrated Framework for Management and Disposal of Low-Activity Radioactive Waste."

We'll hear a briefing on the NRC staff evaluation of the DOE bundling approach, a briefing by a DOE representative on their amended time table for responding to the 293 key technical issue agreements, a briefing from a representative of the Electric Power Research Institute on its December 2003 report regarding scientific and technical priorities at Yucca Mountain, and we'll continue preparation of ACNW reports.

Howard Larson is the Designated Federal

Official for today's initial session. As usual, this meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. The committee has received no written comments or requests for time to make oral statements from members of the public regarding today's sessions.

And should anyone wish to do so, please contact a committee member or staff member and we will make the necessary arrangements. As usual, it is requested that the speakers use the microphone, identify themselves, and speak clearly and loudly, so that we won't miss a word.

All right. The first item on our agenda this morning is the EPA presentation. The committee member that is -- has the lead on this particular topic is Mike Ryan, and I'm going to turn it over to Mike now.

VICE CHAIRMAN RYAN: Thank you, Mr. Chairman, and good morning.

This morning's briefing is on an interesting area. Dan Schultheisz, the Radiation Protection Division representative from the Environmental Protection Agency is going to talk about their advanced notice for proposed rulemaking on low-activity waste. So without further ado, Dan, I'll

turn the meeting over to you. And welcome, and thank you for being with us today.

MR. SCHULTHEISZ: Okay. Thank you. Can everybody hear okay? Is this mike working okay?

I want to thank the committee and Howard Larson for asking us to be here and working with setting up a time to do this. And before I start, I want to introduce -- there are several other people here who have been working on this from the EPA site -- Adam Clinger is the Director of our Center for Waste Management where this effort is being housed; Elliot Zennick is with our Office of General Counsel; and Ken Kszynski, who just came in, is managing our technical work for the modeling aspects of it that we'll be talking about.

So as we get into this, hopefully there will be plenty of time for questions and discussion. And if you have detailed questions on any of the aspects about modeling, you know, Ken is the one who would probably be taking the lead on answering those.

Could I get the next slide, please? Okay.

So what I want to talk about today is just the ANPR, give you an update on the status and the purpose of it, some of the environmental concerns that we're trying to address with this, the regulatory

context of the whole effort driving this as well, and then some specifics about what's in the ANPR and why we have taken certain approaches in outlining what we've done in this notice, talk about the stakeholder reaction and the public comment we received to this date. The public comment period is still open. And then where we expect to go from this point.

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The status we published in November -- November 18th -- and we originally had the comment period was ending 120 days later in March. We got a number of requests for extensions, so we extended the comment period by 60 days and it will end now May 17th. So we have a little bit less than a month left in the comment period.

And during that time, one of the reasons why we got a number of requests from public interest groups was their concern that local communities that were near the facilities that might be affected by any action that we might take needed to be aware of this and have -- really have the opportunity to comment. And so we are taking some additional steps to try to make those communities aware of what -- we're giving them some additional information and background to give us some comments on on this.

Next slide, please.

So what exactly is the ANPR? There's been some confusion in the comments and letters that we've received about this. It is -- the purpose of it is to solicit public comment. We are asking for thoughts on concepts that we are putting out and information on a wide variety of waste disposal issues, radioactive waste disposal issues.

It is not a proposed rule. There has been some confusion about whether it is an active proposal or not. It is not a proposed rule, but it's conceptual in nature and we're asking for a lot of questions to help us determine how we would proceed to a proposed rule if that was the appropriate course for us to take.

It does not affect existing regulations or programs at this point. We've gotten some concerns about this being involved in permit modifications at existing facilities at this time, and it's not the case. It does not have any -- any regulatory weight at this time.

Really, we are trying to provide a vehicle for public dialogue, not just to answer our questions but also to open this up and have a broader dialogue about the state of radioactive waste management in

this country and to help us see how best we can deal with those issues.

Some of the environmental concerns that we see that we could address, or hopefully we could address by this kind of an approach, is just the idea of the limited disposal options for different kinds of waste that are out there. In some cases, efficient disposal is frustrated. Dual regulation and consistent regulation, mixed waste, has been a -- kind of a chronic problem for the past decade or so, and hopefully we can help ease some of those concerns.

Waste is continued to be stored onsite by generators, because they have limited disposal options or are unsure exactly where their options are and what the liabilities are, and so continued storage -- obviously, there is additional opportunity for mishandling or for losing track of the waste or for releases, and we want to try to discourage that.

Transportation risk -- we have limited disposal options. People have to send their waste longer distances to get it there. And not only are there radiation-related transportation issues; there are also the other environmental impacts from continued transportation.

The inconsistency of regulation -- in

particular, the TENORM-type wastes that are primarily a state responsibility, but the states take different approaches to them. They have different regulatory agencies that have jurisdiction over TENORM wastes, and they may be encouraging disposal practices that we don't believe are protective.

And so the result of all of this is that there are, you know, potentially increased exposures and risks to public health and the environment that we hopefully could address.

Next slide, please.

When we start talking about the regulatory context, you know, we -- there has been a lot of talk concerning -- about the -- sort of the origin-based, definitional-based system that we have in this country, low-level waste, mill tailings, TENORM, those kinds of things. So we know there are a limited number of sites for low-level waste.

One of those -- Barnwell -- will become increasingly unavailable to most generators, and they typically do not accept mixed waste. Envirocare does have some mixed waste capability, but as the only option there's always efficiencies that when you have additional options that are protective.

Mill tailings -- the issue there over the

past few years has been the formerly utilized sites' remedial action program that was -- switched jurisdiction from the Department of Energy to the Corps of Engineers, and at that time the waste that was generated under that program would have fell through the regulatory gaps that nobody had really foreseen.

There was a lot of concern about that a few years ago, but there are still ongoing cleanups, significant volumes to be dealt with of those kinds of wastes, and there would be more sites added to the list for that program. It's very likely there have been some added already.

And then TENORM also has large volumes, not really regulated at the federal level, unless it's actually Department of Energy TENORM. The states are inconsistent in their approaches to it. And I mentioned earlier existing disposal practices that may need some additional scrutiny, such as land spreading or uncontrolled burial or simply surface-type disposal of waste.

Next slide.

What we have done leading up to this -- typically, we have focused on mixed waste and have worked with NRC in a number of areas to try to deal

with mixed waste issues. That makes sense, because we have jurisdiction over the hazardous part of that waste under RCRA. We have generated some guidance on mixed waste disposal, disposal facilities on how to do sampling for mixed waste.

The NRC position in 1997 on disposal of cesium-contaminated electric arc furnace dust from the steel industry was -- used the approach of allowing disposal at hazardous waste landfills regulated by EPA. It was a dose-based position. That is a -- it's a branch technical position, not a regulation. So there's a little bit of difference there.

We had for years had a low priority enforcement policy on storage of mixed waste, not necessarily requiring them to get a RCRA permit if they were storing beyond 90 days, recognizing the difficulty in finding outlets for treatment and disposal of that waste.

And then in May 2001 our Office of Solid Waste issued a rule that offered conditional exemption for mixed waste from the RCRA regulations as long as management was done in accordance with the NRC license. So that regulation covered storage, treatment, transportation, and disposal.

And up to this point that's a rule that is

optional for states to adopt -- states that are authorized to implement the RCRA program, which is most of them. And to this point about a third of the states have adopted some or all of the rule, but only one has been authorized to implement it, and that's Virginia.

The concern there is that the three states that have low-level waste disposal capacity will not be adopting the part that deals with disposal. So there is some concern that there would not be relief for disposal of mixed waste from that rule, but time will tell.

This particular ANPR is an outgrowth of work we did in 1999. We actually had a proposal that focused on mixed waste from NRC and agreement state licensees. We actually got that as far as the Office of Management and Budget, and then we were confronted with some jurisdictional issues with the other agencies and could not resolve them at that time, and so we ended up withdrawing that proposal.

This ANPR looks at a broader waste universe beyond mixed waste, beyond the NRC and agreement state mixed waste, and is taking kind of a bigger picture look at the whole system, looking at the origin-based system and seeing is there a rational

way to address that and make things more consistent across the board.

Next slide, please.

So our overall approach, which we've described in the ANPR, is to see if there are additional protective disposal options that can be identified appropriate to the risk from the waste, rather than the origin of the waste or the statutory definition.

Looking at how would you apply consistent methods to evaluate those risks of these different kinds of waste -- waste forms, generating industries -- regardless of where they actually come from. And with this we are looking at the lower activity end of the spectrum as most suited to these kinds of considerations.

The higher activity waste you want to really maintain the controls that are inherent in the Part 61 system, and for the most part the really higher activity TENORM wastes I think are getting attention from the states, even if they're not always handled in the way that is most effective.

But to offer the most relief, since most of the -- kind of the pyramid of radioactive waste, most -- the bases, the lower activity waste, the

larger volumes of mildly contaminated waste, that may be most suited to looking at additional disposal options.

And then, finally, what are the appropriate regulatory controls that need to be maintained over this waste? If you're looking at a risk-based disposal system, the disposal system itself should have the proper protections, but there may be some additional things that you would want to bring along to ensure that the system operated properly and to maintain the confidence of the public and the regulatory agency.

Next slide, please.

So we also think that if you're providing additional protective disposal options, you'd have greater public health protection, because you'd be providing more options. A lot of the wastes that maybe not now are being dealt with because of the concerns about availability or cost would have additional destinations for those.

More efficient use of resources in risk reduction -- looking at the lower activity waste and planning additional homes for them frees up some resources to deal with the higher activity waste and also with the pressing site cleanups that may now not

be moving as quickly as possible because of the concerns about waste disposal.

The next point is on that -- more efficient site cleanups. Department of Energy in particular has accelerated cleanup schedules, and they are going to be generating probably large volumes of slightly contaminated soils and debris, and it would be helpful for those activities to have clear opportunities for disposal that would offer the appropriate protection.

More efficient state decisionmaking -- right now a lot of the decisions are being made on a case-by-case basis. The NRC process -- 10 CFR 20.2002 or the state equivalents, the state equivalents for TENORM, they might have some -- a consistent process that they can apply and not be bogged down in these individual applications for specific cases.

Next slide, please.

Moving on to some specifics and what's in the ANPR, we introduce this concept of low activity as we're applying it and do not have a current statutory or regulatory definition. We recognize that Department of Energy has been using this term really in the context of dealing with the tank waste at Hanford and Savannah River.

We are using it in a somewhat different way than what they are, focusing on the radiation content of the waste rather than the origin and evaluating the safety for the material in question.

And the potential universe of low-activity waste -- what we have discussed in most detail in the notice are mixed waste, TENORM, low-level waste, uranium or thorium ore processing waste, and NRC-exempt or unimportant quantities of waste. And we will look at DOE waste as well as commercial waste to see if that's an appropriate --

VICE CHAIRMAN RYAN: Dan, could you go back and expand on that second bullet, please, on the previous slide? I think that's real important as we go forward. It's the focus on the radionuclide rather than the origin.

MR. SCHULTHEISZ: Oh. Next --

VICE CHAIRMAN RYAN: You skipped over a slide.

MR. SCHULTHEISZ: Next slide?

VICE CHAIRMAN RYAN: There you go. The middle bullet -- you know, if you could expand on your thinking, then I think that's a real important observation that -- you're kind of shifting from source special nuclear byproduct and all of the other

early definitions which are origin-based to I guess a risk basis. Would that be a fair comment?

MR. SCHULTHEISZ: I think --

VICE CHAIRMAN RYAN: Tell us a little bit about that.

MR. SCHULTHEISZ: The system has evolved over the years in sort of a piecemeal way. As each type of waste or process that's under control has been identified, there has been disposal identified for them. So you have -- from the original Atomic Energy Act, you have the source special nuclear byproduct material, led to the distinctions of spent fuel, high-level waste, transuranic waste, low-level waste.

But then you had, say, the Uranium Mill Tailings Control Act of '78 that identified a specific problem and offered specific regulations and approaches to that.

And then there is the TENORM waste where there has not been -- it has fallen largely to the states to deal with those kinds of things, and they have taken various approaches to it, not typically based on the risk from the waste. And so their -- the practices that they have allowed have not necessarily -- in terms of land spreading or those kinds of things, have not been really focused on the risk from

disposal.

And so we think that there can be some efficiency and some consistency brought to this if we look at this. The radioactive -- in the context of what EPA has done for hazardous waste, we identify hazardous waste based on risk. What is the risk for the material as it's being generated? If it's in the environment, what are the overall risks? And then, those things fall into the hazardous waste system, and there is one sort of way to dispose of hazardous waste.

We think it would be a reasonable step to look at the different kinds of radioactive waste and say, "What are the risks attendant to these specific things?" Right now, there are TENORM wastes out there that present higher risks than low-level waste. But there are clearly less regulatory controls and requirements that deal with their disposal.

One of the things that we are confronting now is that a number of states and localities are being faced with residuals from their drinking water treatment, and the radium standards and the new uranium standard, in some cases those can be very high, up to say 50,000 picocuries per gram of radium, depending on the type of -- the treatment process they

have adopted.

And so we have gotten an increasing number of requests from system operators and states to help them deal with that, because it's not low-level waste and they don't really have the -- you know, the mechanisms in place to deal with what are the risks from those wastes.

And there are a number of TENORM type wastes, you know, in that -- in that kind of category. And we just think that it would make a lot of sense to look at -- to strip away the regulatory definitions and look at the risk -- the underlying risk from the waste and see if there is some way that you can build a level at which those risks can be addressed by other disposal options that have been previously identified.

I don't know. Does that help answer your question?

VICE CHAIRMAN RYAN: That's great. Thanks.

MR. SCHULTHEISZ: Next slide.

Okay. So in addition to the -- sort of the conceptual ideas, we discuss in particular some of the methods and the modeling that we could use to define low-activity waste. Right now it's a concept. We have to put some bounds around it. What are the

numbers that go along with these risk ideas?

Specifically, we talk about hazardous waste landfills as a potential destination for low-activity waste. We think, you know, that they are fairly robust in their engineering and regulatory requirements, and in a lot of cases are being used now for certain types of material.

We talk about the regulatory and potentially non-regulatory mechanisms that could be used to bring some efficiencies and alleviate the pressures on the states to make decisions now, and ask a lot of questions. If you looked through the notice, there are a lot of questions. Some of them are very specific; others are more broad and conceptual as, is this a good idea?

So, next slide, please.

Some specifics on how we are talking about defining low-activity waste. Risk modeling in particular, similar to the way the radioactive waste facilities are judged, but we would look at, how would you limit the amount of radioactivity in the disposal cell or have some confidence at closure that you know what the inventory is going to be?

Some basic scenarios looking at the long-term performance of the unit, the basic performance

assessment, modeling the Subtitle C engineering requirements with sort of a national database of characteristics that we use in RCRA. We are trying to meld the two approaches here.

Post-closure site use -- an intruder-type scenario. RCRA has limitations on the use of the site, but it doesn't require government ownership. Part of the ways that we can build the confidence that -- any post-closure disruption of the site would be within the acceptable risk criteria.

And then the facility workers -- this may be a limiting scenario for many of the radionuclides, particularly the shorter-lived nuclides. RCRA facility workers, if you want them to be just considered RCRA facility workers, you know, you have to kind of limit their exposures and see how, in the typical course of their duties, they might be coming into the contact or proximity to waste that could give them exposure.

As I said before, the same type of analyses typically used for years to look at low-level waste facilities and other radioactive waste facilities. Protected performance, not design, as a key factor -- that is one of the -- one of the comments that we get continually is these facilities

weren't designed for radioactive waste. It's a little bit misleading, because I can look at a low-level waste facility, and I can say, "Well, is the design consistent with the requirements for hazardous waste disposal?" And I can say yes or no, because they are very detailed and specific in the regulations.

You can't necessarily do the same thing with a RCRA hazardous waste landfill, say, "Was this facility designed for -- is the design acceptable for low-activity radioactive waste?" I have to do an analysis of the performance to determine whether that's the case or not. So we are, as I said, melding the two approaches to some extent.

And the behavior of the radioactive constituents is based on their chemical characteristics. They are subject to the same influences -- pH, Kd's, soil type -- as the hazardous constituents in determining how they behave in the disposal cell and how if they are released into the underlying soil how well they would travel and migrate to a potential receptor.

That's another comment we get is a lot of concern about mixing the two, the potential impacts on radioactive -- the radionuclide mobility of the chemical constituent. And our -- you can do certain

things within the modeling to try to simulate those effects, and we will be doing those.

And then there are other supporting criteria that are also applied in radioactive waste disposal, the sum of the fractions approach, looking at activity caps or volume caps, specific radionuclides or overall activity, waste form requirements -- is it better to require a specific solidified waste form? What does that say about accepting bulk waste, like contaminated soils? We should have a reasonable -- is there a distinction you can make for those bulk wastes?

Next slide, please.

And looking specifically at the hazardous waste landfills, as I said before they have very explicit design and engineering requirements in the regulations themselves, and the regulation -- regulatory framework, as we see it, is very comprehensive and detailed and well suited as a foundation for determining whether you need to apply some additional controls or confidence-building mechanisms to -- from the radioactive waste disposal paradigm that would help build some confidence in the approach.

They are designed, constructed to contain

chemicals that present significant risk to public health, though they are deemed to provide a significant level of protection from these toxic and otherwise hazardous materials.

They have been used for radioactive material, most prominently for TENORM wastes. Some facilities have specific permit conditions that allow them to accept certain activities of TENORM waste. They have also been used for mill tailings, the FUSRAP waste, right now are going to some 30 Subtitle C facilities.

And then the case-by-case consideration, specific application to NRC or the state to allow disposal of Atomic Energy Act material in those facilities.

We do in our ANPR -- we ask for comment on other types of landfills, and specifically the one that gets the most attention is the solid waste landfill, the Subtitle D landfill, either municipal solid waste or an industrial waste landfill. We thought that it was important for us not to limit the scope of this but to broadly ask the question, because these facilities are to some extent being used for radioactive waste.

Texas has a regulation that allows waste

with less than a 300-day half life to go to a Subtitle D facility. Other cases, decommissioning cases, the Big Rock Point case in Michigan, NRC and the state aggrieved that certain decommissioning waste construction rubble could go to a municipal landfill, and that has gone reasonably well.

And what they found at that landfill -- they had some concerns about the material coming through, what they found at the landfill is that the waste from the nuclear plant is not setting off the monitoring, the portal monitoring.

But now that they've started looking more closely, some of the clean cover material they've been bringing in from the oil and gas sites has actually been setting off the portal monitor. So they've been accepting higher activity waste for some time, and that is the case, actually, at many of the Subtitle D facilities.

If they're in high background areas, they're using clean cover that may actually be higher in activity than some of the waste that they're -- that is of concern and is being regulated.

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So how can we use that infrastructure, that hazardous waste infrastructure, and demonstrate

that it's protective for low-activity radioactive waste? The basic step is to take the basic consistent and RCRA technology, which is consistent from any facility -- there is -- they have to meet these certain basic requirements -- and to assess that with the performance modeling approach of the radioactive waste world.

We would look at the same standards of protectiveness that we, the EPA, then apply to other radiation situations and for other pollutants. Doesn't give special treatment. We have standards that we apply to the basic risk criteria, to all pollutants, all programs, and this would be another application of that, and applying other measures common to radioactive waste disposal to increase the confidence.

I mentioned a few of those earlier -- caps and some of the fractions. But in looking at the distinctions between, say, Part 61 or UMTRCA and RCRA, some of the ones that stand out are the post-closure care requirements, the government ownership requirements, and those kinds of things.

Next slide, please.

So looking at the regulatory aspects of this, we recognize that to deal with licensees NRC is

going to have to take some action to allow waste to go to other than Part 61 facilities on a regular basis.

And we have worked with NRC to try to identify what those might be, and they helped -- and they provide some language for the ANPR and were generally involved in reviewing, and we commented back and forth. We have gotten a lot of good advice from them, and we are sort of educating each other on how the different worlds work.

Those actions could include the license -- some form of licensing for the disposal facility, a specific license for which the facility would have to apply, or a general license that would appear in the rule. And this license could be something very simple. The range could be -- adopt various parts of the Part 61 framework, or it could be something, you know, anywhere along that spectrum.

An exemption for the disposal facility to say, "If you do it this way, we don't need to regulate you anymore. You know, you're under the EPA umbrella by virtue of going to their disposal facility." Or some -- or, in addition to, there could be some regulation of the generator to allow a material transfer to an unlicensed or exempted facility.

I'd point out that the Department of

Energy has an authorized limits process that is similar to the exemption approach which they have in their DOE orders, whereby they do an analysis of the specific wastes that they want to send offsite.

They coordinate with the state and the disposal facility, and after that they declare that it's no longer subject to their Atomic Energy Act authority. It's -- they are releasing it using that authority to this commercial disposal facility, and they have used a number of facilities around the country for specific applications of that process.

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We are also talking to some extent about non-regulatory approaches. The wastes that we are looking at are -- they fall under a number of different authorities or jurisdictions or regulatory agencies, and it's not clear that they can all be brought into one -- one comprehensive approach. And, in particular, the state requirements related to TENORM, it's not clear what -- the regulatory authority that we could apply to those wastes without having the states come along and agree with that.

So we are also considering what non-regulatory approaches might be used to supplement the existing regulations or other regulations we might put

out to help make the system more efficient. Some of the things we talk about in particular are guidance on disposal practices.

To help support the states, as they have applications, as they see different types of waste, one of the big problems, when there was the FUSRAP waste, when it first became a problem was the states had never dealt with it before.

They had no real understanding of where it was coming from or why it was different from 11E2 waste, and so they were not equipped to make those kinds of decisions about what they should allow and shouldn't allow. And so there are some concerns about the practices that were permitted at that time.

And as an example, we -- about a year ago we issued a guide for industrial waste management that was prepared with states, industry, environmental groups, the public, to deal with industrial solid waste facilities, and dealing with a whole range of issues related to siting, risk assessment, management, operation, closure, all of those kinds of things, and that could be kind of an example of the way that we might be able to provide some useful guidance in this topic.

Best practices programs, work with the

industries and the states to figure out what is the best thing to do with these wastes and help them deal with things. There could be something real formal or structured, something along the lines of the ISO 14001 series of environmental management system standards that would, you know, provide the industries with opportunities to identify the aspects of their operations that they need to pay more attention to the radiation issues.

A lot of the industries, the TENORM type industries, you know, radiation is not a -- is kind of a latecomer to their concerns. They have not paid that much attention to the radiation issues associated with their waste.

We also have some examples of industry-specific MOUs. We handle, with the American Hospital Association, sets out some specific goals for waste management, waste reduction. One of the goals they have is to eliminate mercury waste altogether by the year 2005. And it identifies other opportunities for waste reduction, and these MOUs could deal with things like funding and other support mechanisms.

So we talk about those broadly, just to see if there are things we can do apart from regulation or in addition to regulation that could

provide support for more efficient and more effective waste management.

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Some of the major uncertainties that we have at this point, and are going to have to deal with in -- you know, in some detail, is -- the basic one is, how much waste is eligible? Where does it come from? Depends on the technical analyses that we apply to it, the other criteria, the screening-type criteria, limitation criteria that might be necessary to put on it. But that's a major uncertainty, and it kind of drives the whole question of stakeholder acceptance.

