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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)

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6 149th MEETING

7 + + + + +

8 WEDNESDAY,

9 APRIL 21, 2004

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11 ROCKVILLE, MARYLAND

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14 The subcommittee met at the Nuclear

15 Regulatory Commission, Two White Flint North,

16 Room T2B3, 11545 Rockville Pike, at 8:30 a.m., B. John

17 Garrick, Chairman, presiding.

18

19 COMMITTEE MEMBERS:

20 B. JOHN GARRICK, Chairman

21 MICHAEL T. RYAN, Vice Chairman

22 GEORGE M. HORNBERGER, Member

23 RUTH F. WEINER, Member

24

25

1 ACNW STAFF PRESENT:

2 JOHN LARKINS, Executive Director, ACRS/ACNW

3 NEIL M. COLEMAN, ACNW Staff

4 HOWARD J. LARSON, Special Assistant, ACRS/ACNW

5 RICHARD K. MAJOR, ACNW Staff

6

7 ALSO PRESENT:

8 DONALD BECKMAN

9 ADAM CLINGER

10 TIMOTHY C. GUNTER

11 GREGORY HATCHETT

12 CHRISTOPHER McKENNEY

13 DAN SCHULTHEISZ

14 JOHN TRAPP

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I-N-D-E-X

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

2 (8:33 a.m.)

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

9 Also present is Jim Clarke, one of our
10 consultants.

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

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

25 Howard Larson is the Designated Federal

1 Official for today's initial session. As usual, this
2 meeting is being conducted in accordance with the
3 provisions of the Federal Advisory Committee Act. The
4 committee has received no written comments or requests
5 for time to make oral statements from members of the
6 public regarding today's sessions.
7 And should anyone wish to do so, please
8 contact a committee member or staff member and we will
9 make the necessary arrangements. As usual, it is
10 requested that the speakers use the microphone,
11 identify themselves, and speak clearly and loudly, so
12 that we won't miss a word.
13 All right. The first item on our agenda
14 this morning is the EPA presentation. The committee
15 member that is -- has the lead on this particular
16 topic is Mike Ryan, and I'm going to turn it over to
17 Mike now.
18 VICE CHAIRMAN RYAN: Thank you, Mr.
19 Chairman, and good morning.
20 This morning's briefing is on an
21 interesting area. Dan Schultheisz, the Radiation
22 Protection Division representative from the
23 Environmental Protection Agency is going to talk about
24 their advanced notice for proposed rulemaking on low-
25 activity waste. So without further ado, Dan, I'll

1 turn the meeting over to you. And welcome, and thank
2 you for being with us today.
3 MR. SCHULTHEISZ: Okay. Thank you. Can
4 everybody hear okay? Is this mike working okay?
5 I want to thank the committee and Howard
6 Larson for asking us to be here and working with
7 setting up a time to do this. And before I start, I
8 want to introduce -- there are several other people
9 here who have been working on this from the EPA site
10 -- Adam Clinger is the Director of our Center for
11 Waste Management where this effort is being housed;
12 Elliot Zennick is with our Office of General Counsel;
13 and Ken Kszynski, who just came in, is managing our
14 technical work for the modeling aspects of it that
15 we'll be talking about.
16 So as we get into this, hopefully there
17 will be plenty of time for questions and discussion.
18 And if you have detailed questions on any of the
19 aspects about modeling, you know, Ken is the one who
20 would probably be taking the lead on answering those.
21 Could I get the next slide, please? Okay.
22 So what I want to talk about today is just
23 the ANPR, give you an update on the status and the
24 purpose of it, some of the environmental concerns that
25 we're trying to address with this, the regulatory

1 context of the whole effort driving this as well, and
2 then some specifics about what's in the ANPR and why
3 we have taken certain approaches in outlining what
4 we've done in this notice, talk about the stakeholder
5 reaction and the public comment we received to this
6 date. The public comment period is still open. And
7 then where we expect to go from this point.
8 Next slide, please.
9 The status we published in November --
10 November 18th -- and we originally had the comment
11 period was ending 120 days later in March. We got a
12 number of requests for extensions, so we extended the
13 comment period by 60 days and it will end now
14 May 17th. So we have a little bit less than a month
15 left in the comment period.
16 And during that time, one of the reasons
17 why we got a number of requests from public interest
18 groups was their concern that local communities that
19 were near the facilities that might be affected by any
20 action that we might take needed to be aware of this
21 and have -- really have the opportunity to comment.
22 And so we are taking some additional steps to try to
23 make those communities aware of what -- we're giving
24 them some additional information and background to
25 give us some comments on on this.