Another one is the need and level of NRC oversight is not clear. I outlined the specific regulatory approaches that are out there for -- that they've indicated might be appropriate, but which one, and how detailed are they? And where is the line being drawn between NRC actually regulating those facilities and deferring to the current EPA regulation? Or, in most cases, it's the state that's regulating it on -- in their -- through their RCRA authorization.

The level of stated support and adoption for it is not clear. They have some real questions

about, how is this going to work, and whether this -- there is political support. If we outline something very detailed that seems to be protective, can we override some of the concerns that have been expressed by the states about radiation in general?

The disposal facility and generator concerns about the liability and the public perception. And for the disposal facilities, this is almost directly tied to the volumes. They have to make some economic case for themselves, and they can't really do that unless they know, what are the volumes of waste that they could potentially take care of?

And then they have to have concerns about how is our taking that waste going to affect our current customers who may not want to send waste to a facility that is now accepting that kind of waste. And they are public -- for the most part publicly traded companies, and have concerns about their public image. And those are also the case for generators. They don't want to be seen as doing something that the public will not accept or see as somewhat bending the rules.

Leads to the next point -- public acceptance. One of the things we have to get -- we have to do better is to focus on what we are talking

about and not allow the lines to be blurred into other areas.

A lot of the comments I'll talk about in the next slide, confusion with the clearance effort, confusion with DOE's efforts on their efforts to do clearance, confusion with transportation regulations, a number of different things. You know, this is -- we're looking at something specific about maintaining some regulatory control and focus people on what we are actually talking about.

And then what factors will influence those decisions? There are a lot of interactions between the factors. The disposal facilities, the volumes, public acceptance, the state support, the NRC oversight -- those are all things that will play into whether they want to do this or not.

Next slide, please.

So just some of the basic perceptions and reactions that we have heard. Environmental groups -- the deregulatory action, and by definition it's less protective. You're taking things out of a -- potentially out of a highly regulated system, and even though we're putting them into what we see as another highly regulated system they see it as deregulatory.

And as I've said -- I've talked about the

RCRA system a bit. It's a little -- it kind of takes us aback to hear people talk about moving into that system as being deregulatory when the history of it is that people who are in it think it's maybe too strict.

We've had some concern that things that we do might affect existing management practices at Department of Energy, Corps of Engineers. Corps of Engineers is concerned that their FUSRAP program, you know, not be hampered. There are other cleanup and disposal practices. DOE has their own authorized limits process and are working within that. And they don't want to see something happen that would cast that as a not protective practice.

Well, we heard from the states, primarily from the state regulators. They support this concept, and the approach seems reasonable. But to some extent, they're not sure that it's needed. Some of the comments we have gotten from a couple of the states say, "You haven't demonstrated that there's really a need for this."

And how would it be implemented in the states. That's another big concern.

They have also expressed interest in a coordinated federal approach, and to some extent have been pleased that we and NRC have worked closely

together in developing this ANPR.

Waste generators -- what we have expected all along, status quo discourages the efficient disposal of material. You should be able to send things that are not high-risk material to appropriately protective disposal sites and not have to -- you know, just because they came from this kind of facility, they shouldn't have to be dealt with in the way that much higher activity, much higher risk material is.

We've talked to some -- several of the Subtitle C facility operators. They've expressed some interest in exploring this further. They don't want to commit to anything. I talked a little bit before about the tradeoffs and considerations that they have to go through. Well, for them, probably a big key is the state and public buy-in. If they could be satisfied that the state and the public were going to be accepting of this, then it comes down to basically an economic decision. That's something they're very comfortable with.

So we have to define this better. As we go through this with the technical analyses, we have to try to scope out what those wastes are and where the volumes are.

Next slide, please.

So some of the specific comments we've gotten so far -- as of yesterday morning, we had 115 comments in our docket. We have some others that have not been posted to the docket. Most of them have been opposed, but not very detailed. This doesn't show up very well, but in your handout you can -- we have this electronic docketing system now, and anybody can look at the comments that have been posted to this point.

So it's www.epa.gov/edocket. And then if you look at -- if you open dockets, and this is the docket number, and the -- if there's a pdf icon, you would select that. If not, you would just select the number of the comment, because they would have commented directly through this electronic docketing system. But if they send an e-mail or a letter, it gets scanned and posted out of a pdf file.

So you can all look at the comments that we've gotten to this point. It's not clear how quickly they get posted, and we do have some that we need to get to the docket for them to post.

We've also received well over 100 -- probably over 200 now -- e-mails and letters to the Administrator, most of which have been highly opposed. We've gotten letters from two Senators thus far --

Senators Feinstein and Campbell -- both expressing concern, although in somewhat different ways.

Senator Feinstein was much more critical in her concerns. Senator Campbell was more -- asking more a question, which is, "This is what I've read about this, but you can't believe everything you read. So is this really true?" So we have responded to them, and we've also done a briefing for several of the Senators' staffs and may get some additional inquiries in that area.

Next slide, please.

So who have we gotten comments for? Most are just private citizens who are sending e-mails or letters. They may have read something in the newspaper. They may have read something put out by one of the public interest groups, on our website, or a press release or something, and have some concerns that they are expressing.

A few have been on behalf of those interest groups. Also, groups like ASCME, which represents the state and municipal employees' concerns about the people who work at these -- at municipal anthills in particular.

States -- so far we have received some comments from the states listed here. Different parts

of the state -- Washington, we are getting comments from both the Department of Ecology and the Department of Health.

From California, we got comments from the Integrated Water Board but not yet from the California EPA or the Department of Health Services. So they've offered some varying levels of detail and comment on the proposal.

One compact has commented, the southwestern compact, and they raised a concern that was also raised by a couple of the states, which is you have to think about the economic impact on compact facilities, low-level waste facilities. This is going to make them economically not as viable as they otherwise would be, and we did raise that issue in the ANPR about compact requirements.

One Subtitle C operator who said, "We're not interested in this" -- it was actually a letter to the mayor of the town in which it's located. They apparently have a less-than-friendly relationship with the town, and they were trying to assure the mayor that this is not something that they would be interested in.

One mixed waste generator to this point -- the University of Michigan -- commented favorably.

NRC has sent out the comments directly, and so they are not posted yet onto the docket. Very minor comments, given that they approved -- reviewed and provided language for the ANPR, but generally supportive.

We've gotten two offers to treat or dispose of the waste. One said that he can do solidification and disposal in salt domes, and the other one said, "I've got this great patented process for accelerated transmutation, and no problem."

(Laughter.)

We really expect the bulk of the comments to come in towards the end of the comment period. We've talked with a number of states and industry groups, who are -- and DOE who are pulling together a larger volume of comments. And so we expect those to come in later in the comment period.

Next, please.

And what have we been doing in that time to meet with the different stakeholder groups in presentations like this? We have talked with different groups of generators, licensees, small generators, mixed waste generators, industrial users. Next week we're going to be talking with some people from NEI and the larger nuclear industry, the fuel

cycle facilities.

We had a conversation with the National Mining Association and some of the people who are involved in uranium issues. The Department of Energy disposal facilities -- we mentioned we've talked with several of the companies that operate RCRA disposal facilities and their industry trade group.

States -- through ASTSWMO, CRCPD, low-level waste forum, organization of agreement states, environmental groups. We've met several times with some representatives, mostly of the national groups, but have also tried to make some contacts at the more local level.

And presentations were going to be at the DoD low-level waste conference in May. Health Physics Society will be there in July. We were at waste management. We're going to an International Isotope Society symposium, and also the CRCPD annual meeting, and we were at the low-level waste forum last month.

Next, please.

Finally, where we expect to go from here, we extended the comment period, as I mentioned, to May 17th. We're going to continue working in that time to develop our modeling approaches and looking at the other options that we have available.

And when we finish with the comments, we will have to spend some time going through those, and probably go out to some of the commenters and ask them for more information, more detail, are we understanding what you said, how do we reconcile the different comments we got from groups that may seem to be having the same point of view, and continue that dialogue in the outreach with federal agencies, states, and the other stakeholders.

And then we have to figure out, of these possible paths forward, regulatory, non-regulatory, different types of waste, what can we really do? What's the most effective thing for us to do and recommend to our management how we would proceed to the next step?

So I will leave it there, and hopefully there is time for questions.

VICE CHAIRMAN RYAN: Dan, thanks for a very comprehensive presentation on where you've been and where you are and where you're going. That's a great update.

Are there members -- questions from members, please?

MEMBER WEINER: Since you've outlined a number of possible steps that you can take with these

-- this whole spectrum of waste, I don't understand -- and then you said you had all of these comments that were opposed, what is it that they were opposed to?

MR. SCHULTHEISZ: Well, most of the comments that we have received to this point is -- are very short and pointed comments from members of the public. We don't want this -- I don't want this in my local landfill. I don't want it to be recycled into consumer products.

I don't want it to go to an incinerator. It shouldn't go to any facility that's not designed or licensed for these materials. Radioactive waste needs to be more tightly controlled, and there should never be any deregulation of any kind. This is BRC, and we've fought this before, and we're going to fight it again. And that's essentially what those comments are.

To some extent they get a little more nuanced, but fundamentally it's deregulation. We're not going to stand for it.

MEMBER WEINER: On a more specific question, you mentioned a couple of things that NRC could do. And what would -- what is EPA's sort of tendency now? Would you favor more NRC, more detailed NRC regulation? What are you really looking at?

MR. SCHULTHEISZ: Well, let me go back to the earlier effort that we had in 1999, where we were looking at mixed waste from the generated -- agreement state generated. We approached -- we worked with NRC in that broad approach, and at that time we thought the appropriate thing to do to satisfy these concerns about deregulation and confidence -- that there would be additional confidence if there was some NRC licensing of those facilities involved.

And in talking with NRC over that period, it was envisioned as something very simple compared to Part 61 that could be simply a notification. It could be a general license type of an approach. And we thought that would bring some additional credibility, because you would not be losing either regulatory agency. It would be somewhat reduced through a regulation, and hopefully would be more effective at allowing waste to go to a disposal destination.

As we went through that process, after we withdrew it, we talked with several of the RCRA disposal facility operators, and they expressed some severe concern about NRC licensing of any kind, and particularly in relation to the relatively small waste stream of commercial mixed waste.

They saw that there was absolutely no --

no tradeoff for them for this relatively small waste stream, which they thought they could handle effectively, but the economics were not there when stacked up against the potential of the stigma of having -- being an NRC-licensed facility. They were also concerned that that would then open the door for the other additional state agencies to come in and make them do other things, and so they didn't see that as a tradeoff that they wanted to make. And we -- we took that very seriously and had some concerns about the viability of this whole approach.

But then when we determined -- we got some support from NRC and DOE to try to look at it again and try to be a little more flexible, and NRC would be involved more at the beginning, we wouldn't kind of run into these surprises we ran into the last time.

We decided that this was an opportunity for us to open it up to other waste streams, to look at the system more broadly, and with the potential benefit of having some additional economic incentive for those facilities to maybe accept some NRC stamp of approval.

I think they still have their concerns. Not knowing what it might look like is always a concern. You don't want to be too hasty about

committing to something when you don't really know what it's going to look like. But we have had discussions with NRC about this.

I think in the tradeoffs of public acceptance versus facility acceptance, I think we lean a little more towards the exemption dia, and NRC staff has indicated it leans a little more towards the general licensing approach.

And there may be in their general licensing approach some specifics about deferring to EPA for inspections or having an MOU with EPA about inspections and enforcement and notification and those kinds of things, so that the facility wouldn't see anything really different on its day-to-day operation. They still see EPA people, state EPA people. But when you get down to the state level, and you have the two agencies' counterparts, do they accept it as well? And then that's always a concern.

MEMBER WEINER: Do you have -- a final question. Do you have any conflict with RCRA requirements? Because I know we ran into this on the Waste Isolation Pilot Plant big time.

MR. SCHULTHEISZ: We have tried to, you know, coordinate through our agency workgroup process to -- with the RCRA program to make sure that they are

-- you know, we don't want to do anything to undermine that program. And some of the things that we talk about like, you know, extended institutional control, post-closure care, ownership restrictions, those kinds of things are -- you know, we don't want to give people the impression that those facilities aren't protective because they don't require government ownership or they don't have those extended post-closure requirements.

But that's something that is brought up continually is, hey, you know, this is a 30 -- this is 30 years here, and you have to look at -- on the other side, and so how can that be comparable. You know, we point out that there are many hazardous wastes, particularly the heavy metals, that will be there long after any of the radioactive material has gone away, except with the possibility of uranium-238, which will be around pretty much forever.

So we have tried to identify where those areas are and work around them.

VICE CHAIRMAN RYAN: George?

MR. SCHULTHEISZ: Adam, do you have something to add?

MR. CLINGER: I'm sorry. I just wanted to expand on -- my name is Adam Clinger. I'm also with

EPA. And I just wanted to expand a little bit on the second question, in terms of what we're hearing and what NRC could do, I think is the way it was phrased.

We had had some conversations with some generators that we're pointing out. Again, we have raised this general theme of, why don't we treat similar material similarly, either from the generator side or from the disposer side?

And so I guess I wanted to provide an example of each with respect to some sort of NRC requirements. One was with generators saying, "Well, there's some exemption associated with liquid insulation.

And some of ours fit into the exemption, and then some of ours don't. And the ones that don't are similar to ones that fit, and so again -- so that's kind of interesting, and we're looking forward to see those articulations and perhaps to turn to you all and say, "Well, is this, again, another way that we collectively can improve the system under this?"

And then, more recently, from the other end was some input from the National Mining Association saying, "Well, we have these mill tailing entailments as destinations for certain classifications of waste.

And are there other wastes in this broader universe that, again, have similar characteristics, and can we establish performance in the same way that if performance is the metric across the facilities, such that those could potentially, you know, offer disposal options -- again, neither advocating for or against but just sort of articulating, again -- and those are things that come under the existing NRC purview.

And depending on, you know, how characterized and what not -- but I just thought I'd raise that as some specifics that we're hearing and that, again, are interesting and trying to navigate through this sort of complicated area.

MEMBER WEINER: Thank you.

VICE CHAIRMAN RYAN: George?

MEMBER HORNBERGER: I know that EPA, of course, does things on a risk basis, and I'm curious just conceptually if it were to be approved to have low-activity mixed waste go to our RCRA facility, is the idea that the risk associated with the radioactive component would be about the same as the hazardous component or much less or greater?

MR. SCHULTHEISZ: That's a difficult question for us to answer, because we -- at EPA when

we are looking at hazardous waste we typically look at the waste before disposal. We don't really look at, what is the risk from a disposal facility?

So it's very difficult to say -- when you've got these larger volumes of -- there's no sum of fractions for hazardous constituents, or anything like that, what the risk from that facility is, what's the baseline risk from that facility if it just takes hazardous waste. And then, what are we adding to it?

We would anticipate that the risk would not be significantly increased by the low-activity waste that would be accepted by it. We would anticipate for the most part that those -- the low-activity fraction would be a small part of the overall waste stream going to that facility.

If you had -- one of the things we talk about in the notice a little bit is if you had sufficient volumes from some decommissionings or whatever, would it be attractive to an operator to site and permit a facility specifically for low-activity radioactive waste?

And in that case, we are doing -- from the agency's perspective, we are being protective within the criteria we apply. And so it's protective. It's appropriate.

From the public perception, is it -- I don't know how bad this is now. How much worse are you going to make it? That may be what they are most concerned about.

MEMBER HORNBERGER: If I then invert this -- so if we have a mixed waste stream where the radioactive component or -- in fact, potentially much more hazardous than the hazardous side. Where do we stand on resolving those issues? I mean, would that be something that EPA would defer to NRC?

MR. SCHULTHEISZ: Well, in fact, the May 2001 rule is -- that's exactly what it does is it allows conditional exemption from the RCRA requirements if the waste is disposed of in an NRC or agreement state licensed low-level waste facility.

And part of the reasoning for that was that RCRA requires treatment of the hazardous constituents, as long as those conditions are met. And so the toxicity and -- is considerably reduced, either through immobilization or obstruction of the hazardous constituents.

And so by comparison to the Part 61 licensing requirement, and then just from a practical point of view, if you're putting high Class A or Class B or C waste in there, then the radioactive risk

clearly outweighs the limited hazardous risk. So that's exactly what that rule would do.

VICE CHAIRMAN RYAN: John?

CHAIRMAN GARRICK: In your effort to get a handle on this whole issue, how much consideration was given to international practices?

MR. SCHULTHEISZ: We haven't looked, really, to international practices for this. I have to say, we really have not focused on what the international community is doing. We are working within our existing regulatory frameworks to try to determine whether there are existing options that could be made more effective through the type of analyses that we're looking at.

Did you have something specific in mind that we --

CHAIRMAN GARRICK: Well, I was -- it would just seem that as background you would kind of want to know if there's any precedence whatsoever for definitions of -- for example, of low-activity waste, and I think there are. And all of the other ramifications such as the types of facilities that are involved and used and the strategies that have been employed. And I was just curious as to how much the international experience entered into your preparation

of the background material for the --

MR. SCHULTHEISZ: No, it really hasn't. I know they do have very low-level waste in some cases, and low and intermediate and --

CHAIRMAN GARRICK: Right.

MR. SCHULTHEISZ: -- high-level waste, and we have not looked at where those definitions fall to give us any guidance. Maybe we should. I mean, that may be a wise thing for us to do.

CHAIRMAN GARRICK: You in your presentation have done an excellent job of articulating what some of the issues are and some of the requirements. One of the problems in getting public opinion is that a lot of the questions that probably should be answered as a basis for offering an opinion are not answered, such as things like definitions and volumes and scenarios and types of facilities that would be involved and how this risk stacks up with other risks.

I'm sure you've thought about a lot of these things. You, in a couple of your slides, for example, address the issue of the definition of low-activity waste and some of the requirements for that definition. Do you have any definitions that are under consideration?

MR. SCHULTHEISZ: Well, I think the basic would come through the modeling scenarios, and we have not at this point determined what the appropriate level -- dose or risk level to apply to those as a target is yet. You know, we have -- the tradeoffs are there as well, because the volumes depend on, well, if you're looking at one or 10 or 15 or 25, that will change the volumes that are available.

But the higher the risk of the material, the more likely it is that people will demand or ask for additional regulatory requirements to build their confidence that the waste is being managed successfully. And then that feeds into the public acceptance, the state acceptance, the generator and disposal facility acceptance. So there are a lot of balancing things that we haven't tried explicitly to weigh at this point, and we're hoping to get some comment to help narrow that down a little bit.

CHAIRMAN GARRICK: Is this a staged process in the sense -- or a phased process in the sense that the -- this initial feedback from the public will provide you with some additional insights that you can now go back and define the problem a little better?

MR. SCHULTHEISZ: That's what we were

hoping for.

CHAIRMAN GARRICK: And recycle the whole thing?

MR. SCHULTHEISZ: We have very broad concepts, and how do we slice it? What is acceptable, and what is not acceptable? Which of these sort of additional screening or confidence implementation type measures are most important to the public or to the states or the generators or the disposal facilities? And we have been hoping to get some clear -- at least some clear opinions that we can weigh rather than sort of a broad yes or no, this is a good idea or it's not a good idea.

CHAIRMAN GARRICK: Yes. One of the real problems with public comment process to me is that the problems that they're being asked to comment on are very poorly defined, and this is no exception. And it makes it very difficult for the public to really appreciate what they're dealing with in terms of the risk that's involved, for example.

And I don't know how you solve that problem, but to me, as I read the material that you've supplied requesting comments, there's a tremendous amount of information on process and on the different agencies and their roles, but very little information

on, what is the real technical issue here? What is the real risk that we're talking about?

And I don't know how you deal with that, but I think the problem here is that all the baggage that is associated with the fear of anything nuclear ends up being the primary basis for the comments, rather than the specifics of the issue that you're trying to solve. And it seems that there must be a better way to address that than the way it's generally done.

MR. SCHULTHEISZ: Yes, there should be. And part of the problem is that we worked, you know, internally to develop these things. We work with NRC, and we get comments from DOE, or we talk with our other offices. And so we answer the questions we have, and what comes out -- you know, we may have lost sight in some cases of, well, what's the most effective way to get the public to react?

Well, we've answered all our questions about how to say this, but if they're not involved in the process of developing it, there is a gap there. And it's hard from these comments -- the comments that we get, the short statements, to know how much anybody knows about risk or what the difference is between a hazardous waste landfill and a solid waste landfill,

or any kind of -- any kind of background.

And even some of the ones we get that support us that say, "It's about time somebody took a look at this and looked at it, you know, on a risk" -- they don't say anything about what their experiences or qualifications or anything that leads you to say this person knows what they're talking about. And so it's very hard to weigh those comments.

And the only thing I can say is that as we move through the process, if we do a proposed rule, there will be additional public comment there, and hopefully at that time we can be better at describing exactly what the numbers are, where they came from, what risks they represent, what are comparable risks from other activities or applications, and hopefully get people to respond to that material rather than, "I read this in the newspaper."

CHAIRMAN GARRICK: Right. Okay. Thank you.

VICE CHAIRMAN RYAN: Dan, again, thanks for a good presentation. I want to amplify what John said. It's a very complicated arena, NRC and EPA and regulating these materials. You know, we had some additional examples, which I appreciated. And you could go on further.

I mean, things like fly ash, which is a common solidification agent in the hazardous waste industry, often has more radioactive material in it than what you might otherwise dispose as a radioactive material that meets whatever criteria might get developed, and so on.

With all those examples in mind, and many others we could spend a lot of time on, I think as and if you proceed forward some kind of a primmer, a technical primmer, as Dr. Garrick has said, that kind of outlines some examples and some scenarios that, you know, this might go to this facility or that facility or stay as a low-level waste, or those kind of things, would really help exemplify the vision that you have for what you're trying to regulate.

It can very quickly degrade back into the origin-type definitions, which gets very confusing, as opposed to focusing on the radioactive material content and those inherent risks that you are trying to focus on in a forward-looking direction. And I think something that documents and amplifies that shift in basic thinking by example would be extremely helpful in educating not only the public but educating the technical community that, you know, have all sorts of varied reactions to these kinds of things.

So, you know, and just the example you gave of the 1999 part, you know, you have received reactions from "no thanks" to "yes, we'll do it, it's great." And those are -- that's the technical community that theoretically knows something about this.

So a primmer or something that goes into those more concrete examples I think would be a great asset to you as you go forward.

MR. SCHULTHEISZ: Yes. I think we had -- related to the '99 one, we had work -- started working on what we called a layman's guide to low-activity mixed waste at the time, and tried to explain some of the basic radiation issues behind that. And I think that's -- you know, increasingly is a focus of our program is those educational and informational materials. So I think that would be something that we will be spending time on.

VICE CHAIRMAN RYAN: Jim, do you have a question? Please.

MR. CLARKE: Yes, I just have one quick question. You mentioned performance as just being really a key factor rather than design. As you know, the challenges that are experienced with currently favored designs is pretty grief compared to the time

over which we'd like these designs to perform.

I think you mentioned a national performance database. Does the EPA track on a long-term post-closure performance --

MR. SCHULTHEISZ: No, it's not -- and maybe I misspoke, but it's not a performance database. It is a database of site characteristics that EPA developed over the years, primarily in relation to the Subtitle D program, the solid waste program, where there are hundreds and thousands of these landfills of varying descriptions, whether some meet the current standards or some are, you know, older and, actually, simple open and dump type of facility.

But those are typically used by the RCRA program when they do sort of national -- this a national program, so they have like this national database of characteristics that you can then sample from as you're doing some --

MR. CLARKE: I guess my question probably pertains more to the CERCLA program. But as we contain stuff in place, and put in currently favored covers, I get the feeling that the -- we kind of declare the problem over and go on to the next one.

And I was just wondering, is there any interest in the EPA in going back and looking at the

efficacy of institutional controls, looking at erosion, looking at, you know, covered performance, as we progress in time? Because there is very little data on this.

MR. SCHULTHEISZ: Yes, I agree. And ideally that would be something that we could do. I don't know --

MR. CLARKE: We could certainly forecast performance better if we had data.

MR. SCHULTHEISZ: I don't know to what extent the Superfund program does that. It's probably to a limited extent. And as far as the RCRA program, there have been -- there is no site that has gone through the complete 30-year post-closure period and then released. Since it's been less than 30 years since --

MR. CLARKE: Well, CERCLA has the five-year reviews, but, you know --

MR. SCHULTHEISZ: Well, yes. And they are well behind on -- I mean, there is a backlog of those as well that they have to catch up to. But that may be something that we can try to solicit from states as well is, what is their experience in institutional control of the sites?

MR. CLARKE: Thank you. I heard national

performance database and got real excited.

VICE CHAIRMAN RYAN: Any other questions or comments? Ruth?

MEMBER WEINER: A quick one. You might look at the experience with the Waste Isolation Pilot Plant, because there your Department of EPA finally exempted the WIPP from the RCRA requirements.

And, of course, the state screamed, the certain members of environmental groups screamed, but they went ahead anyway, because the two -- two legislative authorities were in direct conflict. One said, "Don't put it in the ground." The other said, "Do." But the process for resolving that conflict I think might be instructive in some of these cases.

MR. SCHULTHEISZ: Okay.

VICE CHAIRMAN RYAN: Dan, thanks again to you and your colleagues for being here today and giving us this briefing. And we'll look forward to hear how it's going down the line somewhere when it's appropriate, if you'll be willing to come back.

MR. SCHULTHEISZ: All right. Thank you.

VICE CHAIRMAN RYAN: Thanks very much.

Mr. Chairman?

CHAIRMAN GARRICK: Thank you. All right. We're grateful to EPA for allowing the time that they

did for questions. That makes the presentations ever so much more interesting.

And we're going to now take a 15-minute break, and we'll come back and hear about the DOE bundling approach to agreements.

(Whereupon, the proceedings in the foregoing matter went off the record at 9:52 a.m. and went back on the record at 10:13 a.m.)

CHAIRMAN GARRICK: Our meeting will come to order. We are now going to hear from the NRC Staff on their evaluation of DOE's bundling approach. And the Committee Member that will lead this discussion is George Hornberger.

MEMBER HORNBERGER: Thanks, John. The ACNW, I think everybody knows, has been following the resolution of the key technical issues, and with considerable interest.

And we have two sessions today. This is the first one with the NRC Staff talking about the idea of DOE's to put these agreements together into bundles and respond to them in hopefully a more efficient way doing that.

And then this afternoon we will actually here about the schedule for the responses to the key

technical agreements.

We have three people from the NRC Staff here with us this morning to discuss this, and I think that I will let these people introduce themselves as they go. And Greg, are you going to go first?

MR. HATCHETT: Yes. Good morning, I'm Greg Hatchett, Senior Project Manager in the new Division of High Level Waste Repository Safety.

As stated before, we came before you at the last meeting and generically discussed, one, the status of the KTI Issue Resolution Process, and two, how we define that process to look at DOE's Technical Bases documents, more affectionately referred to as the Bundling Approach.

And to that end today, we want to specifically go over what the staff process is more specifically related to the detailed review of a technical bases document.

And before I go any further, but I have here with me also Christopher McKenney, who reviewed the TSPAI portion of the Biosphere Transport Technical Bases document, which is the first one we reviewed.

And John Trapp who reviewed the Igneous Activity portion of the Technical Bases Document on Biosphere Transport. As I stated before, we somewhat

discussed the overall review process the last time we met.

And what we wanted to do today was go into a little more detail about the specifics, a part of the process dealing with the nuts and bolts of the overall review. And then we'll provide you with a summary when we're done.

This review process was broken down into five areas. And what you see here in front you is just two of them. It doesn't all fit on this one slide, but this is, again, the receipt of the Technical Bases Document and then the document processing. And, of course, next slide, please. What we're here to talk about more specifically is the Review Team Assessment.

Now, as part of this process is when we first received the document and we begin to process that document and set up review assignments.

Then we have anywhere between a two-week to a four-week initial review before the team gets together to discuss the Technical Bases Document and the agreements associated with them or bundled in the Appendices as part of the Technical Bases document.

What the team does, as part of that process, is, and this again feeding the routine

assessment. That two to four week period of time is a lot of prep work. And it gets into things such as, hey, these agreements were created, you know, somewhere between 2000 and 2001.

This is prior to the YMRP being approved in 2003. So the agreements, in and of themselves, weren't necessarily linked to any review method in the YMRP. These are just the staff's initial thoughts on what they thought the information, do we need it to provide, to understand whether or not they would a high quality license application.

And to that end, we tried to align or map agreements to the review method of the YMRP, which is analogous to what DOE did in their Technical Bases document, which was try to develop a Technical Bases document, which is their approach for, or their future approach for looking at model abstraction in a potential license application.

And then take agreements that are in a line with that particular document, whether it was biosphere or engineered barrier degradation, or whether it was water seeping in the drifts, and take agreements that ask questions similar to what might be a potential soft section related to model abstraction and put those agreements into a certain framework.

So, that was fortuitous for us, because we were running down the path of trying to get more integrated, and what was driving that was the baseline of risk insight.

So the baseline of risk insights were produced back in June of `03, and then we began submitting these technical bases documents, which was their new approach to dealing with agreements on a one-by-one basis, to do it in a more integrated fashion, and the submitted the first one back in September, 2003.

So while the staff was moving ahead with its risk baseline, we also got the added benefit of DOE now trying to do things more holistically.

So we, the next slide. This routine assessment, again, started with all these inputs in mind. It started by the team considering a baseline of risk insight. And so that necessarily drove everything we did in reviewing the technical bases document and associated agreements.

The team would then discuss the scope of each agreement, and try to determine, you know, hey, here we are today in 2003, 2004. How have we, the program evolved from where we started?

Are these agreements still relevant? To

the extent that some of these agreements really deal, in some sense, with scope. And may not be necessarily linked to DOE potentially making a safety case.

So look at the technical bases document very holistically, and then go back and look at the agreements and ask ourselves have we evolved beyond this point, and what effect is our understanding from our baseline of risk insight, have on our, our dispositioning for each individual agreement.

So, in some cases, the agreements may not have been fully answered by DOE, in terms of what we, originally the intent of the agreement was. And if we had that sort of a problem, we didn't shift it out to say no, with respect to this agreement, we had better justification or we thought justification didn't exist efficiently enough for us to deal with it in terms of closing an agreement.

If we, in fact, thought there was sufficient justification, then we went on to discuss the adequacy of the response in terms of looking at, again, the risk baseline and saying, hey, you know, based on the way we understand the agreement and the weight and the direction that they're going in, we feel that this is adequate enough, we don't need any more information.

They've answered the, they've carried the ball, they've answered the mail, we're okay with this. And that has to do with, you know, how we ranked them. Whether it was high, medium or low, as well.

So that influenced our decision making process. And at the end of the day, the team summarized its initial review conclusions and identified any action items.

Now, again, some of those action items dealt with, well, the team may sometimes want to confirm the justification and documents and may want to review some of the references.

And going back to the additional information we thought we might need, you know, what does that look like? How much should we ask for? Again, influenced by our understanding of the, how a repository may perform.

And, again, all driven from the baseline of risk insights. So what I want to do now is, again, we broke this thing up into two areas, the biosphere transport documentation, into the biosphere specifically around the total system performance assessment and integration agreements, which Chris McKenney handled. And then the ones we thought were more specifically dealt with, geologic issues, which

were covered in the Igneous Activity Agreements. And I'm going to turn it over to Chris.

MR. MCKENNEY: Okay, so in September we get the technical base document biosphere in, and we go through initial review. Within the document was seven agreements, were covered by this technical base document.

The, which are listed here. And we tried to characterize them. One, by, in part, by the staff who generated them, and in part also, by risk and whether the level of information was there.

When we went through our staff review, we characterized that five of the agreements, all TSPAI ones and one of the IA ones were considered, were ranked low risk. And also has efficient information available at the time to report it under review without additional information.

Meanwhile, two of the agreements, which dealt with mass loading mainly on igneous activity were, we needed a little bit more information and then, so in December we requested more information for those. Next slide.

And here's just a summary of basically what those, for the first five that were all low category, were dealt. We discussed these with you in

February at the Biosphere Working Group Meeting. Pat LaPante did for the Center.

And on the next one, the, these five, actually the four TSPA ones, were important parameters in biosphere calculations. This is one of these things, going back to how the agreements were formed versus what they would be looked at today.

And there are important parameters there. At the time we did the agreements, we didn't have actually the biosphere code integrated in with the rest of the TSPAI, so we were unable to actually run overall risk sensitivity and analyses at the time to say to what degree do they have on bearing an overall one.

But now, in the new, with the new TPA code and the newer versions of the TPA code and the risk insights baseline, they are all considered low risk. Next slide, please.

The, most of these agreements just focus on completeness of documentation. There weren't real serious technical arguments or issues.

As I said we discussed the review methods at the February biosphere meeting. And since they were low and so we did a review of the information provided in the TBD, that we were able to close those

issues in February.

And now on to the other two issues which were igneous activity which were handled by John Trapp.

MR. TRAPP: Yeah, this is kind of a tag team approach. When we did the original breakdown, there were, like I've mentioned, the two different areas. There are two reasons they were broken down.

Risk and really the technical backgrounds, who would be best suited to review these various documents. The two that I've mentioned as igneous activity agreements, primarily dealt with mass loading parameters.

And it was felt that this, these agreements should be best handled by the geologic people. Next slide. Now why do we have the concerns? Well, there's, if you go back way before we even had the TSPA, when we were first starting to do some of the runs, one of the things that came out of all the sensitivity studies was that mass loading was a very important parameter.

When I've done the risk analysis, it's basically shown the same thing. Mass loading is an important parameter, dose is directly proportional to risk.

If I carry it a step farther, volcanic ash, if you take a look at it, has some very unique physical properties. If you take a look at the mass loading parameters that you've got for normal material for soils, etcetera, you are dealing with something that's got clay particles, its got cementation. Volcanic ash is very poorly graded, it doesn't have these clay particles. There's no cementation. So you basically, you get different mass loading parameters off of volcanic ash than you would expect off a normal soil where everything is normally documented.

In addition, if you go through the literature, and this is where we started getting into our real review of DOE's, just about everything that they were using as documentation came from studies primarily at Mount St. Helen's.

And this is a silicic-type volcanic ash. It is not basaltic ash, and there's quite a bit of difference in the physical properties between these two.

Chemically, of course, they are totally different, but if you take a look, there's a slight difference in the particle shapes, there's a difference in particle size and there's a difference in the particle sortings.

This means that if you're taking a look at these type of things, you are not going to get quite the same mass loading parameters from these two different areas.

In addition, if you take a look at, especially Mount St. Helen's, the climatic conditions that you've got there are tremendously different than you would expect in the upper mountain region.

Some of the justification that was used by DOE, was they were talking about this would be used for the glacial transition or the full glacial. But even if you go to the amounts of rainfall that you'd expect in the area, during the full glacial period, would still be less than what you've got at Yucca Mountain or in the expected Yucca Mountain area.

If you take a look at the studies, again, one of the problems that we had was that all of the studies that we've got to date, really deal with real thin deposits.

Deposits which are seven meters or less. If you're talking about the area around the volcano, you'll be dealing with hundreds of feet to, you know, stuff that does taper out to these dimensions, but none of the things larger than a centimeter were in the literature.

In addition, the fact was that in everything that has been documented, it was all out of the watershed of the volcano. Now this is not to really criticize what DOE is doing, because DOE did note these same problems.

One of the things that we took a look at also, and it's really, was trying to compare the lifestyle of the various people and how this would interact with the various mass loading parameters.

And the slide probably is not stated correctly, because they did consider the lifestyle and activities, but the question was, was it appropriately considered.

Next slide, please. To basically give us kind of a benchmark, there really is only one set of data that's specific to basaltic ash and mass loading parameters, and this was gathered by the center and some of their work down in Cerro Negro.

Now this has also got some significant problems, because it was four years after the eruption and the normal rainfall in that area is about a meter per year.

And it was also after Hurricane Mitch, and Hurricane Mitch, by itself you had two meters in rainfall in addition to this whole thing.

And if you looked at the volcanic ash, what you saw was it was visibly depleted in finds at the surface. So that was really kind of our summary block, summary things that we had to take a look at.

And if you went through the DOE documentation for TBD-12. It appeared that the majority of this information was presented, not in the TBD, but in this backup AMR, which is listed here.

And therefore, because of what we felt was a high risk issue, etcetera, we requested specifically that we receive this AMR before we went through our detailed review.

We are at the position right now that basically we do have a technical review done. We're in the process of, like I said, no job is done until you've got all the paperwork in the process of complete and this getting written up, etcetera, and that type of thing.

And hopefully we'll be done and get it out the door at least by June. Greg.

MR. MCKENNEY: So, in summary, we, you know, we, in our schedule, our priority, our level of review were trying to take the risk insights into account and doing the various, for responding to our agreements, and we have two, a continuing review of

two igneous activity agreements related to mass loading parameters from the TBD12.

MR. HATCHETT: At this point, that completes the sort of overview of our sort of process for reviewing technical bases documents. If you have any questions, we'd be glad to take them now.

MEMBER HORNBERGER: Thanks very much. I just, I have one clarification. So on the two IA Agreements, was DOE asked for additional information? That's what I wasn't clear on. Or do you have the AMR?

MR. TRAPP: We have got the AMR. We have not completed the write-up yet.

MEMBER HORNBERGER: Okay, but you haven't written back to DOE and requested additional information?

MR. MCKENNEY: Well, actually on the, back on Slide 6 of 13, we note that on December 23rd, 2003, we asked for a series of documents, and this was one of them.

DOE has been trying to get them all, all their, of the AMRs up on, electronically are available to the public and it was just, we were at a transition point at that point, and we did get a hold of it back then.

MR. HATCHETT: Our letter stipulated what the five technical bases document where you see at that point that our review for these things were going to be stalled, as a result of not having adequate supporting documentation for what were statements and justifications being made, or trying to be made in these technical bases documents.

But here we decided to, back on January 30, 2003, they provided us with a letter that said for those five technical bases documents, which included the biosphere transport document, we'll have all the documentation on the web.

Or they had made a commitment to have it up on the web by the end of March. But with respect to the technical bases document on biosphere transport, all the documents we requested in that letter have been placed on the website and provided to us via electronic submission.

So the staff at that point, in February, in late February, mid to late February, began to do a more detailed review with respect to those two igneous activity agreements. And now they're in the process of trying to finalize that.

And John, again, John led that effort with the folks down at the center.

MR. TRAPP: And just, yes, there's two points. Was there sufficient information for us to review the TBD? And then I thought you were going to the point, are we going to request additional information? We, are not –

MEMBER HORNBERGER: No, we don't know.

MR. TRAPP: – at the point where we –

MEMBER HORNBERGER: No, I understand that. I just wasn't clear whether or not you had, as an interim, requested, so you've clarified it, I think. Mike. John.

CHAIRMAN GARRICK: John, you indicated that, the differences between mass loading differences between St. Helen and the other analogs and Yucca Mountain. Are you able to say something about what those differences mean?

Are all the differences in the right, in the wrong direction?

MR. TRAPP: In general, the differences appear to require a slightly higher mass loading, than you would directly get from the Mount St. Helen's data, yes.

If you take a look at, again, the information that we do have from Cerro Negro, you get numbers which appear on the base of being relatively

high. And it's trying to determine why they're high and how they relate, it's been a little bit of a hassle.

CHAIRMAN GARRICK: Do you have any sense of order magnitude impact on the dose as a result of these differences?

MR. TRAPP: My overall statement would be that's just about it, it is just about an order of magnitude.

CHAIRMAN GARRICK: I see, okay. And how are you requesting, what are you requesting DOE to do to –

MR. TRAPP: Well, DOE in their documentation, had noted that these difference did exist. And they put in a series of, you can call them whatever you want, adjustments, etcetera, fudge factors and all of this other kind of thing to take care of this. They recognized that there was a problem.

CHAIRMAN GARRICK: I see.

MR. TRAPP: And the review really was going through what they had done, was it technically justified, did they get through sufficient documentation to warrant that the numbers could be supported.

CHAIRMAN GARRICK: I notice that you did give quite a bit of emphasis to following a risk informed process for responding to the agreement.

One of the things that the Committee has commented on in the past is, is there any attempt in implementing this process while trying to address the agreements somewhat on a priority basis.

In other words, you would think that the, the one thing you'd want to end up with at the time we have a license application, is not a lot of outstanding high risk agreements.

You'd like to have the high risk agreements out of the way, and if you have any lingering agreements at that point, they wouldn't be the potential showstoppers, if you will.

MR. TRAPP: Well, part of the reason is there are other high risk agreements we're dealing with. For instance, in IA, the IA-102 Agreement which deals with probability is definitely high risk, and we've spent a tremendous amount of time going through that one.

In addition, there are other things which programmatically have to get taken care of, the IIRSR, these type of things. And our staff has been working very hard at this.

It's simply that with the loading that we've got, which is as fast as we've been able to get through.

MR. HATCHETT: Let me try, if I think I understand.

CHAIRMAN GARRICK: I guess, one of the other things I'm trying to get at, Greg, is there any guidance coming from the NRC to DOE on this? To encourage the strategy of addressing the risk ones.

MR. HATCHETT: We're in the process of reviewing that very point associated with DOE's new schedule submission to us. And we've had, a similar question was asked of us before related to, you know, what are we going to do with these, for instance, the low risk agreements.

One of the ways to look at this is, again, to go back and assess these agreements and ask ourselves, with the understanding of our baseline and risk insights, you know, what relevance or how are these low risk items interrelated?

And I think for the ones that are interrelated to things that may be medium or high and maybe potentially related to DOE making a safety case, we want to investigate them sufficiently enough to assure ourselves that we're, that, you know, combined

affects have been considered going forward.

But for those high risk, I mean low risk agreements, that may lend to understanding scope, or adding greater depth or perspective, but it's just, again, things that are in the margins.

We're considering looking at those things in a different light in terms of how to disposition them. And so, to that end, we're trying to find a way to more efficiently and effectively address those agreements, in the context of our baseline of risk insights.

And also at the same time, once we decided on what our position going forward would be, then communicate that to DOE so they understand how we're going to proceed between here and their proposed LA submission of 1204.

So a lot of that kind of in the pre-decisional draft, sort states about how do we do that? And I know those questions have come forward before.

Where in fact, that if these things are low risk items, I would say, down the road, if they dealt with compliance issues, that they would still, DOE would still have to provide sufficient justification, whether they are high, medium or low.

But we want to go through and scrub that

set of information and ask ourselves is that really relevant to the direction you think they're going in?

How does that potentially affect, you know, our safety case? Is this just really scope or adding prospective? And if it is, that's something we may be able to disposition differently than the way we have been doing it in the past.

So that's just sort of sneak peek, if you will, at what we're thinking about trying to do and different ways of handling that and trying to be more efficient and effective using the staff time and implementing the baseline of risk insight.

MR. STABLEIN: Dr. Garrick, excuse me. This is King Stablein with the NRC. I just wanted to add to what Greg said. That in the various management meetings with DOE we have pointed out the value of their getting the information on the high risk significant agreements to us early so that we can deal with those up-front.

As far, prior to getting the license application as possible. In some instances, their schedule does not appear to allow them to get us this information as earlier as we would like.

But this issue has been raised pretty consistently over the past several months.

CHAIRMAN GARRICK: Yeah. Well, of course, the thought here is that one of the reason you employ a risk informed process is that it allows you to have a better technical basis for prioritizing the work.

And if that process isn't implemented, then we're not taking, getting the full benefit of the process.

MR. STABLEIN: I understand.

CHAIRMAN GARRICK: Okay, thank you.

MEMBER HORNBERGER: Ruth.

MEMBER WEINER: Most of the questions I have relate to scheduling, so I'll just hold them. But I did have one. You mentioned in your review of the biosphere health effect bundle, if you will, that that had not yet been incorporated, the first time, when you started the review, it had not yet been incorporated in the TPA?

MR. MCKENNEY: No. When we did the agreements originally in 2000 and 2001, it was not part of the TPA at that point.

In about 2001, is when we finally integrated the biosphere model into the code so that we could take overall assessment. It's just, it's just part of the history of how we came up with a lot of these agreements.

Whereas, you know, we may, some of, and that's why, in actuality, some of these are, some of these are just justification issues and they may not have been as, the questions may have been written slightly differently if they had been written today under risk insights.

MEMBER WEINER: Thank you. My question that I was getting to is, is this, was this an isolated problem that has now been resolved, or are there other areas where something has not yet been incorporated in the TPA and you can't do proper review?

MR. MCKENNEY: No, we've incorporated most, all the issues over the years. And again, it's part of the, that's part of the process of bringing the baseline risk insights into the agreement review, too.

MR. HATCHETT: We'll have Tim sort of expand on that, if he will.

MR. MCCARTIN: Well, even in the case that Chris talking about, I mean we were doing dose modeling outside of the TPA code to give us some ideas of how to pose the questions, etcetera.

And do we have everything in the TPA code? Well, of course not. In some areas we're doing more detailed modeling, be it with geochemistry codes or

non-isothermal codes to help us structure some of the ideas.

We'd like to think most of the big, if not all the big pieces, are in the TPA code from a risk-significant standpoint, but we continue to analyze offline with process models to give us some idea of some of the limitations of the TPA code.

MEMBER HORNBERGER: And who are you, sir?

MR. MCCARTIN: Pardon?

MEMBER HORNBERGER: And who are you, sir?

MR. MCCARTIN: Oh, I'm sorry, Tim McCartin, NRC staff.

(Laughter.)

MR. CLARKE: I just had a question that will help me understand this a little better. And if you look at that slide under igneous activity there are two agreements that are in process right now, they're working on.

Were there others related to igneous activity that have been resolved?

MR. TRAPP: If I can remember the exact numbers, I believe there are 22 agreements. I think we've resolved something like 12 or 13 of them. There's about eight still outstanding.

MR. CLARKE: Okay. Then if I understood,

Greg, when you get them all resolved, you'll go back and look at them again to make sure that you didn't, you know as they got resolved independently the integration didn't change?

MR. TRAPP: Well, remember resolution is not resolution in the legal sense. Resolution is resolution in the sense that you've got sufficient information that you can do the review. And that's really what we're going for right now.

MR. HATCHETT: So, again, to that end, there are a lot of things that are still ongoing with igneous, you know, activity in and of itself.

But, we've actually closed 13 of those 20 some odd agreements and we're trudging forward, but a lot of that has to do with, you know, DOE providing, you know, in its pre-licensing interaction phase, prior to an LA, sufficient information to resolve them.