1 Next slide, please.

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

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

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

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

1 this country and to help us see how best we can deal
2 with those issues.
3 Some of the environmental concerns that we
4 see that we could address, or hopefully we could
5 address by this kind of an approach, is just the idea
6 of the limited disposal options for different kinds of
7 waste that are out there. In some cases, efficient
8 disposal is frustrated. Dual regulation and
9 consistent regulation, mixed waste, has been a -- kind
10 of a chronic problem for the past decade or so, and
11 hopefully we can help ease some of those concerns.
12 Waste is continued to be stored onsite by
13 generators, because they have limited disposal options
14 or are unsure exactly where their options are and what
15 the liabilities are, and so continued storage --
16 obviously, there is additional opportunity for
17 mishandling or for losing track of the waste or for
18 releases, and we want to try to discourage that.
19 Transportation risk -- we have limited
20 disposal options. People have to send their waste
21 longer distances to get it there. And not only are
22 there radiation-related transportation issues; there
23 are also the other environmental impacts from
24 continued transportation.
25 The inconsistency of regulation -- in

1 particular, the TENORM-type wastes that are primarily
2 a state responsibility, but the states take different
3 approaches to them. They have different regulatory
4 agencies that have jurisdiction over TENORM wastes,
5 and they may be encouraging disposal practices that we
6 don't believe are protective.
7 And so the result of all of this is that
8 there are, you know, potentially increased exposures
9 and risks to public health and the environment that we
10 hopefully could address.
11 Next slide, please.
12 When we start talking about the regulatory
13 context, you know, we -- there has been a lot of talk
14 concerning -- about the -- sort of the origin-based,
15 definitional-based system that we have in this
16 country, low-level waste, mill tailings, TENORM, those
17 kinds of things. So we know there are a limited
18 number of sites for low-level waste.
19 One of those -- Barnwell -- will become
20 increasingly unavailable to most generators, and they
21 typically do not accept mixed waste. Envirocare does
22 have some mixed waste capability, but as the only
23 option there's always efficiencies that when you have
24 additional options that are protective.
25 Mill tailings -- the issue there over the

1 past few years has been the formerly utilized sites'
2 remedial action program that was -- switched
3 jurisdiction from the Department of Energy to the
4 Corps of Engineers, and at that time the waste that
5 was generated under that program would have fell
6 through the regulatory gaps that nobody had really
7 foreseen.
8 There was a lot of concern about that a
9 few years ago, but there are still ongoing cleanups,
10 significant volumes to be dealt with of those kinds of
11 wastes, and there would be more sites added to the
12 list for that program. It's very likely there have
13 been some added already.
14 And then TENORM also has large volumes,
15 not really regulated at the federal level, unless it's
16 actually Department of Energy TENORM. The states are
17 inconsistent in their approaches to it. And I
18 mentioned earlier existing disposal practices that may
19 need some additional scrutiny, such as land spreading
20 or uncontrolled burial or simply surface-type disposal
21 of waste.
22 Next slide.
23 What we have done leading up to this --
24 typically, we have focused on mixed waste and have
25 worked with NRC in a number of areas to try to deal

1 with mixed waste issues. That makes sense, because we
2 have jurisdiction over the hazardous part of that
3 waste under RCRA. We have generated some guidance on
4 mixed waste disposal, disposal facilities on how to do
5 sampling for mixed waste.
6 The NRC position in 1997 on disposal of
7 cesium-contaminated electric arc furnace dust from the
8 steel industry was -- used the approach of allowing
9 disposal at hazardous waste landfills regulated by
10 EPA. It was a dose-based position. That is a -- it's
11 a branch technical position, not a regulation. So
12 there's a little bit of difference there.
13 We had for years had a low priority
14 enforcement policy on storage of mixed waste, not
15 necessarily requiring them to get a RCRA permit if
16 they were storing beyond 90 days, recognizing the
17 difficulty in finding outlets for treatment and
18 disposal of that waste.
19 And then in May 2001 our Office of Solid
20 Waste issued a rule that offered conditional exemption
21 for mixed waste from the RCRA regulations as long as
22 management was done in accordance with the NRC
23 license. So that regulation covered storage,
24 treatment, transportation, and disposal.
25 And up to this point that's a rule that is