As King Stablein pointed out, DOE's schedule is driven by the products that they are, that are in development. And that is irrespective of the NRC's risk ranking. So they're doing some work that, something that we consider high risk and they're not going to submit it, until let's say July. Then if we try to ask for it any sooner, the chances of getting

that are not, it's not likely that we'll see it.

MR. CLARKE: Yeah, I think I understand. I think my question was more motivated on the basis or risk and not resolution and documentation.

But as you resolve these independently and put them into different categories, you know, using risk insights, and if I understood you, you would go back through that process.

MR. MCKENNEY: As part of this there's a separate bundle on igneous. There's an igneous bundle that also came in. And part of our scheduling in this case, we did actually delay in part the two point, these two igneous ones to coincide so that the igneous bundle from DOE would come in at the same time, so we would have the ability to look across igneous to make sure that everything was covered in a holistic manner. Rather than doing them one at a time.

MR. HATCHETT: Let me try this one more time. I think, I think I understand now where you were going. Let's say, the analogy I would use, let's say they submit a TSPASR. At the end of the day they're going to submit TSPALA.

The question is, has anything changed between then and now that we need to be aware of, that also may be linked back to response of agreements and

things that we have, besides what's closed. So part of that activity would be we need to confirm whether or not things are still the same, or things have changed?

And if things have changed, then have they adequately addressed, you know, the concerns?

MEMBER HORNBERGER: John, I had a, something I want to just double check in a response to a question John Garrick put to you. I think I heard you say that your quick, gut-level feeling was that there might be an order of magnitude change in dose.

I presume, because you earlier said, that this is directly proportional to mass loading, that there's an order of magnitude difference in the respirable mass from basaltic vulcanism relative to silicic?

MR. TRAPP: When you take all the factors into consideration, that would be my rough estimate, yes. The thing that's interesting, if you take a look at the silicic ash, really you might have to worry more about stray health affects from silicosis, then you would have to anything else.

MEMBER HORNBERGER: Any questions from staff?

MR. COLEMAN: Greg, you've spoken to the

Committee before generically about the bundling process and how that's been going. And today you've spoken specifically about biosphere and a number of other reviews of bundles are going on now. I just wondered, are you seeing the interrelated, mutually-supporting, technical rationales that I believe were the basis for DOE submitting these in groups?

Is it a more efficient process than the way it had been done before with individual agreement items?

MR. HATCHETT: I think in the context of DOE also telling us that this is a first in the evolution of what their safety analysis report may look like.

And therefore, somewhat directly related to, you know, the various model abstractions that would be submitted as part of a license application that dealt with post-closure, it gives you, one, in fact, a good idea of their thinking.

And it gives you a sufficient road map to understand what they have done. And when I say road map, I mean that's where we run into some of the issues about whether or not the provided adequate technical justification, or whether or not there's some quality issues that lead us to believe that the

justification is not, in fact, adequate.

And that deals with issues related to transparency, traceability and completeness. As Chris said, the biosphere, TSPAI Agreements basically dealt with documentation, completeness of documentation.

And if you have read our recent evaluation report, we had a lot to say about transparency, you know, completeness and traceability. So, as DOE has moved forward to try to address those issues, we are waiting to see how all of those things play in providing better technical bases documents in the future, and we're expecting one at the end of this month on climate and infiltration.

MEMBER HORNBERGER: But I take it, again, as you responded to Neil's question, you haven't had any problem in doing the alignment with the WMRP, which you started out saying that was, you thought was a benefit of this?

MR. HATCHETT: No, we haven't had a problem with that. The problem clearly gets to the fact of looking into whether or not adequate justification is there and trying to separate that issue from the quality aspect when dealing the transparency, traceability and completeness.

And sometimes those two things get marked

together. But they, what they do is they provide a road map to say we've done this work and it's represented here.

So instead of providing a picture of what they've done, they've provided more of a road map to get to where they actually got.

MR. LEE: Greg, for many years Division of Waste Management has had as a goal its pre-licensing consultations, the objective, ensuring that DOE submits a complete and high quality license application. And you've noted, as well as the other staff have today that as a result of some of these reviews, in particular the recent QA evaluation, that DOE might have some work to do in, with regard to ensuring that that license application is complete and high quality.

Do you see a conflict between the demand for additional information, with respect to addressing KTI Agreements and the other goal that DOE has to prepare that license application?

I mean do you see competing priorities? The same people are basically doing the same work. Is there going to, do you see a, what's your assessment of how this is going to play out, in the context of December, 2004?

I mean are you, you're going to get your information to address the KTI Agreement, but how, how good are the license applications going to be?

MR. HATCHETT: I'm going to let King Stablein answer your question.

MR. LEE: Okay.

MR. STABLEIN: Yeah, this is King Stablein with the NRC. Actually, my, that question, of course, needs to be addressed by DOE. The work flow is on their platter that you're asking about.

We know that they're extremely busy. I think you're going to here from them later today. But it's a challenge. And their platter is loaded, the NRC staff platter is loaded.

I mean, there's an awful lot going on in the high level waste program, but I don't think at this point the NRC staff has made any judgement about DOE's readiness by December, 2004.

When the license application rolls in, we hope to be ready to give it a good, complete review.

MEMBER HORNBERGER: So, Greg, you said that you anticipate the end of the month having –

MR. HATCHETT: Climate infiltration.

MEMBER HORNBERGER: – climate infiltration?

MR. HATCHETT: Technical bases document.

MEMBER HORNBERGER: Do you have any, down the line, any anticipation for others?

MR. HATCHETT: Well, I mean, they are going to get up and talk about their schedule.

MEMBER HORNBERGER: I know.

MR. HATCHETT: So, they'll explain that. But a lot of things –

MEMBER HORNBERGER: They've already told you this, what they're going to tell us?

MR. HATCHETT: Well, I mean, just by reading the schedule letter.

MEMBER HORNBERGER: Okay.

MR. HATCHETT: You find out what is supposed to be submitted and how things have shifted from their November 28th schedule letter to this one.

Although they appear to be still committed to trying to provide responses to address all of these by the end of August, `04.

MEMBER HORNBERGER: Other questions. Tim.

MR. MCCARTIN: Tim McCartin, NRC Staff. I'd just like to amplify a little bit of what John Trapp said about the order of magnitude changing mass loading, and to clarify it a little bit.

I believe John is looking at the mass

loading. However, there are a number of assumptions that go into actually getting the dose between the types of activity, the percentage of time spent in activities. Indoor versus outdoor, etcetera.

And what, you know, in order of magnitude increase outside, what that translates to the actual dose, depending on how long the persistence of the mass loading at high levels outdoors, etcetera, there's a lot of factors.

And it doesn't necessarily directly translate to an order of magnitude increase in dose. It depends on a number of other assumptions. And so there's, there's a little, it's not quite as linear as one might expect.

MEMBER HORNBERGER: Thanks for that clarification. Other questions. Well, thanks very much, that was very informative. We look forward to continuing to learn how things go along this line.

It sounds as if we've certainly made progress and we've learned a lot by looking at this first one. And thanks for the presentation. And I'll turn it back to you, Mr. Chairman.

CHAIRMAN GARRICK: Okay. While we're a little ahead of the game, with respect to presentations, the Committee is very much behind the

game in terms of our preparation of reports.

So what we're going to do is use this time until noon, to work on reports. But in order to get ready for that, we need about a five minute break to get reorganized.

(Whereupon, the foregoing matter went off the record at 10:55 a.m., and went back on the record at 2:01 p.m.)

CHAIRMAN GARRICK: We are going to continue with our session on key technical issue agreements, and, George, this is in your hands.

MEMBER HORNBERGER: Thank you, John.

We are going to hear from two people, Tim Gunter and Don Beckman, and I guess the thrust of it is, as you recall the question I asked the NRC staff this morning was, well, when are you going to get these agreements, and now I think we're going to learn, right?

MR. GUNTER: Right. Can everyone hear me?

MEMBER HORNBERGER: And you can introduce yourself, Tim.

MR. GUNTER: Okay. Good afternoon. My name is Tim Gunter, and I'm with the Department of Energy, with the Office of Repository Development in Las Vegas. I appreciate the opportunity to speak to

you today.

We're going to talk a little bit about and get to your question about when will the agreements come in and a few other things.

And I'd also like to mention that Don Beckman is here with me from Beckman & Associates. He works with BSC, and he's basically my counterpart on the contractor's side, a KTI completion manager.

The items we're going to cover today, just to give you a little background real quick, we'll talk about updating our strategy on how we're approaching the agreement, the status of where we stand in terms of what has been sent in, what is on the schedule, what does the future schedule look like, and then wrap it up.

So if you go to page 3, just real quick in terms of background, most of you are aware there are 293 key technical issue agreements that DOE and the NRC entered into over a period of about a year and a half starting back in around the year 2000. We discussed this with the committee back in June of last year and told you then of a new approach that DOE was taking sort of informally called the bundling approach, but basically it's where we take agreements of related topics and try to wrap them up in a summary

document, a technical basis document, as we call it, which lays out in terms of repository performance and sets sort of the bounds for how these agreements interact with each other and what they mean in terms of the overall project performance.

Most of the agreements will be addressed in this fashion, the technical basis documents. However, there are some that don't really fit in well or either they're a group among themselves, and so we'll address those in a smaller group or either individually.

Page 4 shows you the major groups based on the performance aspects of the repository. Basically it's sort of the flow of the water through the repository, and I'll run through it very briefly, but if you'd like more details we'll be glad to go into further details on any of them.

But basically starting with number one, they're numbered in the order. Climate and infiltration where the water first starts into the surface and then proceeding on down through the unsaturated zone.

Using Roman numerals in this fashion makes it a little bit more difficult, but water seeping into drifts, it goes to the top right corner, and number

four is mechanical degradation and seismic effects in drift chemical environment.

Number five, waste package and drift hill (phonetic) corrosion.

Number six. Let's see. Where's seven? Yes, seven, the environment, in-package environment, waste performed degradation and solubility.

Colloid transport.

Yeah, EBS transport, number nine.

Number ten is the unsaturated zone transport.

Eleven, saturated zone flow and transport and then volcanic events.

Let's see, 12 is biosphere transport and then volcanic events.

So those are the 14 major technical basis documents that you will see. Some of them you've already seen. About seven of them we submitted through starting in last fall, September, and we submitted several of them through the end of last year.

All right. Moving on to the next slide, we covered the first bullet. You know, the reason why we wanted to use this approach, and that we're fungible into these technical basis documents.

Let's see. I'm just reading real quick to see if there's anything I haven't already talked about.

Basically, you know, what we've seen so far is we think the approach has been working fairly well. You know, it gives a better perspective of the importance of the agreements.

And in terms of schedule, some of the things that have come up related to the technical basis documents, and of course, the completion of those is driven by a number of other documents, such as the analysis and model reports. That would be the key for being able to complete the technical basis documents and the agreements.

So in some areas we're going to be proposing to the NRC that we have one of our meetings on the topics to provide them information earlier because of fishing out the schedule, which I'll get to in a couple of minutes. The information is just not going to be available as soon as we would like it to be or as soon as the NRC would like it to be.

So we think there may be value in meeting with them, for example, in some of the TSBA (phonetic) work. The results would be available, you know, weeks if not a month or sooner than the actual final

document that would be able to be released.

Page 6 gives you a little bit of the current status. We've fully responded to 168 of the agreements, and that includes some of the additional information needs that we've received from the NRC staff, and that's out of the total, of course, of 293.

To date we've submitted seven of the 14 technical basis documents, and there's about 125 remaining agreements and additional information needs. And of that number, approximately half -- again, I will get into the schedule in a minute -- but roughly half of those have been delayed to some extent.

Some of the reasons for the change to the schedules I touched on earlier, but a little more of the details is some of the model updates that we're doing. There's also, you know, everywhere the NRC's evaluation identified the need for more transparency and flexibility, more defensibility in some of our technical basis documents.

So we're putting together a team that's going to review the AMRs from that aspect and try to identify where there may be some improvements needed, and that's going to take a substantial period of time and a pretty large team that's being formed and put together, and this is where Don can give us -- I think

he's a lot more familiar with the makeup of the team.

If you want to touch on the team just a minute, Don.

MR. BECKMAN: Certainly. The team involves five major discipline areas that include both the natural and engineered barrier systems with a mix of both technical personnel and regulatory staff that are looking at each of the individual AMRs from a traceability, transparency and technical defensibility perspective intending to take some of the documents that had a more scientific bent and respond in large part to the results of the NRC's technical evaluation a couple of months ago and improve those particular features in such a way that it will better support the NRC's staff review and preparation of the safety evaluation report because these are essentially the first level of reference behind the license application, which is in parallel preparation.

MEMBER HORNBERGER: Don, just out of curiosity, you said regulatory staff. Do you hire former NRC employees or NRC licensees or do you just -- how do people get the experience being a regulatory?

MR. BECKMAN: It's a mix. We have former licensee licensing and regulatory staff. We have

several former NRC employees, and we have several attorneys that are acting as consultants to the team. So we tried to get a fairly hybridized mix of skills to look at the documents in preparation for your review and the eventual hearings.

MEMBER HORNBERGER: Okay. Thanks.

MR. GUNTER: Okay. so basically we're trying to incorporate some of the lessons learned from both NRC's evaluation and our own internal assessments that we have performed, which came up with some consistent type of issues that NRC identified.

The last bullet here talks about a couple of specific areas, total system performance assessment, integration, and then criticality, and these are two areas that because of the schedules, particularly, for example, the TSPAI completion, it will be probably in the fall some time.

So our goal is to try to provide complete answers no later than end of August, and that's the case where we think we would have the information available even though maybe the final document is not publicly available yet.

So we would try to extract from that, summarize whatever we need into the response, and then wait on the final document necessary to close the

loop, but we would try to address it with the information we expect to have at that time.

MR. LARSON: When you say "fully responded" on the top there, that's DOE's evaluation because they're not complete as far as NRC is concerned.

MR. GUNTER: Right, and when I say fully responded, I mean DOE has submitted a response that we think fully would address the agreement, and then it's up to NRC to determine whether it is complete or not.

MR. LARSON: And so far there's only been 93 of those.

MR. GUNTER: Right. Ninety-three at the moment, and I understand there's some more that we would expect, another six or so on the way from NRC that would be complete also.

CHAIRMAN GARRICK: I notice you used the word "responded to" and "addressed." Are we to read anything in to that?

MR. GUNTER: The only thing to read into that, I think, is that we didn't want to say that we would complete the agreements because that's not really in DOE's hands. I mean, we can submit what we believe is a full response, but as we've seen, there is additional information requests coming back from

the staff, and then once we satisfy those, they will determine that it's closed or complete, but we didn't want to presuppose completion of the --

CHAIRMAN GARRICK: Okay. So it's very much on purpose.

MR. GUNTER: Yes.

CHAIRMAN GARRICK: Yeah.

MEMBER WEINER: Is your success rate improving? I mean, have you noticed that there are fewer back and forth requests for information or is it pretty much the same as it always has been?

MR. GUNTER: I think I would have to say that because we submitted this large number of documents last fall, we haven't received any evaluation of those yet. They're still pending review by the NRC staff, and that's the information I would use to answer your question, and I don't have the answer to that yet.

I know some of them are on their way. They're coming back closed, and there will be some number of them that will be looking for more information, which is our hope that the percentages improve.

I think the technical basis documents in these recent agreements that we submitted last fall,

at least from my perspective in reviewing them, they seem to me to be more complete than some of the earlier submittals. So we're hopeful that they'll be more on target.

MR. LARSON: Just following up on Dr. Garrick's question, is there a difference between "fully responded" and "addressed"?

MR. GUNTER: I think those were used pretty much interchangeably. I guess the only potential difference would be when I mentioned now in the case of trying to accelerate to the end of August those, for example, TSTAI where initially we would have hoped to have final documents from TSGA (phonetic), you know, ready when we address the agreement.

We still think we will fully address it, but there will be some information yet to come that will, like I saw, close the loop. So there's no real difference, I think.

Okay. Page 7 once again lists the agreement -- I mean, lists the technical basis documents into groups, and you'll see one through 14 are the technical basis documents, and in the right column is the number of agreements or additional information needs that have been requested by NRC that

are remaining.

And the last four that aren't numbered will be groups of submittals that will not have a technical basis document accompanying them, and that's barrier capability and total system performance assessment integration.

Criticality, feature events and processes, and then a number of ungrouped agreement responses.

Page 8 gives you just a little more breakdown on some of the reasons we rescheduled specific technical basis documents. Technical basis document number four, the first sub bullet there, there was 14 KTI agreements and AINs grouped under that document, which was mechanical degradation and seismic effects, and we've delayed that. It was originally scheduled to be at the NRC in May, and we delayed that to July of this year primarily to incorporate some updated ground motion analyses and also some rock fracture model updates.

The next significant change is in technical basis, document number seven, in-package environment, waste form degradation and solubility. There were 12 agreements and additional information needs associated with that, and that's been delayed from April to July, and as given there, the primary

reasons were to update the chemistry abstraction model.

And then the last significant change to the technical basis document is number 14, the low probability seismic, eight agreements and additional information needs associated with that. And we delayed that from March to June to incorporate model updates primarily related to stress corrosion cracking.

That was sort of the big changes, but there was as number of other changes in the schedule also which we sent to NRC on April 2nd of this year, and page 9 shows you a comparison of the new schedule versus the schedule we sent in November of '03.

And what is obvious is that although we're holding the end date of August, we're building a significant peak in the July time frame, and May and June are fairly significant months also for us.

MR. LARKINS: Now, were all of those updates on the previous viewgraphs to just update the documentation or did some of it involve additional analysis?

MR. GUNTER: Well, it was both actually. As I mentioned, some of the models are actually being updated and revised, and that, of course, drives the

changes to the technical basis documents which depend on the AMR's analysis and model reports as the basis for our response to the agreement.

MR. LARKINS: Okay.

MR. GUNTER: Are there any questions on this chart while we're on it?

MR. LARSON: The last two months there, are they high probability, low probability -- I mean high consequence risk or low or what?

MR. GUNTER: Let's go to --

MR. LARSON: -- Jim Mullen in August was 61.

MR. GUNTER: Okay. If we look at page 10.

Yeah, thanks for the lead-in. This is the new schedule, and it shows the breakdown of NRC's low risk, medium risk and high risk. So if you look at August, out of a total of 17, nine are low risk, four are medium risk, and four are high risk, and, Don, you may want to add some details here, but I know that most of these are TSTAI related, criticality, but criticality has low risk ones.

MR. BECKMAN: Yeah, these in August involved a performance assessment abstractions and uncertainty and model confidence and validation issues that are dependent on the development of the final

TSPA analysis in the model report that documents it. This fall into, in part, the category that Tim mentioned earlier about addressed responsively, but requiring completion of the final documentation before it was supported.

The nine in July involved in-package chemistry, waste package corrosion, and basically tunnel stability issues. Those are the risk ranked high by your prioritization approach, and the nine in June involve FEPs, additional waste package corrosion items. The aircraft hazards analysis, for example, constitute those nine.

Relative to that, the items that we have now are on schedule to the extent that we're making adjustments to the internal schedule as we need to to accommodate the development of the specific information, but the delivery dates to NRC following the DOE final review are still considered very solid. We have enough float in our schedule to accommodate the internal work that we have to do and still get them to be able to deliver.

MR. GUNTER: Okay. If we could go on then to page 11, the next slide just shows basically a work-off curve comparing the previous schedule, and you see we're holding the end date. As we said, we

want it due by the end of August, but what that does, as you saw from the earlier schedule, is that it gives us a higher peak rate as we're approaching that end date.

And also the April schedule. So you're seeing not as many come in early, and then a steeper ramp-up leading to August.

And then I will point out that, you know, at one time we had some that were pushing out past August and into early next year, and we believe dealing with the previous schedule we pulled those back to August.

CHAIRMAN GARRICK: Now, what was the basis for that? How did you move that schedule up? Just more resources?

MR. GUNTER: More resources. That was about the time that we actually formed under Don this KTI completion group. It was a dedicated team, not fully 100 percent dedicated, but I think close to it, and, Don, you can jump in if you want to add to that, but you know, their focus is on completing these agreements.

So along about the time that we initiated the technical basis document approach, Don formed his team of people to help get us through.

MR. BECKMAN: Additionally, some of those that trailed out there involved a mix of needs, if you will. Some of them we were able to address by getting some additional dedicated people to provide alternate resolutions to what we had originally planned so that we could be fully responsive and provide a somewhat different answer than we had originally anticipated, and others just involved researching of available data further than we had previously so that we could harvest more information earlier.

MR. GUNTER: Okay. If we move to the next slide, this just gives a breakdown, and actually NRC started this table format back when Jim Anderson was here, and we've adopted it to try to be consistent with the way they kept track of things. We just wanted to change the titles to reflect the DOE viewpoint.

But you know, if you're interested in the actual details of how a certain -- the agreements in a certain KTI span can go to the table and find out whether everything is. Basically it has got all of the KTI's technical issues listed down the left side, including three which is pre-closure. Although not an official key technical issue, we were treating it like one.

And then there's also GEN, general agreement 101, which is listed there, but that will give you the status going across the top of the table, a number of agreements reached. You can see, of course, the total at the bottom, 293. The number in each KTI that we've submitted to the NRC, and then the rest of these sort of make up the number submitted, and it tells you the status, the response submitted that are in the NRC review. Currently our number shows 76.

Partial responses submitted, the total is 17, and what partially submitted means, in some cases the agreement called, for example, to provide a series of documents or AMR revisions, and maybe they became available not all at one time. Some were available sooner than the others.

So we would submit the ones as they became available. So it will be complete when we submit the last piece of the agreement, but that's just really just for tracking purposes.

The number of additional information needs that we've received from NRC, again, an individual breakdown and a total of 28. DNS 79, a total remaining to be submitted. Then 93, as we mentioned, were complete.

And then you compare. You can compare like the number of agreements reached with the number complete or the number remaining to sort of get a feel for how each group of key technical issues is coming along.

MEMBER WEINER: Before you leave that table, do you have any sense of where the high risk agreements are, since every bundle has some high risk, medium risk, and low risk agreements in it? Which section, you know, just roughly, of the agreements already reached, how many are high risk?

MR. GUNTER: We have that information. I'll see if Don can help me.

MR. BECKMAN: I'm not sure that I can answer you by number account, but the areas in which open high risk agreements reside, if that's the fundamental question --

MEMBER WEINER: Yes.

MR. BECKMAN: -- the container life and source term contain several of them that are high risk. The repository design of thermomechanical effects have, I believe, at least two that are high risk that involve tunnel stability and rock mechanics properties. TSPAI has four or five.

So out of that last 23, the bulk of them

fall in those three areas. Igneous activity, the dike drift interaction issue of IA-218 remains high risk, and I'll be glad to share a table with you off line to answer your question more specifically if you'd like.

MEMBER WEINER: Sure. I was just thinking that this table would be even more informative if there were some indication in that, well, in each of the columns as to how many or roughly approximately how many of those agreements are high risk.

Because the reason for the question is pretty obvious. It seems to me that the high risk one are the ones you're going to want to focus on early on, and I don't know to what extent. I don't really have a judgment to what extent you're doing that.

MR. BECKMAN: The practicality of the timing of those items unfortunately depends somewhat on the sequence of the analytical work. For example, one of the items that I missed, there are a couple of them in I believe they're either container labels and source term or radionuclide transport that involve radionuclide solubility and impact its chemical conditions.

That analysis is just now being completed and is available in draft form. So its timing, which

was one of the delay items that we mentioned earlier, its timing and the availability of the process model results are driving my ability to generate a response to that set of KTIs.

Similarly, those which are tunnel stability related, we have just completed doing the seismic runs for the tunnel stability calculations, and I have preliminary results available, and the documentation is being prepare even while we're meeting today.

So it is driven more by the development sequence of the analysis, unfortunately, than our desire to move them up in the schedule.

MEMBER WEINER: I'll save the rest of the questions.

MR. GUNTER: Well, we could have that information. We have that in another table that's not in the presentation. Actually each agreement, whether it's high, medium or low, it's just not summarized in this table.

And then we go on to the next slide.

I like this because it's easy on the eyes, but it's basically the same information that was presented in the previous table. It just gives you sort of a big picture of, you know, the total number

of agreements. Thirty-one, about 32 percent are complete. About 26 percent we have submitted in our NRC review. About six percent are the partial agreement submittals that I discussed earlier, and then about 27 percent still remain for DOE to submit to NRC, and then nine and a half percent NRC has asked for additional information for the agreement.

Okay. Just to summarize then, which that last slide pretty much did in terms of status, but 57 percent of the 293, the technical issue agreement DOE has responded to, and NRC has formally closed by letter 93 of those agreements. That leaves us 125 of those agreements and additional information requests that we are responding to by the end of August of this year.

As I mentioned, there's some agreements, roughly 13 that are associated with criticality and total system performance assessment, which we may want to meet with NRC to provide them some information prior to that information becoming documented in the final documents.

And then as I said, by August of this year we will provide a submittal to NRC on all of the agreements with the current status, and for those, for example, TSBA, if we're waiting on the final report

will address, you know, when that information would be available and what form and that kind of thing.

That concludes my presentation. I'd be glad to take any other questions.

MEMBER HORNBERGER: Thanks, Tim and Don, as well.

We'll start to my left. Jim. Please use your mic; please use your mic.

MR. CLARKE: I know I'm missing something here, but let me ask anyway. If you add 93 to 125, is that all of the agreements? Because that isn't 293.

MR. GUNTER: Okay. The 93 is the number closed. One, twenty-five is the number that we have remaining to submit. There is a number of agreements that we've submitted but haven't received an evaluation back from NRC yet.

MR. CLARKE: Okay. I understand.

MEMBER WEINER: This may be an unfair question, and I can understand why you're still looking at data for some things like their stability, but, for example, corrosion chemistry is corrosion chemistry. It has been around for a long time, and this project has been underway for 20 years.

And even if you only come fairly recently, you've been working on this stuff for more than a

decade. Do you have any reason why this has been delayed so long and now there's still more delays, why it's taking so long to develop these technical documents?

MR. GUNTER: You want to take that one?

MR. BECKMAN: I'll try. There are a couple of factors, and I'm not sure that I can give you a comprehensive answer for all of the various aspects.

A number of the KTIs that we are addressing at this stage, if you will, particularly for the corrosion properties, there are a couple of different facets to it, one of which is we still have corrosion data from some of the later testing that is being collected and reduced, and that's part of what's going on now at Lawrence Livermore Laboratory.

Part of it is that the analytical work to reduce that data and get it into a reportable form that we can then use to translate into the KTIs is still underway. So we're still caught in that work sequence.

I'm not sure that I have the information to comment accurately on why the development work has taken so long in that regard. I can tell you what's impacting our ability to get the information collected

and submitted to you.

Over the last year, there has been quite a bit of additional thinking and development on the project with respect to the treatment of passive film behavior and localized corrosion, and the models have undergone continued evolution, as well as the application of the new data that have come in, and that's about the extent of my personal knowledge of what's going on behind the scenes there.

MEMBER WEINER: It's as much, I guess, a rhetorical question as anything else. It just surprises me. I mean, we were talking about passivation 15 years ago, and much of the -- I'm focusing on the chemistry, but the same thing could be said for features, events, and processes. These began to be identified, the ones you could screen out, begin to be identified more than a decade ago, and I believe this is a question that may come up again and again, especially if your schedules keep pushing forward as they do.

MR. BECKMAN: I understand.

MEMBER HORNBERGER: John.

CHAIRMAN GARRICK: This is a very interesting breakdown, and it's very helpful.

I notice that two of the KTIs resulted in

far more NRC requests for additional information than all of the rest put together, and namely the container life and source term and the TSPA (phonetic).

Is the reason for that that these are high risk, have high risk elements to them, or is it quality of response? Can you elaborate on it a little bit? Because there's very little additional KTIs where you have many iterations, whereas these seem to have a whole bunch.

MR. BECKMAN: I'm not sure that I can speculate on the cause. That may be something that would be better directed at the staff.

There were a mix of reasons from our perspective reflected by the information that was requested. In at least one or two of the cases, we had early on attempted to formulate risk informed responses based on total system performance of some of these, and we clearly missed the staff's mark on the amount of process level information that we provided with them.

And my recollection is there was at least one and perhaps two of those in the eight that fell in that category.

In several of the other cases, the issues involved some fairly detailed information needs and

additional basis information that the staff felt that was needed that we apparently did not include in the first submittal.

Again, I think there's a certain amount of it that's part of the natural iteration of information with the staff. There was some of it where we clearly missed the mark of staff expectations or needs for information.

We also had a large number of agreements in that category. So I'm not sure that the return rate is that much significantly higher than some of the others in terms of the number of questions resulting from the number of items submitted.

CHAIRMAN GARRICK: Does the 23 remaining responses on TSPA, which is more than any of the others and many times more than some of the others, given that that's the document that's going to be the principal basis for the safety case, does that cause you any undue concern?

MR. BECKMAN: Of those, they are actually spread among several groups, even though they carry a TSPAI label. I believe we actually have about less than a half dozen, five perhaps that are specifically related to TSPA results. We have perhaps another four or five that are specifically related to TSPA

methodology, treatment of uncertainty, treatment of obstructions, guidance, application of guidance of that nature.

There are a number of others that though they carry the TSPAI label deal with process model uncertainties in other areas. For example, in drift chemical environment has one item that has a TSPAI label that deals with the propagation of uncertainty. So we're dealing with the other roughly 15 or 16 that carry the TSPAI label in the other technical basis document groups, and they're flowing through the process with their own groups.

So with respect to level of concern, only the generic level of concern we have to maintain our schedule throughout, and then as Tim has pointed out a couple of times, the need to get closure on the documentation for TSPA methodology and results as we get into the late summer.

CHAIRMAN GARRICK: One final question or comment. Early on you received a considerable amount of criticism for the amount of emphasis that was being given to engineered areas, engineered systems over, say, the analysis of the natural system, and the NRC has always indicated that the safety has to come from both sources.

It still looks like that most of the activity centers around the engineered barriers, which surprises me a little bit, given the history. Is this because you feel you have been reasonably responsive with respect to the natural system and its containment capability, or what is the issue?

It still seems to be highly emphasizing the engineered barriers as far as the analysis time is concerned.

MR. GUNTER: I guess let me ask if I could get you to clarify your question, if you would. In terms of activity, are you referring to the number of agreements and responses related to --

CHAIRMAN GARRICK: Yeah, I'm trying to. I'm trying to correlate the agreements with the scope of the safety case or the analysis, and in the earlier presentations that we've heard from the TSPA, not so much from us, but from other sources there was considerable concern about the emphasis on the engineered barrier systems and not much emphasis on the natural setting with respect to its containment capability in the analysis.

And so given that, I would have expected this data to reflect more emphasis on the natural setting than it seems to be, and I realize these

numbers are difficult to interpret and the correlations are fuzzy, but I was just curious as to whether or not there was a real reason for this because it seems to be that it's business as usual. Most of the action is with respect to the waste package, the near field on the TSPA, et cetera, not on radionuclide transport through the unsaturated/saturated zone, and so forth.

MR. BECKMAN: I think part of what you're seeing, Dr. Garrick, is some input reflected by the interest of the NRC staff as well. We're acting in a response role to either issues raised by the staff or questions asked about the responses to those issues.

CHAIRMAN GARRICK: We'll ask them the same question.

MR. BECKMAN: Yeah. So I think there may be a little artificiality there, driven by --

CHAIRMAN GARRICK: Yeah, I'm sure there is because once you reduce it down to these kinds of numbers, you're masking a whole lot of activity. It's very hard to see what's behind them. One of these could be worth ten of another.

MR. BECKMAN: Well, again, by example, radionuclide transport, which is the RT category, had effectively half as many issues originally and

essentially no additional information needs even though we've submitted up to this point most of the agreements.

Recognizing that the staff has still got about half of them in review, but the balance that we're providing from my part of the project is largely driven in response.

MEMBER HORNBERGER: Mike?

VICE CHAIRMAN RYAN: No questions. Thank you.

MEMBER HORNBERGER: Tim, on your Slide 7, the remaining KTI agreement responses list volcanic events as one. Can you tell me which one that is?

MR. BECKMAN: There are actually two.

MEMBER HORNBERGER: I was going to say because on the slide we were just looking at, Slide 12, there are two.

MR. BECKMAN: Yeah, that's an artifact of the way we've chose to manage the groupings, not necessarily any technical implications there at all.

IA-217 has to do with ASHRE distribution and its effect on dose and as dependent to a great extent on the overall system model. The second one is IA-218, which is dike drift interaction and is more functional process model level. So they're being

handled separately, and it's an accounting issue.

MEMBER HORNBERGER: Well, okay. I guess we've spent enough time on that interesting table.

I was curious. One thing that piqued my curiosity, on your Slide 8 you mention that you're considering stress corrosion cracking under a low probability seismic events heading. Why isn't that under corrosion or CLST?

MR. BECKMAN: I'll try to give you a thumbnail sketch of the seismic consequences model, and I may not be able to do it justice, but we'll give it a try.

The seismic consequences model, because of the large ground motions introduced by the low probability seismic events, results in the waste packages bouncing and impacting end to end, particularly at the very, very low probabilities.

The original finite element analysis that was done on the waste package structure had a very coarse grid size which resulted in what were termed patch failures, which were dimensionally unrealistic in terms of the way we expected that package to actually behave.

We did some additional review and evaluation of the modeling and brought in some

additional expertise to the project. That effort concluded that the actual failure model of the package is because of the nature of the impacts and the stresses introduced would be on the order of tightly closed stress corrosion cracks rather than patches unrealistically defined by a finite element grid.

So we're probably overusing the shorthand here somewhat, but it's a fairly substantial change in the realistic direction of the modeling that was done of that particular set of consequences.

MEMBER HORNBERGER: But it is a modeling then. I think I understand now. It's failure in direct response to seismic stresses.

MR. BECKMAN: That's correct.

MEMBER HORNBERGER: Not corrosion.

MR. BECKMAN: That's correct.

MEMBER HORNBERGER: Okay. Because, I mean, the reason that it struck me that you're bundling these to put like things together, not to scatter stuff all over.

MR. BECKMAN: Yeah, it was a little bit of a misdirection. I apologize for that.

MEMBER HORNBERGER: Okay. I understand.

Any questions from staff? Neil.

MR. COLEMAN: Actually I have a question

for the NRC staff based on Slide 10, and I think they have the right people here to answer this. I just wondered if staff would care to comment on the kind of planning that they've done, perhaps considering the risk ranking of these many agreements that are coming in.

As you can see, it sort of resembles the bow wave of a ship. There's a really large number coming in and perhaps the risk baseline work that the staff have done will help prioritize these reviews.

I just wondered if you could comment on that and any planning that you have done for that.

MEMBER HORNBERGER: A volunteer? who's going to surf on this one? Tim.

MR. McCARTIN: Well, this schedule hasn't changed that much. We're aware of the agreements and when they were coming in. We continue to both do our own analyses to help us be better ready to review things. We continue to talk with the Department of Energy to get a better sense of their analyses.

I'm not quite sure what your question is pointed at. If you can put it a different way, I'm not -- the schedule is what the schedule is. I mean, we're working within those constraints.

MR. COLEMAN: Well, let me just say, for

example, the higher risk rank agreements, would those be reviewed first as a priority?

MR. McCARTIN: Well, each bundle has a variety of agreements in it, and certainly as we've said, we will look deeper into high risk items, but you know, the bundle has a package of agreements that are all interrelated, and I don't know. You can't necessarily pull out a few high risk things and do them separately with the other ones. I'm not sure there's a lot of --

CHAIRMAN GARRICK: The problem here is the groupings are not done by risk, but rather by the system, and so each basket has a mix of all levels of risk.

MR. COLEMAN: Well, I'm actually referring just to individual items.

CHAIRMAN GARRICK: Right.

MR. CAMPBELL: May I add something here?

CHAIRMAN GARRICK: Yes.

MR. CAMPBELL: This is Andy Campbell. I'm Chief of the Performance Assessment in the High Level Waste Division.

When we review these bundles, we have usually a mix of agreements from different KTIs. Those are submitted as attachments to what's called a

technical basis document, and those attachments refer to the technical basis document.

So we really have to review the whole bundle. We certainly use risk information in that review and will continue to use our understanding of risk insights in that review. But it's difficult, and it wouldn't be very productive to pull out of that just the high risk agreements and only focus on them. We have to look at the whole bundle and evaluate it in the context of risk.

MR. COLEMAN: Well, I would just add one other thing. We noticed from the biosphere example this morning that two agreements on igneous activity were separated from that group. So that's the one that we've gotten to hear about in more detail. That's sort of what brought up the question.

MR. McKENNEY: This is Chris McKenney.

In the biosphere one, we also had another thing which is we also had the schedule for the IAA agreements, and there was that confounding factor of the fact that the two higher risk IA agreements we wanted to wait and, in part, one, we needed information needs that we didn't need for the other five of the agreements that were in that bundle itself, and also there was to be an IA bundle that

came in in the first few months of the first quarter of '04, and that to review all of those together, all of the IA issues together was much more resource efficient. I don't want to say intensive.

But that was one of those issues of why that was split in that direction, and you know, that's the other issue beyond risk, is beyond risk we still have to look at staff resources and what makes sense.

MEMBER HORNBERGER: Any other questions?

Don, I notice that your team is called the KTI completion team, and you're the manager and the calendar ends there in August. So you guys have a cruise lined up for Alaska in September?

(Laughter.)

MR. BECKMAN: Actually I am hoping, but I'm not confident.

MR. GUNTER: That's because you'll be doing other things.

MEMBER HORNBERGER: That's what we all assumed.

MR. LESLIE: This is Bret Leslie from the NRC staff.

I actually have kind of two questions. One, given Don's response that in August for the TSPAI agreement you're going to address where you're at,

could you define a little bit more clearly what do you mean "address responsively"?

MR. BECKMAN: Sure. The schedule for the development of the TSPA model report right now, as of the time I left late last week, extended into September for the final publication process. We expect to have in July the calculational results for the TSPA model runs themselves, plus the confidence building activities that go along with that, as well as the beginning of the documentation or the draft of the documentation that addresses the TSPAI items that are not quantitative in nature. There are a number of methodology issues that will end up being documented in the report.

So it's our intention at that point in time to provide, in effect, an attachment to a licensing letter from BSC via DOE to you that would describe those results by the end of August.

We have also recommended that we hold one or a series of meetings at the Appendix 7 format to discuss those results with you as they come out in preliminary form, if that would be constructive for the staff to begin to understand what the final end model results look like.

MR. LESLIE: And that kind of leads to my

second question which would be the timing of the description or these Appendix 7s or technical exchanges. What time frame are you looking at?

MR. BECKMAN: I guess that's under some discussion internally, and I may want to defer to Tim for that, but we expect to have some of the non-quantitative information available in the next month or six week, and then the preliminary results, as I said, will start coming out -- the numerical results will start coming out in the July time frame.

MR. GUNTER: But there's really two parts to that answer. One is that it depends on the availability of the information. That would be the key for when you'd hold the meeting, and then the other part that is still under discussion is DOE and NRC needs to come to an agreement that these meetings actually would be beneficial to the NRC staff or their understanding.

MR. LESLIE: Thank you.

MEMBER HORNBERGER: Okay. Well, thank you very much. Thanks for letting enough time to have us address the questions and thanks for your responses.

CHAIRMAN GARRICK: Thank you.

MEMBER HORNBERGER: Back to you, Mr. Chairman.

CHAIRMAN GARRICK: Thank you.

All right. The next item on our agenda is to receive an update from the staff on risk insights, and according to the handout we received, Bret Leslie, Dr. Leslie is going to provide that presentation.

MR. LESLIE: Well, good afternoon. My name is Bret Leslie, and I'm a senior project manager in the Site and Performance Assessment Directorate in the newly formulated Division of High Level Waste Repository Safety, and as Dr. Garrick indicated, I'm giving an update on the risk insights report today.

Moving on to slide two, I really want to try to do four things today, which is to briefly summarize the risk insights baseline report, and the reason why I want to briefly summarize this is Jim Dana in February went through the framework of the report, and so I just want to kind of summarize what some of the things that Jim provided to the committee.

Second, I'm going to talk a little about the risk insights ratings and describe the basis for how the staff have decided to rate the risk insights, and again, provide a brief summary of the ratings. I don't want to spend too much time on the middle portion of the presentation because I want to spend some time explaining two examples of the risk

insights, and I try to try to address two things.

We provided a preliminary risk insights baseline back in June of 2003. Some of the concepts have changed. Some of the ratings have changed. So I want to go through the philosophy of how we've changed in terms of the risk insights.

Finally, I'll spend a brief time talking about our next steps.

So moving on to Slide No. 3, first I want to start off to say that we're in the process of finalizing this report right now. The risk insights based on the report is part of the NRC's high level waste risk insights initiative, and this initiative is an ongoing effort to increase the use of risk information in the NRC high level waste repository program.

It consists of compiling and synthesizing risk information to better support risk informed pre-licensing activities, to support our license application review and other regulatory activities and decision making.

As you are aware, we began this effort in early 2002, and we provided preliminary results to the ACNW in April of 2002.

We began development of the risk insights

baseline report in late 2002. In June of 2003, in response to a Commission staff requirements memorandum, we provided a preliminary report on the risk insights baselines, which did not contain the results from performance assessment.

We reported on the status of our activities in the risk insights initiative to the ACNW in July of 2003, and the risk insights initiative, again, as I said earlier, was described to the ACNW in February of 2004.

Now, after we briefed the ACNW back in that July briefly, the ACNW wrote a letter in August and provided us some recommendations. The report we're finalizing adopts the terminology from the white paper on risk informed performance based regulations, which was one of your recommendations.

In addition, the report incorporates the risk assessment that supports the finding, which was again another one of your major recommendations in that August letter.

Moving on to Slide No. 4, the risk insights based on report obviously gives the risk insights, but the idea is to identify the important parameters, models and assumptions that are used to describe the system at Yucca Mountain.

The report also addresses uncertainties, and it provides a framework for an informed and focused approach for NRC's review.

Moving on to Slide No. 5, the risk insight baseline report, the risk insights themselves, again, are based on performance assessment results, subsystem analyses, and auxiliary calculations, and I'll go through the two examples today that hopefully illustrate this factor or fact, and the report also includes references to the detailed risk analyses.

The baseline report includes system level insights and detailed risk insights, again, supported by quantitative risk information and the uncertainties are described.

One thing I want to say is that the risk insights are organized around an integrated subissue approach, and this is the structure which is used in the Yucca Mountain review plan and the integrated issue resolution status report. So you're seeing a migration from agreements to the application of the Yucca Mountain review plan, going back to the technical basis document and addressing Neil's concern, what we're trying to get at is the big picture and how things are integrated so that we're trying to address things a little more holistically.

So because we've adopted that structure in the risk insights baseline report, on some of the subsequent slides you'll see abbreviations like ENG-1 or UZ-2. This represents those acronyms associated with that structure, associated with the integrated subissue approach.

Finally, the baseline report talks about the rating of the significance of the insights, and here's one of the major changes. Before we talked about risk significance in that preliminary report. Now we talk about significance to waste isolation, and again, this was addressed by Jim Dana in February and also Tim McCartin to a certain extent in past presentations has kind of shown how we get to the significance to waste isolations by looking at radionuclide release or the waste package stability.

So let's move on to Slide No. 6. The NRC's risk insights are intended to assist the staff in its pre-license interactions with DOE and in reviewing a potential license application. So it's not just for issue resolution.

I want to point out he staff has not made any determinations regarding the technical condition for adequacy of the repository at Yucca Mountain at this time, and if DOE submits a license application

for a repository at Yucca Mountain, the staff will review the information provided by DOE and make its determinations based on the information available at that time.

So let's move on to the second part of the talk, the right insights rating. That's on Slide 7.

The rating of the significance of the insights helps to prioritize our activity, focus staff resources, and support risk informed project management and decision making. And, again, I alluded to this in an earlier slide. The ratings in this report were finalized and consider the potential effect on waste isolation capability.

In particular, we focus on waste isolation capability by looking at the effect of a process feature event on the integrity of the waste package, on the release of radionuclides from the waste forum, and transport of radionuclides through the geosphere.

And, again, Jim Dana had a nice table of how each radionuclide is assessed in each of these three areas. This is the same chart that Tim McCartin has done before.

So let's move on to Slide No. 8. The risk insights ratings are divided into high significance, medium significance, and low significance, and again,

this is for the potential of a significant effect on waste isolation capability, and again, the waste isolation capability is tied back to the effect on the integrity of these packages, effective on the release of radionuclides from the waste form and waste package, and the effect on transport of radionuclides through geosphere and biosphere.

Moving on to Slide No. 9, this slide is really for your use to help understand the subsequent slides up to page 15, and I will only briefly go through the next slides as I want to try to spend some more time on the two examples later in the presentation.

It should be noted about 20 percent of the ratings of the risk insights have changed from that preliminary report in June of 2003 to the present.

Further, the ratings have changed both ways. In other words, for instance, we've had three risk insights that were rated high in the preliminary report. They're now medium, and also we've had two that were medium in that preliminary June 2003 report that now reflect a high rating.

So one of the examples I'm going to go through is to try to explain why a rating might change. The items listed in the subsequent slides

were in the preliminary risk insights baseline report, dated June 2003. There is only one rating on the subsequent slides. That means the rating remained the same.

I've tried to highlight if a rating has changed by putting it in yellow, in italics, and tried to identify this was the preliminary rating, and now this is the rating in this updated report.

One other point I want to make out, that some of the new insights have been added in the report we are finalizing, and are underlined.

So let's move on to Slide No. 10. Again, if you have questions about individual one, I'd like to try to wait until the end to come back to it, but a couple of points on this slide. this is a clear example where the changes go from a higher rating of the preliminary report to a lower rating in the final. report, and in effect, this is one of the examples I'm going to talk about later, and this is because you had pointed out in your August 2003 letter you have no risk information to support your rating.

Okay. Let's move on to Slide No. 11. Here I want to point out that there were only two changes. They were both in the radionuclide release and solubility limit area where we changed the rating

on waste form degradation from a high to a medium, and the mode of release, that being a vective versus diffusive, from a medium to a low.

Moving on to Slide No. 10, in this case this deals with issues in the unsaturated zone, and there were two risk insights that increased in their significance, one from a low to a medium, being long term climatic change, and the second seepage from medium to a high.

And I also want to point out that the other example today that I'll talk about is from the natural setting, and this will be the hydrologic properties of the unsaturated zone. So this is one where the rating remained the same, but we want to provide you some information so that you understand how we came up with that rating.