1 optional for states to adopt -- states that are
2 authorized to implement the RCRA program, which is
3 most of them. And to this point about a third of the
4 states have adopted some or all of the rule, but only
5 one has been authorized to implement it, and that's
6 Virginia.
7 The concern there is that the three states
8 that have low-level waste disposal capacity will not
9 be adopting the part that deals with disposal. So
10 there is some concern that there would not be relief
11 for disposal of mixed waste from that rule, but time
12 will tell.
13 This particular ANPR is an outgrowth of
14 work we did in 1999. We actually had a proposal that
15 focused on mixed waste from NRC and agreement state
16 licensees. We actually got that as far as the Office
17 of Management and Budget, and then we were confronted
18 with some jurisdictional issues with the other
19 agencies and could not resolve them at that time, and
20 so we ended up withdrawing that proposal.
21 This ANPR looks at a broader waste
22 universe beyond mixed waste, beyond the NRC and
23 agreement state mixed waste, and is taking kind of a
24 bigger picture look at the whole system, looking at
25 the origin-based system and seeing is there a rational

1 way to address that and make things more consistent
2 across the board.
3 Next slide, please.
4 So our overall approach, which we've
5 described in the ANPR, is to see if there are
6 additional protective disposal options that can be
7 identified appropriate to the risk from the waste,
8 rather than the origin of the waste or the statutory
9 definition.
10 Looking at how would you apply consistent
11 methods to evaluate those risks of these different
12 kinds of waste -- waste forms, generating industries
13 -- regardless of where they actually come from. And
14 with this we are looking at the lower activity end of
15 the spectrum as most suited to these kinds of
16 considerations.
17 The higher activity waste you want to
18 really maintain the controls that are inherent in the
19 Part 61 system, and for the most part the really
20 higher activity TENORM wastes I think are getting
21 attention from the states, even if they're not always
22 handled in the way that is most effective.
23 But to offer the most relief, since most
24 of the -- kind of the pyramid of radioactive waste,
25 most -- the bases, the lower activity waste, the

1 larger volumes of mildly contaminated waste, that may
2 be most suited to looking at additional disposal
3 options.
4 And then, finally, what are the
5 appropriate regulatory controls that need to be
6 maintained over this waste? If you're looking at a
7 risk-based disposal system, the disposal system itself
8 should have the proper protections, but there may be
9 some additional things that you would want to bring
10 along to ensure that the system operated properly and
11 to maintain the confidence of the public and the
12 regulatory agency.
13 Next slide, please.
14 So we also think that if you're providing
15 additional protective disposal options, you'd have
16 greater public health protection, because you'd be
17 providing more options. A lot of the wastes that
18 maybe not now are being dealt with because of the
19 concerns about availability or cost would have
20 additional destinations for those.
21 More efficient use of resources in risk
22 reduction -- looking at the lower activity waste and
23 planning additional homes for them frees up some
24 resources to deal with the higher activity waste and
25 also with the pressing site cleanups that may now not

1 be moving as quickly as possible because of the
2 concerns about waste disposal.
3 The next point is on that -- more
4 efficient site cleanups. Department of Energy in
5 particular has accelerated cleanup schedules, and they
6 are going to be generating probably large volumes of
7 slightly contaminated soils and debris, and it would
8 be helpful for those activities to have clear
9 opportunities for disposal that would offer the
10 appropriate protection.
11 More efficient state decisionmaking --
12 right now a lot of the decisions are being made on a
13 case-by-case basis. The NRC process -- 10 CFR 20.2002
14 or the state equivalents, the state equivalents for
15 TENORM, they might have some -- a consistent process
16 that they can apply and not be bogged down in these
17 individual applications for specific cases.
18 Next slide, please.
19 Moving on to some specifics and what's in
20 the ANPR, we introduce this concept of low activity as
21 we're applying it and do not have a current statutory
22 or regulatory definition. We recognize that
23 Department of Energy has been using this term really
24 in the context of dealing with the tank waste at
25 Hanford and Savannah River.