Let's move on to Slide 13. This one is kind of boring. There are no changes. So I'm going to go on to Slide 14.

Here I want to make a clarification for the record. The first bullet, probability of igneous activity, should not be read as a probability of igneous activity as high. No, that's not what we mean. But the risk insight is that the probability of igneous activity has a high significance to waste

isolation. So don't read that as probability of igneous as high. It's related to the risk insight.

One other thing is that here DOE has consistently indicated that failures from igneous intrusion are one of the dominant contributors, and we have added new insight based upon our own results and also based upon what DOE has been projected in their total system performance assessment.

So moving on to Slide 15, again, here's another boring slide that there are no changes, but those are the ratings that we have, and now I'd like to move on to Slide 16, and perhaps I'll slow down a bit here.

Like I said, I want to go over two example today. I chose this first example primarily because it was an area singled out by the committee in your August 13th, 2003 letter on risk significance ranking of the agreements and the use of risk information to resolve issues, and in particular the committee noted that there were no supporting risk assessments associated with the rockfall issue.

In addition, in March you wrote a letter to the Commission, March 4th letter on the instability of emplacement drifts where you again addressed this issue. So I felt that this was one that you'd be

interested in hearing about and that's why I chose it.

Finally, this example illustrates how a rating changed to give you an idea of the thinking process that went into the revision between the preliminary and this report we're finalizing right now. The idea of these two, one engineered, one natural, is keeping with how we perceive Part 63, but also it allows you to see how we don't just use the total system performance assessment results, i.e., dose, alone, but we also try to understand how this system is operating from intermediate outputs from the performance assessment and how we discuss the remaining uncertainties. I'll do that in both of those examples.

So moving on to my first example, accumulated rockfall under engineered barrier. This slide tries to capture the essence of what the risk insight is. Basically mechanical loading from rockfall that accumulates that accumulates from degradation over time may lead -- may lead -- to failure of drip shields in the waste package. The failure of the drip shields in waste package will depend on the rate of accumulation of the rockfall in the drift, building that static load on the drip shield, and the threshold load bearing capacity of the

drip shields in the waste packet.

In addition, this process of rockfall and drip degradation on the outside of the drip shield could also potentially have impacts on the waste package and drip shield temperatures, which again because corrosion is temperature related, they'll have some kind of secondary effects.

So moving on to Slide No. 18, the first thing I want to talk about, change in the rating reflect two things. One, we agreed in June of 2003 we didn't have the risk assessment results to support the ranking. We have completed some preliminary consequence analysis results, and I'll get to that in the next slide. That's one of the bases for why we've changed this rating.

The second is, you know, this is not a static document. The idea is that we're going to change it as a function of time, as we gain new information from additional risk insights, but also as DOE changes its design or firms up its design, we will do additional analyses to assess whether maybe a change in the drip shield design actually now has a much more robust drip shield, whereas, when we were doing our preliminary calculations we had a different design.

So, in essence, we're looking at projecting the potential damage using this new what we believe will be a more robust design. We are doing some process level modelings to insure that it is going to be a robust design.

This has to do primarily with adding additional structural supports to allow the drip shield to withstand larger rates of accumulation of rockfall.

So in this risk insight example, we talk about how potential temperature effects with that added rock outside the drip shield could effect the creep rate failure of the drip shield. Also, again, how much rockfall accumulates and the rate at which it accumulates will impact the potential interaction between the drip shield and the waste package.

We discussed briefly the effect of drift degradation on seepage, and the impacts on low probability intrusive igneous activity.

Now, in the report, we try to frame these uncertainties based upon what we know, either from the existing risk insight or for someplace else. For instance, we might refer to what we've talked about on seepage.

Well, if we have on average about 20

percent of all the waste packages already seeing seepage, then we kind of know it can't be more than maybe a factor of four higher, even if all of the drift degradation occurred and it miraculously didn't act as a capillary barrier. So we have some ways to try to address the range of these uncertainties.

This is an example where the insight was supported from results from a total system performance assessment calculation. In this example it's a conditional dose. I'll talk a little bit more about that in this next slide.

And I also want to point out this is, again, a snapshot of where we are. Additional work to refine our understanding of the likelihood and the extent of the rockfall is ongoing and we basically described a little bit more about that in the two letters that we replied to your March letter to the Commission.

So on Slide No. 19, we realize that this isn't risk, okay, first of all, but this helps us to understand what the potential risk significance is. This is the conditional peak expected dose.

First, the red line is the base case. This is the peak does. This is what we expect. These other two are conditional. Okay?

A hypothetical case where we failed all of the drip shields, and this is from the TPA 41 code results. So we failed all of the drip shields at year one. So let's just say all of the rockfall failed all of the drip shields in year one.

Now, we know that's not realistic, but it certainly bounds the potential response. So that's the effect of just failing the drip shield in year zero.

As I said on the previous slide, one of the issues in the interaction between the drip shield and waste package because it's not just the drip shield that may fail. It might also impact the waste package as well. So what we also did is to fail all of the drip shields and waste package at time zero.

Again, we realize this is unrealistic, but we're trying to place this where if this was realistic and the probability was one, this would be what the risk is. But we know it's much -- we believe it's much less than this, and so as we become more realistic, we think we have defined where risk could be. It's probably going to be lower than that. It's not going to be driving it higher.

So in essence what we're saying is as we conduct these results and do this in a more realistic

manner, we believe that these results are coming down, and so we don't think it's as big a deal as it was before.

So now I'd like to move on to my second example. So this concerns the hydrologic properties of the unsaturated zone. This may be something near and dear to Dr. Hornberger's heart. I did it because it's partly geochemistry and I'm a geochemist by profession.

But on this slide, again, I try to capture what the risk insight is, and basically we're talking about the transport time of unretarded radionuclides from the repository to the water table on the order of a few tenths of years for float paths that occur primarily within fracture welded or zealotized tuff units. So we're not talking about the hydrologic properties of the various rock units underneath the repository horizon. What we infer in the longer transport times, on the order of several hundred years, are estimated for areas beneath the repository with a non-welded vitric or glassy Calico Hills unit is present, and I'll give you a little more geology and understanding of what these insights really are in the next couple of slides.

But the insight really is that the aerial

extent and thickness of the geology actually plays a part in how the repository performs. Now, it might not be all that clear from a dose result. In fact, it might be less than a factor of two, but if we look at intermediate outputs, we might see how this plays out.

Where is it that the staff should focus on? Should DOE take credit for unsaturated zone retardation?

So let's move on to the next slide, slide 21. As we point out in this report that we're finalizing, it's really the thickness of these non-welded, glassy units and aerial extent that play a part in this, and while the report doesn't include direct results from dose, we refer to previous analyses, and this isn't a case where we've conducted assessments using the earlier version of the TPA Code 3.2, and Jim Wirely identified that the presence of a non-welded vitric unit decreased an expected dose by a factor of five.

So several years ago we didn't take into account that this unit was there, that it had any potential for performance, and as we increased our realism, we saw, hey, it actually reduces dose by a factor of five.

In addition, as part of our continuing

risk analyses, I personally have attempted to assess how the change in the repository footprint, from that in a site recommendation to the license application might impact the thickness and the aerial extent. And basically what I've done is use the TPA 41J code and kind of overlaid in on the map of the thicknesses of these units, changed it in this next slide, and ran the results.

And, again, because of the shifting of the footprint of the repository, it probably -- you know, it may reduce dose by a factor of two. So, in essence, they've moved to an area where there's less of the glassy Calico Hills non-welded unit.

But, again, as I said earlier, sometimes we look at intermediate outputs to better understand the system, and we try to compare these intermediate results to total system performance assessment input parameters. So, for instance, when we look at our own calculations, this is going to tell the staff, okay, if the Department of Energy is taking credit for retardation or the hydrologic properties' unsaturated zone, this is where you need to look. This is the idea of trying to use the risk insights to focus where the staff should be looking.

So on Slide 22, the busy slide, but I'll

walk you through. The first observation is that there are four curves to the left of the slide, and those reflect Subarea 2, which is the dark blue open squares, and these are subareas. We split the repository footprint into discrete subareas and model that within the TPA code.

So Subarea 2 in the open squares, dark blue. Subarea 8 in the orange filled triangles or orange filled squares. Subarea 9, in light blue filled triangles or diamonds. Excuse me. And then finally, this pink one is Subarea 10.

And the point here is that there's a very big difference in behavior in the distribution of unretarded radionuclide transport time in the unsaturated zone for different areas of the repository. Okay?

So let's move -- that's kind of the intermediate output. So what are we going to look at? So let's go to the next slide.

And this is a graphical depiction of the input parameters of our TPA code, and again, Subarea 2. In this case the Calico Hills non-welded glassy unit is in red and the thicknesses in meters are these number. So there's 44 meters of non-welded, vitric in Subarea 7. So again, longer transport time for

unretarded radionuclides.

So Subarea 2, 8, 9 and 10 have very little Calico Hills non-welded, vitric. So we are going to look, you know, if DOE claims this as a barrier. We're going to be looking at the thickness and how they've mapped out the extent of these units. What is their basis for that?

This goes to the requirements in Part 63 on describing the capability of the barrier. So it's not just about risk. We're looking at what Part 653 requires.

So I'm going to move on to the final two slides to kind of say what our next steps are and how we intend to apply the risk inside. Perhaps you've gotten a little feel for that in these last two examples.

But we are in great -- we talked about this earlier today. You know, the PA group is integrated in this team approach to reviewing these technical basis documents. We use the risk insight baseline. We frame to the staff, with the staff what's important in this technical basis document based upon the risk information that we have now.

And so we use the baselines to review the technical basis documents and any agreements that are

brought in not in a technical basis document.

We're in the process right now of incorporating into this iteration of the integrated resolution status report. We're trying to get the staff to focus on, okay, now we have a Yucca Mountain review plan. Let's bring in these risk insights and say what are the most important things.

Just like I showed in this unsaturated zone one, you know, let's not talk about what's not important. Let's talk about what's important, and let's write to what's important.

And so the idea is to have this revision a major step that we really want to do in completing this integrated issue resolution status report, is to take a more risk informed approach to that by pulling in the risk insights baseline ideas.

As appropriate, we intend to incorporate the risk insights baseline insights into the development of the NRC's inspection program, and finally, we'll be using that to develop our performance confirmation review capability.

So in conclusion, our next steps are kind of laid out here. In essence, we are continuing to conduct a focused set of risk analyses. We intend to complete these analyses and update the risk insights

report.

Again, new risk information becomes available from DOE through their pre-licensing. You know, as DOE provides us information, either their performance assessment results or design documents, we can refine our analyses.

We plan to update the risk insights baseline report as appropriate before the anticipated license application, and staff plans to expand in that updated report to include the repository, pre-closure repository system.

So, in essence, I've kind of run through -- well, I gave you a half hour to grill me.

CHAIRMAN GARRICK: Thank you, thank you.

Okay. Ruth, do you have any questions?

MEMBER WEINER: Yes, I do.

First of all, I want to thank you, Bret, for a very thorough explanation of how you are using risk insights. I think that was really very informative. It was great.

I have a couple of questions. Are your risk rankings the same as DOE's? Do you use theirs? How does that interaction work?

MR. LESLIE: That's a great question. You'll note that we don't say risk ranking anymore in

this report.

MEMBER WEINER: Yes.

MR. LESLIE: We say "significance to waste isolation."

MEMBER WEINER: Okay.

MR. LESLIE: Again --

MEMBER WEINER: Which, by the way, I'm reading that into it.

MR. LESLIE: Right. DOE and EPRI, to an extent you'll hear in this next presentation, actually gives a pretty good summary of the differences between the three of us, but we're also trying to -- we're not just doing risk, okay, and the reason is Part 63 is not just risk. Okay?

It tells us a couple of things. It tells us, yes, you have to comply with the dose limit, but you also have to be able to demonstrate you have capability of barriers, and these are barriers important to waste isolation.

So we're trying to tie how we move forward and use risk information back to what our regulatory framework is.

So DOE has approached it from just saying, "Well, if it's a difference in dose, then it's important or not," and we're trying to say, no, as we

see it, if you're going to go forward with these barriers, then these things are important. These are the areas.

So we aren't looking to tell DOE to do it our way. We're allowing them to use how they want to do. What we have been very clear with the Department of Energy is we will be evaluating what is in their performance assessment to see how they describe the capability of the barriers, not their words. It's what's in their code that matters to us.

MEMBER WEINER: well, so far, if you look at these issues from the point of view of protection, how good the barrier is, do you see any significant difference between your assessment and DOE's?

MR. LESLIE: The unsaturated zone is a good one, the example I give. We believe, based upon what we know about gravity and how water flows vertically through fractures, that when you get to a porous medium that has a lot of matrix permeability, things should slow down. Okay?

Well, the Department of Energy has most of their capability in a fractured Topopah Spring tuff with limited matrix fracture interaction. We need to understand the difference. I don't think that they're doing the Calico Hills non-welded any differently than

us. That's a difference that we're going to say and look at, how they have taken credit for the Topopah Spring.

MEMBER WEINER: I'll hold.

CHAIRMAN GARRICK: George.

MEMBER HORNBERGER: So, Bret, you said you were going to do the Calico Hills for me, but also for you because of the geochemistry, but all I saw was unretarded. So here --

MR. LESLIE: Well --

MEMBER HORNBERGER: -- here all along I was thinking that the Calico Hills was important because it was zeolitized. So it's not.

MR. LESLIE: Well, actually, no. You bring out a really important point. It turns out if you have too many zeolites, you end up clogging up the matrix porosity and permeability. So it becomes acting like if it were a fractured rock.

So you bypass all of that capability by having too much. Okay? So it's kind of Goldilocks. If you've got nothing, there's no chemistry. Okay? If you've got no zeolites in there.

But when we talk about the non-welded, vitric Calico Hills, we're still talking about eight to ten percent zeolite, but it acts as a porous

medium. So it's this range in geochemistry of the mineralogy basically that affects the hydrologic parameter.

So, yeah, the chemistry is a little subtle there, but it's there.

MEMBER HORNBERGER: I see. Okay. I thought you had forgotten it.

I noticed in one of the changes in your risk insights was to move long-term climate change from low to medium. Can you give me some insights on why your insights changed?

MR. LESLIE: I will attempt to, and hopefully Tim can help me out here, but I'll take a first stab at it.

It actually goes -- well, let me see if I have that. That's probably on Slide 12.

They kind of go hand in hand, seepage and long-term climate. The NRC and the Department of Energy have different approaches for long-term climate. Okay? We can assess how the Department of Energy takes into account long-term climate. In essence, after 600 years they start to change climate, and I think at maybe 1,000 years, they really change climate. All right?

So that means that the present day

infiltration rate is only active for a short period of time, and so the majority of the repository actually sees this long-term climate change.

The NRC approach actually doesn't have this long-term climatic change until much later. How does that impact? Why is it important?

Well, it turns out that the Department of Energy's approach to allowing water to seep into the drifts has this cutoff, okay, and it's a function of depercolation rate. So, in essence, when you jack up the infiltration rate, which they do with this long-term climatic change, then you jack up the percentage or increase that percentage of seepage.

And so they're kind of tied together. It turns out that the seepage is more important, but the long-term climatic change actually affects the seepage. So it's not one to one.

Tim?

MR. McCARTIN: Yeah, Tim McCartin.

Yeah, that's pretty much it, but the one side aspect is some additional concern with respect to the water chemistry and, you k now, estimating the amount of seepage will impact some of the things that might evaporate on the waste container, and so getting a better handle of the environment of the waste

package corrosion. So there's kind of some cumulative effects here, but it's clear the long-term climate change seepage with this additional concern about the chemistry on the waste package.

MEMBER HORNBERGER: So I think I understand it now, but now what I don't understand is why seepage is rated high and long-term climate change is rated medium.

MR. LESLIE: Well, the seepage is the -- I mean, long-term climate is the grandchild of seepage, basically. Seepage itself, I mean, there are a lot of processes that affect seepage, all right, whereas long-term climate is here is your input.

There's more uncertainty with seepage, drift degradation, how they've actually abstracted it. You can think of the long-term climatic change as kind of one input into seepage. All right, and so therefore if you take into account all of those different porosities that impact what that seepage percentage is, that's why it's more important.

MEMBER HORNBERGER: All right. So I guess I really do understand this, but I'm still mystified as to why it was low before and medium now. I don't understand what changed in either the DOE case or your analysis.

MR. LESLIE: Well, I think as you pointed out in August of '03, we didn't present our analyses, and that's 20 percent of our changes. We changed 20 percent of the things, and this is because we did our best, thinking what we thought we knew. Okay? And so now we've collated all of our insights into one document, the dose results and intermediate inputs.

Our thinking has changed.

MEMBER WEINER: Could I ask a follow-on question to George's?

MR. LESLIE: Sure.

MEMBER HORNBERGER: Sure.

MEMBER WEINER: So in your example here, the seepage is going from medium to high.

MR. LESLIE: That is correct.

MEMBER WEINER: Does that mean more water is seeping?

MR. LESLIE: No. It just means we're going to spend more time on this issue than we had in the past. We're going to focus more. This is the rating of the risk insight.

MEMBER WEINER: I see. So it means that you are --

MR. LESLIE: Previously we didn't think --

MEMBER WEINER: You just didn't think it

was important.

MR. LESLIE: -- it was critical. Now we think it's much more important.

MEMBER WEINER: Okay. Thank you.

Because the burden of the question was if you have more water, you are decreasing the possibility of saturation deliquescence and basically increasing the initiation of corrosion, but I understand now. Thank you.

Sorry to interrupt.

CHAIRMAN GARRICK: No interruption.

Mike.

VICE CHAIRMAN RYAN: It's interesting. You made a comment, I think, in the early part of your talk about how you've got to transition from the risk insights into the Yucca Mountain review plan. Could you give us -- did you mention a little bit about that or--

MR. LESLIE: Well, yeah, I can mention it. I don't think I actually said that we're going to bring the risk insights into the Yucca Mountain.

VICE CHAIRMAN RYAN: I may be misquoting you, but if you could talk a little bit more about how you go from A to B that would be great.

MR. LESLIE: Sure. In February, Jim Dana

had a couple of slides on how the risk insights baseline report, the Yucca Mountain review plan and the integrated IRS relate to each other, and I'll try to reproduce that now.

The Yucca Mountain review plan says do a risk informed review. It provides a lot of review methods and acceptance criteria for all of the major abstractions that I went through today. It allows a detailed review of each of the areas. It says in the introductory sections associated with these abstractions, use risk information to conduct your review. Okay?

So where is this risk information coming from? The risk insights baseline report.

Now, the integrated IRSR is the staff's evaluation or application, I should say, of the Yucca Mountain review plan review method to what we know now, and so what we're trying to do is we're trying to take the responses that we've written back to DOE on these technical basis documents and the information we have now, and rather than write agreement by agreement, let's look at the big picture. What is important?

Okay. Staff, try to write to this. So it's kind of we're trying to, as we do this integrated

issue resolution status report, we're trying to implement the Yucca Mountain review plan and the risk insights baseline report.

VICE CHAIRMAN RYAN: Thanks. That's helpful.

CHAIRMAN GARRICK: Okay. I wanted to ask a couple of process questions here in terms of the benefit of what you're doing. It seems pretty clear that in invoking the risk insights initiative that you are getting a better understanding of what's going on. I guess a question I'm asking is related to the issue that we raised before, is how is this better understanding being used to make the review process more efficient.

Because it's not clear to me that what you're doing would be any different whether or not you did any risk insights. In other words, I'm thinking back of the probabilistic risk assessment policy statement and the language associated with all of the things that you want to get in terms of benefits from implementing that thought process, and one of the things, of course, is burden relief.

MR. LESLIE: That's correct.

CHAIRMAN GARRICK: And I haven't seen much evidence of that.

MR. LESLIE: That's a big question, and let me see if I can hit a couple of different aspects. Early on in 2001, we basically -- DOE first said we think we're going to use risk information to identify why we don't need to supply this information, and we said this is a good thing. You're allowed to do that. Come back to us to say why we shouldn't do this. Okay?

They have backed away a lot. They submitted a few examples, but primarily it's DOE's choice to say this is an undue burden, in particular. That burden question is one that you have to think about because, in essence, is it an undue burden to ask the licensee to justify the technical basis, and the answer is I don't think so.

So they would either have to come in and say from a risk perspective this is not important and we're not going to take credit for it in our performance assessment as a barrier.

That kind of thing, oh, sure. We can get rid of a lot of agreements if they chose to have a lot fewer barriers. But, again, we're responding to what the Department of Energy is proposing, and we have to review that, and we have the issue resolution process, as Greg said earlier today, is about, you know, what

is the goal.

The goal really is for the staff to be able to conduct an efficient and effective licensing review, and that means just as we just said in the staff evaluation. We are trying to focus to make sure that the Department of Energy provides adequate justification for what they're saying. We need to be able to assess whether there's an adequate justification, again, more or less depending up how much the Department of Energy wants to claim credit for.

I hope I tried to --

CHAIRMAN GARRICK: Yeah. That's useful.

MR. LESLIE: -- address that.

CHAIRMAN GARRICK: But, on the other hand, DOE is basically providing you with the information you're asking for.

MR. LESLIE: That's correct. And I guess the way I would say, and I'll think back to some of the words Greg said, if we started today, I don't believe we would have 293 agreements. If we had started with a risk insights baseline --

CHAIRMAN GARRICK: Now you're getting to where I'm headed.

MR. LESLIE: Okay. I don't think we would

be at 293 agreement.

CHAIRMAN GARRICK: Right. Okay, okay. So what you're really saying is that we're kind of pilot testing this whole process, this whole way of thinking.

MR. LESLIE: I wouldn't say pilot testing. I mean, yeah, part of what we have been very good at, we have been very good at assessing risk. Okay? Now what we need to focus on is managing risk, and there are differences.

If we have a lot of people on performance assessment who, you know, are just so used to doing the assessments, but then now we're trying to focus. Okay. Now we're in a different framework. This is where we now have to start applying the risk information.

And that's a cultural issue and it's a management issue. How we go forward in each of these processes. How do we incorporate our risk insights into our performance confirmation review capability? How do we take the risk insights into the development of the inspection program? How do we do this when we review the integrated IRSR sections.

I think Greg may want to add something to this, as well.

MR. HATCHETT: This is Greg Hatchett from the staff.

When you refer back to the initial policy statement on risk, one of the things we have to understand is that risk is a two-edged sword. In some cases --

PARTICIPANT: Only two-edged?

MR. HATCHETT: Just, you know, in simplistic form. In some cases as you have seen, we've changed ratings upward from medium to low, meaning at one phase of this we didn't think it was that significant. Now we understand it to be more significant, and it can have just the opposite effect on something we thought was high, now has a lower rating.

But at the end of the day, we can't do DOE's work for them. So going back to the earlier presentation, we may believe and agree from a philosophical point of view that an issue may be low risk, but we can't close that issue out if they haven't provided adequate justification. So we can't just say just because we agree with the assertion in the document, you still haven't provide adequate justification to support that. So we can't actually do that for them. They still have to unbundle this

web of reference documents to try to bring to the surface that work that they have done to provide the justification for their position.

So, again, while we might agree in principle, we can't necessarily close an item because they haven't transparently demonstrated.

CHAIRMAN GARRICK: Thank you. Thank you.

MEMBER HORNBERGER: It sort of seems that there's a Catch-22 here because the previous speakers from DOE said that what they were doing was responding to requests from the NRC staff.

CHAIRMAN GARRICK: Yes.

MEMBER HORNBERGER: And so how do we reconcile this?

MR. McCARTIN: Tim McCartin, NRC.

I might differ a little bit from Bret saying if we did it today we'd have less than 293, and let me just put that in a slightly different way. I feel we've been risk informed for a long time. We started performance assessment analyses 20 years ago, and over the last 20 years, the sophistication has improved.

And as it has been improving, you've seen manifestations of it. The KTIs that were set -- I don't know -- I'll say maybe ten years ago, that was

done on a risk basis. We looked at what are the things, given our understanding today and performance calculations, that are most significant.

As time has gone on, we've been able to refine them. When the 293 agreements were done, there was some PA input, and there was some understanding, but you can see, okay, here's the set. Then you can start to be a little more sophisticated, a little more focused, and things start falling off the importance list. Some become low.

And I think we are evolving with time, and --

CHAIRMAN GARRICK: Right. The only thing I'd say, Tim, and you're absolutely right; you can't do safety analysis without it having an inherent component of a risk perspective.

But on the other hand, the performance assessments that were performed as a basis for the ten years ago development of key technical issues was not probabilistic to the same degree that it is now, and it's very hard to get into any kind of prioritizing or ranking in any kind of quantitative form without at least moving in that direction.

But you're right. The safety analysis can't be done by competent people without some element

of risk being involved.

The one thing though that I'd like to say is that I would assume, based on what you have been doing of late -- and I think that the last year we've seen a great deal more emphasis on being risk informed and risk oriented than in prior times -- and that would lead me to something that Bret kind of telegraphed, and that is that repository, too, I would expect in the technical exchange meetings that occur during the equivalent of the issue resolution phase, we would be seeing a great deal more emphasis on a risk perspective.

In the technical exchange meetings that I observed, and that was only a couple of them, the concept of risk was just simply not very evident, and so that to me is kind of encouraging to hear you say that.

MR. LESLIE: Yes, and, in fact, I attended most of the early technical exchanges, and after the first one, one of the first things we were requested from the Department of Energy for all subsequent ones was to start to provide that risk perspective, you know, so that they would always have a total system performance assessment.

It's not the same sophistication as we go

forward, but again, this gets back to that we've been trying to do this for quite some time.

And the other aspect, I actually think this risk insights baseline report is very important for risk communication within the staff, and this is part of having everyone -- the reason we wrote it at the level which we wrote it is so that an informed public and an informed staff member can think outside of their box and understand what we've presented so that they start to see the whole perspective and the risk perspective as we go forward.

You know, I agree with Tim. We've been doing lots of analyses, but we as performance assessment staff have to spend a lot of time making sure that we are explaining what we are doing to all of the staff so that everyone understands and has the same basis of information.

So I'm actually kind of excited about going forward.

CHAIRMAN GARRICK: Just one further question. this one is more of a technical question on the presentation on Slide 19. Now, this is with respect to rockfall on engineered barriers, a specific event, but is this another piece of evidence that after a few thousand years you get no contribution or

little contribution from the drip shield as far as peak dose is concerned?

MR. LESLIE: I'm going to actually ask Tim to try to address this one, if he can.

MR. McCARTIN: Well, certainly in our analyses, the drip shields are failed before 10,000 years, if you're talking about the blue curve.

CHAIRMAN GARRICK: Yeah.

MR. McCARTIN: Yeah.

CHAIRMAN GARRICK: Well, I'm talking about the fact that the blue and red converge.

MR. McCARTIN: Right, right.

CHAIRMAN GARRICK: And pretty rapidly.

MR. McCARTIN: Right. At the end there in the base case, the drip shields are all failed also, yeah.

CHAIRMAN GARRICK: Right, right. Okay.

MR. CLARKE: Can I ask you a question?

CHAIRMAN GARRICK: Yes, you may.

MR. CLARKE: What are you transport assumptions there? You've got the doses at the compliance point; is that right?

MR. LESLIE: That's correct.

MR. CLARKE: So is this unretarded transport?

MR. LESLIE: Oh, no. I mean, the only thing that the blue and the green lines that are different from the base case or that we set the drip shields to fail at zero years, and for the green case, the green triangles, the drip shields and waste packages fail at zero years.

So everything else is the base case. So, no, it's not unretarded transport.

MR. CLARKE: I guess it was made to scale probably.

CHAIRMAN GARRICK: Yeah. Okay. Any questions from staff? Yes, Mike Lee.

MR. LEE: In the spirit of grilling the speaker, a number of years ago the center sponsored an expert elicitation on climate, and I'm still having some trouble as to understanding why climate has been kicked up as a medium risk issue. I understanding the coupling. I mean, I understand the relationship with the coupling between climate and seepage, but my recollection is the elicitation, I believe, was effective, and we can get clarification from the center because they're on the phone, in at least bounding the estimates of precipitation.

MR. LESLIE: You know, I don't have that portion of the risk insights report at the tip of my

fingers.

MR. LEE: Okay.

MR. LESLIE: I think we're going to have to get back to you with a better answer. I tried to address it, and I don't know if Tim has anything more to add.

MR. McCARTIN: It's not so much something has changed with climate as much as a concern about the kinds of chemistries that might develop such that that estimate is more significant than it was before because of how it might affect near field chemistries.

MR. LEE: Okay. So as a parameter it's --

MR. McCARTIN: We're not suggesting that, oh, now climate is changing far more radically, but there might be the uncertainty in that estimate. It's a little more important because of the role it will play in the chemistry.

MR. LEE: All right. So you're really basically saying there's a stronger coupling, if you will, between climate change and seepage.

MR. LESLIE: Yeah, and subsequent downstream effects that impact those.

MR. LEE: Okay.

MR. LESLIE: Okay?

MR. LEE: Thank you.

CHAIRMAN GARRICK: Any other questions from any other person?

(No response.)

CHAIRMAN GARRICK: Thank you very much, Bret.

MR. LESLIE: Sure.

CHAIRMAN GARRICK: We are scheduled for a break at five o'clock, a 15 minute break. I'm going to take license and liberties here and declare a ten minute break now and then a five minute break then. So let's take a ten minute break right now.

(Whereupon, the foregoing matter went off the record at 3:55 p.m. and went back on the record at 4:07 p.m.)

CHAIRMAN GARRICK: All right. Our meeting will come to order. We're now going to hear from the Electric Power Research Institute, and in particular from John Kessler, who we've learned, we've heard from many times before and we welcome him back once again.

And look forward to whatever he has to say. John.

MR. KESSLER: Eastern Representative of EPRI, right? I guess I'd like to, before I start my formal presentation, I'd like to react to two things Bret said.

One, I kind of got clarified during a break, but I heard Bret imply that, you know, DOE was going to apply for a barrier, or take credit for a barrier. That that was going to prompt a lot of regulatory review and it's a break, I understand, that the amount of regulatory review for a particular barrier will be commensurate with its risk importance, for lack of a better way. And that's great to hear.

The other thing that wasn't so great to hear was the discussion about, well, if we knew what we, if we knew then what we knew now about the 293 Technical Agreements, perhaps there wouldn't be 293 of them.

Okay, we know something now, why are there still 293? When we've got three different groups, or more, describing a whole bunch of these with low risk priority, why are we continuing with the ball rolling?

It's got to be for other reasons, and I'll just leave it at that. Next viewgraph, please. So what I'm going to go through today, is I'm going to whiz through our 2003 TSPA end results.

Basically, my talk is based on part of what we produced in December of `03, the end of the year report for last year. So I'm going to refer to stuff that was produced last year.

I'll spend more time talking about our view risk prioritization, our measure of risk importance, our main findings. I'll provide, again, just a few brief comments on DOE's Risk Prioritization Report, the one they presented in 2002.

And then I'll spend a bit more time commenting on NRC's risk prioritization work as it was documented last year. So this is sort of a, first stuff Bret just talked to you about that was produced, or that we commented on in our December of `03 report, and so I'm not going to be talking about the most recent stuff that Bret presented to you today. Next.

Okay, also here's my disqualifies. We're considering only the normal release mode at present. That is container and cladding must fail for the diffusive release to begin. The drip shield failure allows invective releases to begin, where the local flow is high enough.

Invection and diffusion through the unsaturated zone and saturated zone to the 18 kilometer fencepost is essentially our normal release mode.

What are currently not in the EPRI model is igneous activity. I will say that at the time that we did this report and what I'm going to say today, we

hadn't completed an igneous eruptive scenario and we made certain comments about how we thought that igneous was probably pretty important.

I will advertise that in about two months we'll come out with a report that suggests that the igneous release is not very risk important.

We also did not include human intrusion and we haven't included colloid transport. Next. We used a simplified logic tree approach to probabilistic TSPA. It's not Monte Carlo, or I should say it's actually partially Monte Carlo in the sense that some of our submodels, we do use a Monte Carlo approach, for example, on container failure distribution, which you don't see in this logic tree.

So we have a limited number of branches which involved a lot of expert judgement to pare it down to this logic tree, with discreet probability and parameter values for each branch. We have uncertainties on the net infiltration. A focused flow factor, which is essentially the amount that the water, how it distributes itself when it gets down to the repository horizon.

Is there a lot of focusing into small area, or is there essentially no focusing that kind of percolates down pretty evenly?

Seepage fraction gets to something that Bret talked about in his talk, which is this idea, we're not really sure once we get the percolation down to the top of the repository, how much actually gets in?

There are some alternative conceptual models there, and we essentially are putting a probability on which of those conceptual models we think is correct, that governs then how much seepage we actually think would drip in.

Solubility and alteration time. This is radionuclides solubility and the waste form alteration time, we think that the chemistry, local geochemical conditions will govern both of these more or less together. So we combined those branches.

And then use the SC retardation is the last set of branches in probabilistic tree. Next. Again, quickly, just showing that we have split our climate up only into three different stages.

We assume greenhouse, which is very similar to their monsoon climate for basically the first thousand years. Since that we are assuming that perhaps greenhouse gases might lead to something like a monsoon climate.

We'll return to interglacial for the next

thousand, and then, based on a bunch of sensitivities we said let's just move it to full glacial maximum and be done with it. We don't see that much sensitivity to climate change.

And here are the net infiltration numbers, with the uncertainties that we used in millimeters per year. Next. Here's the distribution of the seepage fraction and seep flow rate versus the local percolation rate for these two alternative conceptual models.

So what this is saying is that we have to get up, in this base pace, we have to get up to something like 73 millimeters per year of seepage, to start getting any water to drip into the repository and then you would get this flow rate.

For the high seepage case conceptual model, you can see we get larger fractions of the repository that would be wet with larger flow rates through them. Next.

Here is our drip shield and container failure distributions. Essentially, this is the drip shield failure distribution with time. And here is essentially the waste package failure distribution with time.

We're assuming one drip shield and one

container are assumed failed in placement, but those failures are not co-located so we basically don't assume we've got them right on top of each other. Next.

We also have cladding failure rates that depend on whether we have a dripping system or essentially a dry or just a humid air system in failure distribution versus time. Next.

We have a saturated zone model that's pretty pared down, in the sense that we have a fracture matrix interaction in the first 13 kilometers through the volcanic and then we've got classic porous flow model with absorption and the last five kilometers to the accessible environment. Next.

Okay. Just to show you that we do do some intermediate results, rather than just jumping you right into the means of the dose distributions, here is an example of a radionuclide mean concentration exiting the engineered barrier system.

And, as we would expect, we've got, in terms of concentrations, U238 being the highest concentration just because it dominates what's in the system in terms of what gets BBS versus time. Next.

Okay, I'm going through this quickly because I want to get to the risk prioritization and

I'm just trying to set the stage here a little bit.

I call this the compliance zone, but you get it. Here's the 15 millirem for ten thousand years kind of fencing off. And here is our mean result, a probability weighted mean result.

And, yes, it is very low. And that's because of the assumptions that we're making about diffusion dominated and how the containers and drip shields and the cladding lasts, the flow through the system, etcetera.

So what we're essentially finding is, is that the ten thousand year dose risk is something like seven orders of magnitude lower than the Part 63 limit. Even in a million years, we're only up at about a millirem per year to the RMEI.

I actually threw this up for Mike, so I'm glad he's back. This one is actually for ICRP-72 dosimetry. And what you see, when we use ICRP-72 dosimetry along with assumptions we made about inhalation and dust loadings, is that we don't have neptunian-237 dominating out here, but we have thorium-229, I think that's are dominating radionuclide for ICRP-72 dosimetry. Next.

Okay, here it is with FGR-11 dosimetry. Essentially, everything is about the same, except the

neptunian-237 came up by about an order of magnitude. And that's, again, because of the differences in dosimetry for that particular radionuclide, along with assumptions that we made about dust loadings and inhalation.

VICE CHAIRMAN RYAN:: Which part of that, John, would you say is controlling? The dust part of the dose conversion factor part, can you tell which has more influence?

MR. KESSLER: Inhalation is, are, for these actinide is our dominant dose contributor.

VICE CHAIRMAN RYAN:: Right, but I'm asking, you said the dose conversion factor is changed and your assumption about dust loading changed or they were the same in both cases?

MR. KESSLER: The same in both cases.

VICE CHAIRMAN RYAN:: Okay, so it's just –

MR. KESSLER: Right, it's just the difference between ICRP-72, okay?

VICE CHAIRMAN RYAN:: I got you, okay. Thanks.

MR. KESSLER: All right, now to the point that I wanted to make here that's going to get into the risk insights. Is that we're saying complete function failure of any two barriers, will not cause

the ten thousand year dose to increase above the Part 63 limit.

And I've got a few examples to follow here. But basically, this conclusion really colors our risk insights. Okay. Along with, of course, the basis that the model that sat behind it, which is why I wanted to rush through it. Next.

Okay, some examples of contributors to the low dose risk estimates. Slow container and drip shield degradation rates. Repository is in the unsaturated zone which means a small fraction of the repository is contacted by flowing ground water rather than all of it.

We have limited diffusive release from failed containers via tortuous pathways. That's all a benefit of being in the unsaturated zone, along with, you could say the engineered components.

So this is sort of a mixed bag of engineered and naturals features and I can't really separate one from the other, and nevertheless, it's an important component.

Solubility limitations and then travel time in the UZ and SZ are sorption delays most actinide and cesium and stronium. You need to remember that. And it just reminded me that we can't

forget about all these actinide that fell off the dose list because of all these important barriers that are a lot of the natural ones.

And this actually meant that we didn't even have to model for our longer term models, cesium 137 and stronium 90, because they didn't get anywhere by the time they decayed. Next.

Okay, sensitivity studies. We use them as most others do to test the robustness of the system. If some components don't perform as anticipated, along with of course understanding the insight it gets you in your system, as well. The results are dependent on other system components functioning as advertised. We know that.

That the results we get are based on the assumption that the other parts of the system behave in the way that we expect with their uncertainties.

Examples, again, just from the ICRP-72 dosimetry one, is that say, let's, just using this one as the sensitivity study, not that it's important for the ICRP-72 one.

The drip shield doesn't function. I'm going to show you the same, essentially the same ones that you just saw from Bret, but with our results. So it worked out rather well. Next.

Okay, drip shields failed to function. Again, what we see is that we have a little bit earlier release so it gets up above the ten to the minus six we had before out at long time periods. Pretty much the same behavior. Next.

That's just now waste packages only failed to function with everything else functioning as advertised. We do get higher releases, again, still very low in ten thousand years, and our peak is up closer to ten millirem per year, but still lower than background. Next.

Now let's take them both out. So drip shield and waste packages failed to function. So I'm following right along. I just split them up in three viewgraphs rather than one. And we do get higher doses within ten thousand years, but it still hasn't even reached one millirem per year in ten thousand years, with both of these barriers taken out.

And our peak is up around background now. Next. So our preliminary conclusions are that our probabilistic analysis results in very low doses and that many natural and engineered features contributes to those low doses.

We also found that complete failure to function of any two or even more, in some cases,

depending on which barriers you pick, a component will still not cause the regulations to be exceeded. And both of the above contribute to confidence, while some processes and parameters remain uncertain. Next.

Okay, now switching into the, our risk prioritization work. While certainly our motivation was the KTI Agreement Item Completion Process, we felt that doing risk prioritization has its value all the way through what will be actually decades-long licensing processes, you think through construction and receive and possess and operation and eventual closure.

So we think that, certainly that risk prioritization work has value throughout the entire long licensing process. And certainly there's a three-year regulatory review period for construction authorization that we had our thoughts around as we developed this work, too. So our purpose was to develop an independent understanding of the risk importance system steps.

Identify a potential approach to completing risk important work, and then at the appropriate time during repository development or operation, one of our concerns was that we seem to see a lot of stuff front-end loaded in terms of when it

seemed to be, needed to be done, regardless of when that risk from that barrier might actually come along in repository operation.

I'm going to explain that a little bit better as I get along here. So our approach was to develop a working definition of what is risk important. Do some TSPA sensitivities.

The one offs, the one ons, the hazard index work that you've seen from other presentations I've made elsewhere, at least some of you have. And the evaluation of DOE and NRC work. Next.

Our definition of high risk importance turns out to be pretty similar to DOE's. In the sense that we talk about thefts or barriers who uncertainty range causes the current estimate of dose risk to vary by one millirem per year or more.

So when we talk about uncertainty range, it includes conceptual model or parameter uncertainty. Dose risk means the output distribution treated probabilistically of dose, so I like to keep the two words together, dose risk.

The dose risk in the first ten thousand years is considered. Rationale, Part 63 in Yucca Mountain, review plan require risk informed approach. Next.

Our conclusion that no single barrier or theft is of high risk importance. The examples of the theft barriers considered, non-infiltration rate, degree of flow focusing and seepage fraction flow rate.

We're saying invective release at early times is relatively unimportant. Engineered barrier still provide protection. UZ/SZ travel times aren't shortened to the point of ineffectiveness, even for the high values of infiltration and focusing.

Same with solubility and waste form alteration time. Technetium and iodine are already essentially solubility unlimited. Actinide solubilities would have to be much higher to even begin to approach being risk important on their own.

And plutonium colloid uncertainty is also, in our opinion, not sufficiently large to get us up to where we get doses, these dose risks over one millirem per year.

And waste form alteration time is already assumed to be about a thousand years, which we think is sort of at the low end of the range, now. Next.

Continuing examples of barriers considered for UZ/SZ retardation, KDs of zero shift the actinide arrival times, but again, we don't see significant

dose increases because of that.

Drip shield waste package LA-22 cladding. If one or even two fail, the others back them up and we still don't get a dose risk increase of one millirem per year in ten thousand years. Next.

So what are we left with? We would say that we only have, for lack of a better word, common mode failures that we may need to worry about here that may be risk significant.

But its effects that if they occur could cause multiple barriers to fail to function as advertised, as we believe the normal release scenario.

So some examples could be unexpectedly corrosive local environmental conditions that could cause early failure of drip shield, waste package and cladding, might also cause local solubility limit increases.

So you are essentially failing the functionality of several barriers here. Disruptive events. They could have a potential short circuiting of multiple barriers would include igneous activity, major rock fall, which is what NRC, we just heard about from them, maybe thermally or seismically induced.

Not human intrusion because single waste

package penetration just isn't enough, so we don't even consider human intrusion a disruptive event that would result in a common mode failure.

And I just throw it on here to be inclusive, not because we've done much analysis, but dramatically higher repository temperatures that really could cause things to fall apart, might be one of these common mode failures. Next.

Getting back to my opening comment. Work that is not of high risk importance should not be required to be completed. Probability that multiple models or uncertainty ranges are inadequate and all in the wrong direction is low.

Much is already known and preliminary DOE estimates of risk importance is the basis to prioritize work. The LA should be accepted by NRC at this time. Meaning if DOE wants to take the risk of, in this pre-licensing phase, of coming into NRC with certain information or not certain information, that's a risk that I think they should be allowed to take.

NRC review of the license application is going to be independent anyway, and if DOE's call is that they don't need that work because it is of low risk importance, that should be DOE's call. Next.

Having said that, we do recognize some

information is required in all areas. We're certainly well aware of the Part 63 requirements that say you have to understand your system to some extent, regardless of its risk importance. I'm adding those words, even though it's not quite written exactly like that.

So, we're certainly not saying no information is required. The degree of information should be relative to the risk importance. We do feel, however, that the current amount of information in areas of lesser importance to risk is probably adequate already.

And we understand that determinations of what is important, are based on assuming the current TSPA submodels are correct. And the decision to proceed with prioritization and KTI Agreements should be solely at DOE's risk.

NRC should not require DOE to perform all the agreements, and certainly not those low ones. Especially if DOE feels they're low. Next.

So when should risk important work be completed. And it sent as sort of step-wise licensing issue. When is that work needed to support the particular licensing phase you're in?

I'm making an analogy here to Part 50

Reactor Licensing. Granted they're under revised licensing now for any new reactors that come along, but I sort of view Yucca Mountain being that sort of an analogy to the earlier Part 50 space.

Which was the level of detail and construction in the preliminary safety analysis report is lower than in the operation, final safety analysis report. That is we need some time to learn and understand the system.

The level of detail needs to be associated with a need for a particular barrier. The sense that there's little to no public associated with construction for a lot of the post-closure natural barriers.

So I would argue less information about them is required at the time of construction LA and you'd need more information about them later in the regulatory process.

And more information is required about the surface facilities and subsurface handling because those are going to come along next in the licensing process.

What this is trying to build in, is that there's a lot of time to learn and to do more work. And that you don't need to know everything up-front to

proceed with the next phase of licensing.

What you need to know is what you're going to incur the risk about in the next phase of the repository development. Next.

So here's just sort of an example of degree of information required for the various parts of the system. We're saying at site recommendation, in all of these areas from transportation through the engineered barriers and the saturated zone, and the natural barriers, you needed just preliminary information.

At the time of the construction permit you're going to need to know more about transportation and surface handling facility. Maybe a bit more about rock stability, because you're actually going to have to start building it during the construction permit.

But these other, sort of post-closure parts of the system, you still wouldn't need to know as much information, because you're not incurring that risk yet.

And receive and posses you would need to know more and so on through closure when you would finally have to have complete information for full barrier reliance. Next.

Okay, now I'm going to shift into our

evaluation of DOE and NRC risk prioritization activities. I'll do a real quick review of DOE's based on their risk information report back in August of 2002.

And I'm relying on essentially two different pieces of information that I had when I did this evaluation. Dave Esh's presentation to you last June, along with this preliminary risk insights, baseline of risk insights that occurred also in June that Bret talked about. Next.

Regarding the DOE approach, our measure of risk importance is fundamentally the same as DOE's. The effect on probability weighted dose on the order of point one to point one, to one millirem per year. You consider risk important.

DOE considered alternatives, but rejected them. We agree with that, and that they talked, they thought about importance based on conditional probabilities, the focus on most likely consequence rather than the mean of distribution.

And they said in their report that neither of these approaches provides a means for assessing the role of a TSPA model components in meeting the requirements that had been established by the NRC. We agree with that.

DOE found only waster package degradation was of high risk significance. And as I pointed out earlier, we disagree. Even waste package degradation uncertainty is only of high risk significance coupled with other failures. Next.

In terms of our evaluation of the NRC report, I'll start back with a letter that, NRC letter to DOE back in the beginning of `03.

NRC encourages the use of risk assessments and sensitivity analyses to help identify data, models and barriers that are most important to repository performance and to focus available resources on those items. We very much agree with that.