1 We are using it in a somewhat different
2 way than what they are, focusing on the radiation
3 content of the waste rather than the origin and
4 evaluating the safety for the material in question.
5 And the potential universe of low-activity
6 waste -- what we have discussed in most detail in the
7 notice are mixed waste, TENORM, low-level waste,
8 uranium or thorium ore processing waste, and NRC-
9 exempt or unimportant quantities of waste. And we
10 will look at DOE waste as well as commercial waste to
11 see if that's an appropriate --
12 VICE CHAIRMAN RYAN: Dan, could you go
13 back and expand on that second bullet, please, on the
14 previous slide? I think that's real important as we
15 go forward. It's the focus on the radionuclide rather
16 than the origin.
17 MR. SCHULTHEISZ: Oh. Next --
18 VICE CHAIRMAN RYAN: You skipped over a
19 slide.
20 MR. SCHULTHEISZ: Next slide?
21 VICE CHAIRMAN RYAN: There you go. The
22 middle bullet -- you know, if you could expand on your
23 thinking, then I think that's a real important
24 observation that -- you're kind of shifting from
25 source special nuclear byproduct and all of the other

1 early definitions which are origin-based to I guess a
2 risk basis. Would that be a fair comment?
3 MR. SCHULTHEISZ: I think --
4 VICE CHAIRMAN RYAN: Tell us a little bit
5 about that.
6 MR. SCHULTHEISZ: The system has evolved
7 over the years in sort of a piecemeal way. As each
8 type of waste or process that's under control has been
9 identified, there has been disposal identified for
10 them. So you have -- from the original Atomic Energy
11 Act, you have the source special nuclear byproduct
12 material, led to the distinctions of spent fuel, high-
13 level waste, transuranic waste, low-level waste.
14 But then you had, say, the Uranium Mill
15 Tailings Control Act of '78 that identified a specific
16 problem and offered specific regulations and
17 approaches to that.
18 And then there is the TENORM waste where
19 there has not been -- it has fallen largely to the
20 states to deal with those kinds of things, and they
21 have taken various approaches to it, not typically
22 based on the risk from the waste. And so their -- the
23 practices that they have allowed have not necessarily
24 -- in terms of land spreading or those kinds of
25 things, have not been really focused on the risk from

1 disposal.

2 And so we think that there can be some

3 efficiency and some consistency brought to this if we

4 look at this. The radioactive -- in the context of

5 what EPA has done for hazardous waste, we identify

6 hazardous waste based on risk. What is the risk for

7 the material as it's being generated? If it's in the

8 environment, what are the overall risks? And then,

9 those things fall into the hazardous waste system, and

10 there is one sort of way to dispose of hazardous

11 waste.

12 We think it would be a reasonable step to

13 look at the different kinds of radioactive waste and

14 say, "What are the risks attendant to these specific

15 things?" Right now, there are TENORM wastes out there

16 that present higher risks than low-level waste. But

17 there are clearly less regulatory controls and

18 requirements that deal with their disposal.

19 One of the things that we are confronting

20 now is that a number of states and localities are

21 being faced with residuals from their drinking water

22 treatment, and the radium standards and the new

23 uranium standard, in some cases those can be very

24 high, up to say 50,000 picocuries per gram of radium,

25 depending on the type of -- the treatment process they

1 have adopted.

2 And so we have gotten an increasing number

3 of requests from system operators and states to help

4 them deal with that, because it's not low-level waste

5 and they don't really have the -- you know, the

6 mechanisms in place to deal with what are the risks

7 from those wastes.

8 And there are a number of TENORM type

9 wastes, you know, in that -- in that kind of category.

10 And we just think that it would make a lot of sense to

11 look at -- to strip away the regulatory definitions

12 and look at the risk -- the underlying risk from the

13 waste and see if there is some way that you can build

14 a level at which those risks can be addressed by other

15 disposal options that have been previously identified.

16 I don't know. Does that help answer your

17 question?