Later on, in NRC staff remarks to ACNW, the amount of technical basis for the analysis should be commensurate with the uncertainty, this significance and pessimism introduced into the analysis. We partially agree. Certainly we agree that if it's risk significant the analysis should be a high.

Regarding uncertainty, we would say the uncertainty, only if it's risk significant. We may be able to live with a very large uncertainty in some barriers or some thefts, if, even that large band of uncertainty doesn't affect risk much, I would say that

we can live with that.

Pessimism, I would say that it's only in those cases where it may cause something else to appear risk significance, would we worry about pessimism. Next.

Also, on that same presentation to ACNW, where Dave Esh said the NRC agrees that the margin between the analysis results and the performance objective can be considered when risk informing.

That seems clear enough and fundamentally consistent the DOE and EPRI approach. Then there was some concerns about combined effects that I think are less clear.

There was an example of several unrelated parameters, that together contribute to the highest risk, which I'll talk about on the next slide and then a little bit later.

There was an artificial equation that was provided as an example of how an outcome could be affected based on changing uncertainties. Next.

Okay, from Dave's presentation to the Committee last June, he gave this one example from their results which show just essentially that the first five realizations were the highest realization here.

And what he's point out was that in the highest realization three parameters are near edge of their uncertainty range and others are elsewhere. Well, this certainly isn't surprising.

We would expect for the highest realization you would get some parameters that are out toward the edge of their distribution and others could be somewhere else.

That's, like Monte Carlo would get you, when certain parts of the system contribute the most to your outcome. What it seemed like was that NRC was concerned that additional information collected on all three parameters will result in worse ranges.

Meaning that they were arguing now, okay, this is a combined effects and therefore you need to go get information on all three. And what I'm arguing is that it doesn't seem likely that new information is going to tend to move them all in a worse direction.

And that somehow didn't seem to get factored into their thinking. Next. Also in that presentation and in the report they talked about this artificial equation where the outcome was this particular formula here. They selected some base case ranges for each one of these three parameters and some new uncertainty ranges, and they showed that for the

selected base and new ranges that if all three parameters shifted to the new ranges, the probability weighted outcome is much larger than if each parameter range is shifted to its new range one at a time.

And this seemed to be NRC's argument against using just the one off sensitivity studies that DOE was doing in its risk prioritization report. What wasn't discussed and what I didn't understand was what's the likelihood that the new information you might collect about these three parameters would cause all three parameter ranges to shift to the new values.

I didn't understand that. Such an approach may make it impossible, I would argue, to prioritize work. You don't know what the new uncertainties are going to be, whether they're going to be shifted, especially in that direction, until all the work is completed.

It requires some speculation on new uncertainty distributions and which combinations of distributions you might get. And my concern is that this is just not a practical approach. Next.

So my concerns about NRC's combined effects thoughts, that it is well understood that particular combined effects cause the highest dose

realizations. Another example, if you have high net infiltration, high corrosion and high solubilities and you use a faster transport, which is a combination of these kinds of parameters, you're going to get a higher dose.

The above effects are largely independent. So the question is what's the likelihood that new information would cause multiple independent factors to all or even mostly shift in the wrong direction.

Hence, speculation about what we might have wrong that would require, that would require additional work if risk informed, should not be based on the concern that new information will cause several barriers to all change in the wrong direction. Next.

In the review of essentially the first baseline of risk insights report. There was a statement in their that staff judged risk significance by evaluating the impact of the requested information could have on current risk estimates and uncertainties in the risk estimates, taking into account the performance of multiple barriers, i.e. defense and depth.

So this suggests that NRC is considering more than a traditional uncertainty assessment approach. I think Bret talked to you about that.

That it's not just the uncertainty assessment, but somehow the need for multiple barriers is worked into their risk importance. I would argue and say, okay, well fine, there's a regulatory requirement for multiple barriers, but let's not mix this up with risk significance that you do when you get TSPA results and work on trying to understand the risk significance there. Next.

More on the philosophy that was in that first NRC risk insights report. It says generally the risk significance of an agreement is associated with the level of uncertainty addressed by the agreement and the relationship of the uncertainty to risk.

We agree it's a good approach. The level of uncertainty, I would argue, just depends on whether it's a risk important level of uncertainty or not. NRC does provide a nice, clear example of what they mean by this approach.

And they talk about high risk importance. Now I understand things have changed, but this is just an example here of uncertainty in rockfall initiators and we certainly believe that NRC's rockfall model was quite conservative and we certainly understand why then they would consider this high.

Lower risk importance would be the

uncertainty in the waste package mechanical integrity. They were worried about, again, the difference between initiators and the other things that follow behind it. And I can understand that difference in ranking based on that philosophy. Next.

The also talked about evaluating the agreements is not as simple as the above example, because many of the agreements are complex and interrelated, thus they had used judgement.

Indeed, many of the agreements are interrelated. In retrospect, it would have been nice to have simplified the final set of agreements, rather than leaving the current hodgepodge, but there we have it.

Hence, it is necessary to use judgement in determining risk importance, and we agree that we're going to have to use some judgement. Next.

NRC states its risks insights are based on TSP calculations and they include all of this supporting evidence. That's great, all appropriate. However, DOE should have already considered all of the above when developing its conceptual models and parameter ranges.

And I would argue that if NRC feels DOE did not do that properly, then that is largely a

separate issue and they'll need to do more research. Next.

NRC subjectively modified its quantitative risk assessments to determine risk importance to somehow include the concept of multiple barriers. There words about safety significance of individual barriers.

The effect essentially is to raise some of the issues higher in risk importance than traditional risk assessment approaches support on their own.

NRC introduces the concept of risk potential and I was real unclear on what that meant. But it seems to have to do with radiotoxicity and specific radionuclides, but it was unclear.

If so, this is not necessarily supportable based on current levels of understanding of the more radiotoxic nuclides. In other words, some are really well understood. We know what's, we know what's going to happen with those radionuclides and even though they're theoretically highly radiotoxic, we still don't care about them.

An example might be plutonium. If you really understand that it has low solubilities and high KDS and colloids aren't that important. It's radiotoxic but it's not that, we shouldn't even be

thinking about its potential in the sense of what's high risk and low risk.

Does the mere existence of a postulated risk potential imply risk significance, is the question I'm asking. Next. IN NRC's Attachment 2, they divided up their risk insights into these seven areas. Next.

They found no high risk important issues in the following, water infiltration, percolation and seepage. We agree and we still agree that there's still not high risk importance. NRC finds shallow infiltration to be of moderate importance to its potential effects in neptunian-237. I believe this now is the one that's high, Bret? Okay, seepage, okay.

We disagree with the moderate importance. Infiltration uncertainties won't cause even close to a significant change in overall dose.

We're concerned that this is one of those risk potential items, simply because it involves neptunian-237. Flow and transport in the UZ not high risk importance. We agree.

Biosphere and RMEI we agree but for slightly different reasons that I won't get into here, in terms of difference in our models and approaches.

Next.

They have some high risk important EBS degradation items. Some chemistry issues governing nature of salts that could develop on the drip shield. We agree in principle, as local chemical conditions could in some models cause a common mode failure.

When we wrote this, this is what we believed. We've done a lot more work now trying to do some analysis to address TRB's concerns that they're going to talk about next month. And we no longer feel that there's much of a chance that local chemical conditions could cause a common mode failure.

The existence of a passive film on the waste package. We disagree. We think that 100 percent of the packages can fail and those risks won't rise by one millirem per year. They also thought, at the time, that rockfall was a high risk importance, and again we disagree because we feel that NRC's rockfall model is conservative, so has biased their risk assessment. Next.

They thought that retardation in the alluvium was high risk importance, we disagree. Again, even no alluvium retardation does not cause dose risk to rise by anywhere near one millirem per year.

There are many other engineered and natural barriers that back that barrier up. Medium risk important items about the amount of transport in fractures verses porous media.

We agree that these are of some importance, although still not high. Next. In terms of igneous activity, there were several item. We agree that in principle igneous activity is a higher risk importance due to its possibility of common mode failures.

And I mentioned earlier that since we produced our report in December, 2003, we've done some more work and we think that there's been a lot of neglect and mitigating factors that we think will dramatically, meaning orders of magnitude, lower igneous eruption dose risks, and we'll publish that work in a couple of months. Next.

So our conclusion is that the EPRI normal release scenario dose risks are very low. The EPRI and DOE approaches determining FEP center barriers of high risk significance are fundamentally the same.

Essentially, standard probabilistic sensitivity analyses are only used. Additional combined effects consideration do not seem to be risk informed, from what I can tell.

EPRI partially agrees and partially disagrees with NRC's approach to determining risk significance. The disagreement is in the areas related to combined effects and risk potential.

And I just want to say that NRC may have a good reason to require work to support multiple barriers. It is a Part 63 requirement, but let's not confuse those regulatory requirements with risk significance. That's it.

CHAIRMAN GARRICK: Thank you. I would call that a marathon sprint.

(Laughter.)

CHAIRMAN GARRICK: Mike, you got any questions?

VICE CHAIRMAN RYAN:: I'm still catching up with the presentation. That was a lot of information. I'll hold off for the moment, thanks.

CHAIRMAN GARRICK: Okay, George.

MEMBER HORNBERGER: John, first of all, I know your life is pretty busy and perhaps even busier than normal now, so I'll thank you for making time to come here and do this presentation for us.

I know you did it on short notice and I wanted to let you know we appreciate.

MR. KESSLER: No problem, glad to be here.

MEMBER HORNBERGER: So much for being nice.

(Laughter.)

MEMBER HORNBERGER: Actually, my first question is for staff. Does, can the NRC staff require the DOE to submit all of the agreements before the license?

MR. MCCARTIN: Yes.

MEMBER HORNBERGER: Okay, that's what I thought. So I don't, I don't think that there can be any requirements. I think that probably we're talking more good feeling about interacting. That would be my sense.

MR. KESSLER: Okay.

MEMBER HORNBERGER: John, I thought it was quite interesting the way you presented this stuff, but, I forget which slide it was, but it was, you had the degree of information required to each licensing step. And you had Roman Numerals One, Two and Three.

And it, I wasn't, I thought there might have been a disconnect there in some of your, from some of your other conclusions. For example, why is it at closure that there should be complete information for full barrier reliance on the drip shield, if in fact your uncertainty analysis and everything else shows you that you're –

MR. KESSLER: It's a matter of what you describe, they are two separate issues. In the sense that what is complete information is relative to its relative risk importance.

So, the amount of information that's considered complete for some particular barrier or theft that may be of lower risk importance, is going to be a lot less information than some barrier or theft that's of higher risk importance.

MEMBER HORNBERGER: Don't you kind of mean enough, rather than complete?

MR. KESSLER: Enough, sure.

MEMBER HORNBERGER: Yeah, okay. That helps. And also just, I ask you, as you said, you were commenting on the earlier staff presentation.

MR. KESSLER: Yes.

MEMBER HORNBERGER: And what you heard today Bret give is that they are no longer using risk significance. They are using important to waste isolation. Does that resolve some of your concern about risk significance?

Because it's clear that Part 63, does require multiple barriers and the staff does have to review that.

MR. KESSLER: It does help that they're

getting away from risk significance tied to, you know, solely probabilistic, you know, uncertainties and information like that.

The question is what is important to waster isolation? How does one determine that and what are the regulatory requirements for demonstrating importance to waste isolation?

What I'm asking is, is that, okay, they're talking about important to waste isolation. If it has to do with what are the, we have to have multiple barriers and therefore we think that maybe what they've got now is something that's high for a particular barrier, that's great.

I still would argue then that we've gotten away from the relative importance of some of these things they consider high to overall dose risk. And therefore, something that's maybe high, say net infiltration, using against seepage, may not be that important to dose risk.

But it may be important to that particular barrier. Okay. So what is DOE supposed to do with that, when they have something that's called high for a particular barrier, but it may not be that high for dose risk.

Somehow there has to be some sort of

understanding that what's the dominant thing we're after here. To me that's public health and safety. That's the dose risk number for, in regulatory space.

And that should be what we focus on. I'm now concerned that if switch to importance to waste isolation, we've moved so far away from its relative importance to overall dose risk, that there again, may not be good focusing of resources.

MEMBER HORNBERGER: Okay, so then I guess I would ask you, then, how you would address the following kind of question that has been raised.

If we have such a robust waste package that we don't get any doses in the compliance period, then the geosphere doesn't matter at all.

MR. KESSLER: I wish that people would stop saying that.

MEMBER HORNBERGER: So do I.

MR. KESSLER: You've seen analyses from your own staff that suggest that there are other components of the system that matter a heck of a lot. Bret showed waste packages and drip shields failing to function.

I showed waste package and drip shields failing to function. We are having doses that are higher, but they are not huge. Both of us are showing

doses that are still less than background.

And compared to what the doses could if no barrier function, we are getting a huge amount of performance from things other than the drip shield and the barrier.

MEMBER HORNBERGER: Thank you, thank you.

MR. KESSLER: So, I don't like it when people say that.

MEMBER HORNBERGER: That's exactly what I was hoping you would say. So wouldn't you then say that there are components of the geosphere that are important for waste isolation?

MR. KESSLER: I would say that there are components of all the barriers that could be important to waste isolation, if other barriers didn't function.

So if you are interested in defense and depth, you want to show some basis for showing that those barriers exist. Okay?

MEMBER HORNBERGER: Right.

MR. KESSLER: And the amount of work you do to show the basis for those barriers and how much they exist should be, in my mind, more a function of the overall impact on dose risk and less on, you know, showing that a particular barrier is there.

MEMBER HORNBERGER: I think we probably

agree. I'm not sure, that last twist in the road may have gotten me. I mean we're agreeing that, I mean my point is obviously that the staff is saying that we want to show that there are natural barriers that are important for waster isolation.

MR. KESSLER: Right.

MEMBER HORNBERGER: And therefore, in an evaluation of what is important for waste isolation, some of these barriers will have high significance.

VICE CHAIRMAN RYAN:: George, I take kind of a view too, that you can't say that, well you made that sort of hypothetical statement if the packages work the geosphere doesn't matter.

To me, I think about them all as important to safety more or less, but it's not one substituting for another anywhere along the line. That's the key to me to keep it straight is that, you know, if you said, if you said, for example, the package is perfect, it works great, the geosphere doesn't matter.

The probability of the package failing is zero, the probability of the geosphere failing is one. You know what I mean? So, it doesn't work that way. That's why that statement doesn't hold water.

So I don't think about them in terms of importance to risk significance separate from one

another. It has to be a system. That's the whole point of a probabilistic approach, is that it's a system and you're trying to describe the behaviors within the system. Not trading one off versus another component. Does that make any sense? No, yes? Okay.

MEMBER HORNBERGER: Well, I should perhaps clarify. When I posed that question, it was to irritate John, not because I believed it. And what I wanted to stimulate was exactly his response.

Because what he said was that, no, the geosphere is important. And I believe that the staff, that is what they're aiming for in folding in that aspect of Part 63 that requires multiple barriers into their risk insights.

And you may quibble with the work risk there, but I think that Bret today, now, was very careful not to say this is a risk ranking. It is an importance ranking of some type.

MR. KESSLER: That's good. That is a good change in approach. I would agree with that. I guess all I'm saying is that I'm still not understanding, well maybe not until it's put into practice.

What is the balance between how much emphasis is placed on defending multiple barriers versus how much emphasis is placed on defending the

things that are most important to dose risk?

MEMBER HORNBERGER: Yeah, and you can tell that we're, we're worried about the same thing because we keep pressing, well, exactly how are you going to use these risk insights to prioritize. So we have the same feeling.

CHAIRMAN GARRICK: Ruth.

MEMBER WEINER: First of all, I'm very happy that somebody besides me uses the term dose risk. Thank you very much.

MR. KESSLER: I tried to come up with something when we have this particular criteria.

MEMBER WEINER: Yeah, we're always having to explain to people what it is. I want to get back to your slide that talks about when should risk important work be completed?

And I'm going to ask you, I mean that's a nice idea to say that because some of these barriers don't matter until a long time in the future, you don't need to, the level of detail that you need in assessing the efficiency of the barrier doesn't, you don't need that much level of detail until after the construction, until after the construction phase.

Could you tell, give me a counter-argument to that? Because I'm sure you know what the counter-

argument is. In other words, okay, why don't we do that? Why aren't we, why isn't NRC saying, okay, the level of detail you need for construction is lower so we'll just go ahead and, we'll get our details later, we'll go ahead with construction now.

And let DOE come in with the more detailed resolution of these KTIs at a later date. Why, what, you've given a nice argument, interesting argument for doing that. What is the argument for not doing that?

MR. KESSLER: I don't know. You're asking me to take a different position than the one I have?

MEMBER WEINER: Yeah, I'm asking you –

MR. KESSLER: I think that part of what we're thinking is this is merely a first of a kind. We do have a few repositories that have gone before, and there are other repositories that are under development or at least under investigation worldwide.

But this is more of an analogy to, you know, where we were at the beginning of reactor licensing. In that there was more we didn't know, so you wanted sort of this two stop or multiple stop licensing process, with certain degrees of information.

John, probably knows more about this than all the rest of us put together in terms of this came

about, but what we're also trying to come in here with is that there's a lot of time.

And what is it you need to know? Was it you can find out ten years from now, that you want to pull into the licensing process? Not, forgetting about the things you need to know now to proceed into the next stage of repository development.

And all I can say is that it makes a lot of sense to have your, your information collection and even your arguments and how much information is needed to be based on what are you at in the repository development process.

MEMBER WEINER: Don't you want to eliminate at this stage any possibility or almost any possibility, since we always talk probabilities, of the smoking gun?

I mean the logical argument against this is so what if you're down line, you've begun construction and you find out something in one of these details that is something that you didn't before and that's very –

MR. KESSLER: That's why you have a regulation for a reasonably maximally exposed individual at a fraction of the background with defense and depth through multiple barriers, with

already requiring to know a lot of information up-front, that you can't guarantee that you won't have any surprise that really is bad, but you could have sure done a lot to minimize it between the regulation, the, I would say the degrees of conservatism that are in the compliance regulation.

The amount of information that's already been collected is things you've done to help mitigate something like that happening.

MEMBER WEINER: So you would argue for some degree of conservatism?

MR. KESSLER: I would argue that it is a tool you could use if you wanted to and you need to, and you understood what was happening when you used the conservatism.

It is best to do what I believe this Committee suggests, which is to know, at least have some understanding of what your best estimate dose risk is. Not just the conservative one.

Otherwise, you don't know what that tool is? You don't know whether that's helping you or not.

MEMBER WEINER: Okay, thank you.

CHAIRMAN GARRICK: Well, I have a number of questions, but I'm going to have to table them for the most part, and we'll get to you some other time, John.

But I'm, just to draw you out a little bit, I want to play a game with you. And that is supposing you suddenly became the Czar of the Yucca Mountain Repository and you had complete control of the design.

And that you also had something to say about the regulatory impact. Can you just highlight very quickly some of the things about the design that you would change or do differently?

MR. KESSLER: Well, I'm not the Czar. I don't appreciate everything that's gone on in the program and I would say that there are certain things that maybe would have been nice to have started earlier, in terms of research and kept them going, a bit of hindsight.

But at the time decisions were made, sometimes they were, you know, understandable why things were cutoff or other research went ahead.

I don't know. I don't know what I would change. I can understand, fundamentally, why the design has evolved the way it has, based on information that came along.

I mean once we knew something more about what the net infiltration numbers were, there were design changes that were made there.

That's probably the dominant example of what's driving a design change in terms of what we understood about net infiltration. That's understandable why that was done. I'm not quite sure what you're asking me.

CHAIRMAN GARRICK: Well, I'm just, well I'm asking you that there's two basic barriers here. One, the natural barrier system, and two is the engineered barrier system.

There are things you can do with the natural barrier system of a design nature. Richard's barrier is one example. There's a lot of things you can do with respect to the engineered barrier system, and there's a lot of things that are being done that strike some people as being extremely conservative and other people not conservative enough.

But, just to pick specific examples, looking at the drip shield in the waste package. These are, these are where a lot of the attention is as far as the resolution of the agreements is concerned and as far as the performance of the repository.

And they are utilizing very exotic designs and very exotic materials that are costing a great deal of money. And I'm just curious, given the level

of expertise you have, the extent of continuity you have with the project.

The amount of analysis you've been engaging with respect to performance. What are some of the things that you've learned from that, that would suggest changes in, say, just those two features?

MR. KESSLER: Well, if I predicate my remarks thinking about the results of our performance assessment, which show doses around, there was risks of around ten to the minus six millirem per year at ten thousand years.

I would say that there are some opportunities for backing off on conservatism, making your life easier, things along those lines that could be done.

I think that some of what the Science and Technology Program is doing will get at some of those issues. I hope for their continuity so that longer term things than might actually help save money, since we know that is one of their goals, is brought to bear. Perhaps supporting some barriers that DOE, for whatever reason, have chosen not to support as well, could perhaps be better supported with some additional work.

It might ultimately get pulled back into the licensing process. One would hope that that would continue as well.

CHAIRMAN GARRICK: One final minor question. At the outset you presented your, the EPRI general approach of a simplified logic tree and you indicated that you did not, it was not a Monte Carlo.

That confused me a little bit because you followed that up with saying that you did calculate uncertainties at these branch points of your logic tree. What did you, how did you calculate your, and I assume your uncertainties are probability distributions. How did arrive at your probability distributions?

MR. KESSLER: Perhaps I didn't explain it well, but it, we are using the logic tree approach, but we weighed each branch. You know the outcome we get from branch by its weight, its probability weight and then we sum them up –

CHAIRMAN GARRICK: But how do you get the distributions themselves? Monte Carlo is nothing more than a method of doing probability arithmetic.

MR. KESSLER: Right, right.

CHAIRMAN GARRICK: It's not a magic wand for creating probabilities.

MR. KESSLER: Well, we're ordering them by outcomes. So, you know, we have a fifth percentile and a fiftieth and a ninety-fifth percentile based on our probabilities. Is that what you're asking?

CHAIRMAN GARRICK: No, I'm asking how you get the fifth percentile. The distribution. How do get the probabilities at the branch points?

MR. KESSLER: They are based on data, based on expert judgement, some are both.

CHAIRMAN GARRICK: Okay, are these basically discreet probability distributions –

MR. KESSLER: Yes.

CHAIRMAN GARRICK: – that you, you –

MR. KESSLER: Right, right. So on this one we only have, we only have three branches. We don't have, we don't have a continuous range. We have three branches. So that this is a discreet value of parameters that affect net infiltration that we've assigned a probability of .05 to, and so on.

For these solubilities out here, we have three solubility numbers we'll pick for, say, plutonium and we will assign probabilities to those numbers.

CHAIRMAN GARRICK: And those assignments are basically based on your state of knowledge about

those?

MR. KESSLER: Yes.

CHAIRMAN GARRICK: Okay, very good. As George said, we are very pleased that you, on short notice, came and visited with us. We hope it will happen again. These are always stimulating discussions and you kind of represent the conscience of industry and we appreciate having that input and we'll look forward to seeing you again.

And what I'm going to do is, unless somebody else has a question. Do you have a question? Jim, anybody from staff? I'm going to adjourn the Committee for five minutes. We will not need the Court Reporter in the next session.

(Whereupon, the foregoing matter was concluded at 5:06 p.m.)