18 VICE CHAIRMAN RYAN: That's great.

19 Thanks.

20 MR. SCHULTHEISZ: Next slide.

21 Okay. So in addition to the -- sort of

22 the conceptual ideas, we discuss in particular some of

23 the methods and the modeling that we could use to

24 define low-activity waste. Right now it's a concept.

25 We have to put some bounds around it. What are the

1 numbers that go along with these risk ideas?

2 Specifically, we talk about hazardous

3 waste landfills as a potential destination for low-

4 activity waste. We think, you know, that they are

5 fairly robust in their engineering and regulatory

6 requirements, and in a lot of cases are being used now

7 for certain types of material.

8 We talk about the regulatory and

9 potentially non-regulatory mechanisms that could be

10 used to bring some efficiencies and alleviate the

11 pressures on the states to make decisions now, and ask

12 a lot of questions. If you looked through the notice,

13 there are a lot of questions. Some of them are very

14 specific; others are more broad and conceptual as, is

15 this a good idea?

16 So, next slide, please.

17 Some specifics on how we are talking about

18 defining low-activity waste. Risk modeling in

19 particular, similar to the way the radioactive waste

20 facilities are judged, but we would look at, how would

21 you limit the amount of radioactivity in the disposal

22 cell or have some confidence at closure that you know

23 what the inventory is going to be?

24 Some basic scenarios looking at the long-

25 term performance of the unit, the basic performance

1 assessment, modeling the Subtitle C engineering
2 requirements with sort of a national database of
3 characteristics that we use in RCRA. We are trying to
4 meld the two approaches here.
5 Post-closure site use -- an intruder-type
6 scenario. RCRA has limitations on the use of the
7 site, but it doesn't require government ownership.
8 Part of the ways that we can build the confidence that
9 -- any post-closure disruption of the site would be
10 within the acceptable risk criteria.
11 And then the facility workers -- this may
12 be a limiting scenario for many of the radionuclides,
13 particularly the shorter-lived nuclides. RCRA
14 facility workers, if you want them to be just
15 considered RCRA facility workers, you know, you have
16 to kind of limit their exposures and see how, in the
17 typical course of their duties, they might be coming
18 into the contact or proximity to waste that could give
19 them exposure.
20 As I said before, the same type of
21 analyses typically used for years to look at low-level
22 waste facilities and other radioactive waste
23 facilities. Protected performance, not design, as a
24 key factor -- that is one of the -- one of the
25 comments that we get continually is these facilities

1 weren't designed for radioactive waste. It's a little
2 bit misleading, because I can look at a low-level
3 waste facility, and I can say, "Well, is the design
4 consistent with the requirements for hazardous waste
5 disposal?" And I can say yes or no, because they are
6 very detailed and specific in the regulations.
7 You can't necessarily do the same thing
8 with a RCRA hazardous waste landfill, say, "Was this
9 facility designed for -- is the design acceptable for
10 low-activity radioactive waste?" I have to do an
11 analysis of the performance to determine whether
12 that's the case or not. So we are, as I said, melding
13 the two approaches to some extent.
14 And the behavior of the radioactive
15 constituents is based on their chemical
16 characteristics. They are subject to the same
17 influences -- pH, Kd's, soil type -- as the hazardous
18 constituents in determining how they behave in the
19 disposal cell and how if they are released into the
20 underlying soil how well they would travel and migrate
21 to a potential receptor.
22 That's another comment we get is a lot of
23 concern about mixing the two, the potential impacts on
24 radioactive -- the radionuclide mobility of the
25 chemical constituent. And our -- you can do certain

1 things within the modeling to try to simulate those
2 effects, and we will be doing those.
3 And then there are other supporting
4 criteria that are also applied in radioactive waste
5 disposal, the sum of the fractions approach, looking
6 at activity caps or volume caps, specific
7 radionuclides or overall activity, waste form
8 requirements -- is it better to require a specific
9 solidified waste form? What does that say about
10 accepting bulk waste, like contaminated soils? We
11 should have a reasonable -- is there a distinction you
12 can make for those bulk wastes?
13 Next slide, please.
14 And looking specifically at the hazardous
15 waste landfills, as I said before they have very
16 explicit design and engineering requirements in the
17 regulations themselves, and the regulation --
18 regulatory framework, as we see it, is very
19 comprehensive and detailed and well suited as a
20 foundation for determining whether you need to apply
21 some additional controls or confidence-building
22 mechanisms to -- from the radioactive waste disposal
23 paradigm that would help build some confidence in the
24 approach.
25 They are designed, constructed to contain

1 chemicals that present significant risk to public
2 health, though they are deemed to provide a
3 significant level of protection from these toxic and
4 otherwise hazardous materials.
5 They have been used for radioactive
6 material, most prominently for TENORM wastes. Some
7 facilities have specific permit conditions that allow
8 them to accept certain activities of TENORM waste.
9 They have also been used for mill tailings, the FUSRAP
10 waste, right now are going to some 30 Subtitle C
11 facilities.
12 And then the case-by-case consideration,
13 specific application to NRC or the state to allow
14 disposal of Atomic Energy Act material in those
15 facilities.
16 We do in our ANPR -- we ask for comment on
17 other types of landfills, and specifically the one
18 that gets the most attention is the solid waste
19 landfill, the Subtitle D landfill, either municipal
20 solid waste or an industrial waste landfill. We
21 thought that it was important for us not to limit the
22 scope of this but to broadly ask the question, because
23 these facilities are to some extent being used for
24 radioactive waste.
25 Texas has a regulation that allows waste

1 with less than a 300-day half life to go to a
2 Subtitle D facility. Other cases, decommissioning
3 cases, the Big Rock Point case in Michigan, NRC and
4 the state aggrieved that certain decommissioning waste
5 construction rubble could go to a municipal landfill,
6 and that has gone reasonably well.
7 And what they found at that landfill --
8 they had some concerns about the material coming
9 through, what they found at the landfill is that the
10 waste from the nuclear plant is not setting off the
11 monitoring, the portal monitoring.
12 But now that they've started looking more
13 closely, some of the clean cover material they've been
14 bringing in from the oil and gas sites has actually
15 been setting off the portal monitor. So they've been
16 accepting higher activity waste for some time, and
17 that is the case, actually, at many of the Subtitle D
18 facilities.
19 If they're in high background areas,
20 they're using clean cover that may actually be higher
21 in activity than some of the waste that they're --
22 that is of concern and is being regulated.
23 Next slide, please.
24 So how can we use that infrastructure,
25 that hazardous waste infrastructure, and demonstrate

1 that it's protective for low-activity radioactive
2 waste? The basic step is to take the basic consistent
3 and RCRA technology, which is consistent from any
4 facility -- there is -- they have to meet these
5 certain basic requirements -- and to assess that with
6 the performance modeling approach of the radioactive
7 waste world.
8 We would look at the same standards of
9 protectiveness that we, the EPA, then apply to other
10 radiation situations and for other pollutants.
11 Doesn't give special treatment. We have standards
12 that we apply to the basic risk criteria, to all
13 pollutants, all programs, and this would be another
14 application of that, and applying other measures
15 common to radioactive waste disposal to increase the
16 confidence.
17 I mentioned a few of those earlier -- caps
18 and some of the fractions. But in looking at the
19 distinctions between, say, Part 61 or UMTRCA and RCRA,
20 some of the ones that stand out are the post-closure
21 care requirements, the government ownership
22 requirements, and those kinds of things.
23 Next slide, please.
24 So looking at the regulatory aspects of
25 this, we recognize that to deal with licensees NRC is

1 going to have to take some action to allow waste to go
2 to other than Part 61 facilities on a regular basis.
3 And we have worked with NRC to try to
4 identify what those might be, and they helped -- and
5 they provide some language for the ANPR and were
6 generally involved in reviewing, and we commented back
7 and forth. We have gotten a lot of good advice from
8 them, and we are sort of educating each other on how
9 the different worlds work.
10 Those actions could include the license --
11 some form of licensing for the disposal facility, a
12 specific license for which the facility would have to
13 apply, or a general license that would appear in the
14 rule. And this license could be something very
15 simple. The range could be -- adopt various parts of
16 the Part 61 framework, or it could be something, you
17 know, anywhere along that spectrum.
18 An exemption for the disposal facility to
19 say, "If you do it this way, we don't need to regulate
20 you anymore. You know, you're under the EPA umbrella
21 by virtue of going to their disposal facility." Or
22 some -- or, in addition to, there could be some
23 regulation of the generator to allow a material
24 transfer to an unlicensed or exempted facility.
25 I'd point out that the Department of

1 Energy has an authorized limits process that is
2 similar to the exemption approach which they have in
3 their DOE orders, whereby they do an analysis of the
4 specific wastes that they want to send offsite.
5 They coordinate with the state and the
6 disposal facility, and after that they declare that
7 it's no longer subject to their Atomic Energy Act
8 authority. It's -- they are releasing it using that
9 authority to this commercial disposal facility, and
10 they have used a number of facilities around the
11 country for specific applications of that process.
12 Next slide, please.
13 We are also talking to some extent about
14 non-regulatory approaches. The wastes that we are
15 looking at are -- they fall under a number of
16 different authorities or jurisdictions or regulatory
17 agencies, and it's not clear that they can all be
18 brought into one -- one comprehensive approach. And,
19 in particular, the state requirements related to
20 TENORM, it's not clear what -- the regulatory
21 authority that we could apply to those wastes without
22 having the states come along and agree with that.
23 So we are also considering what non-
24 regulatory approaches might be used to supplement the
25 existing regulations or other regulations we might put

1 out to help make the system more efficient. Some of
2 the things we talk about in particular are guidance on
3 disposal practices.
4 To help support the states, as they have
5 applications, as they see different types of waste,
6 one of the big problems, when there was the FUSRAP
7 waste, when it first became a problem was the states
8 had never dealt with it before.
9 They had no real understanding of where it
10 was coming from or why it was different from 11E2
11 waste, and so they were not equipped to make those
12 kinds of decisions about what they should allow and
13 shouldn't allow. And so there are some concerns about
14 the practices that were permitted at that time.
15 And as an example, we -- about a year ago
16 we issued a guide for industrial waste management that
17 was prepared with states, industry, environmental
18 groups, the public, to deal with industrial solid
19 waste facilities, and dealing with a whole range of
20 issues related to siting, risk assessment, management,
21 operation, closure, all of those kinds of things, and
22 that could be kind of an example of the way that we
23 might be able to provide some useful guidance in this
24 topic.
25 Best practices programs, work with the

1 industries and the states to figure out what is the
2 best thing to do with these wastes and help them deal
3 with things. There could be something real formal or
4 structured, something along the lines of the ISO 14001
5 series of environmental management system standards
6 that would, you know, provide the industries with
7 opportunities to identify the aspects of their
8 operations that they need to pay more attention to the
9 radiation issues.
10 A lot of the industries, the TENORM type
11 industries, you know, radiation is not a -- is kind of
12 a latecomer to their concerns. They have not paid
13 that much attention to the radiation issues associated
14 with their waste.
15 We also have some examples of industry-
16 specific MOUs. We handle, with the American Hospital
17 Association, sets out some specific goals for waste
18 management, waste reduction. One of the goals they
19 have is to eliminate mercury waste altogether by the
20 year 2005. And it identifies other opportunities for
21 waste reduction, and these MOUs could deal with things
22 like funding and other support mechanisms.
23 So we talk about those broadly, just to
24 see if there are things we can do apart from
25 regulation or in addition to regulation that could

1 provide support for more efficient and more effective
2 waste management.
3 Next slide, please.
4 Some of the major uncertainties that we
5 have at this point, and are going to have to deal with
6 in -- you know, in some detail, is -- the basic one
7 is, how much waste is eligible? Where does it come
8 from? Depends on the technical analyses that we apply
9 to it, the other criteria, the screening-type
10 criteria, limitation criteria that might be necessary
11 to put on it. But that's a major uncertainty, and it
12 kind of drives the whole question of stakeholder
13 acceptance.
14 Another one is the need and level of NRC
15 oversight is not clear. I outlined the specific
16 regulatory approaches that are out there for -- that
17 they've indicated might be appropriate, but which one,
18 and how detailed are they? And where is the line
19 being drawn between NRC actually regulating those
20 facilities and deferring to the current EPA
21 regulation? Or, in most cases, it's the state that's
22 regulating it on -- in their -- through their RCRA
23 authorization.
24 The level of stated support and adoption
25 for it is not clear. They have some real questions

1 about, how is this going to work, and whether this --
2 there is political support. If we outline something
3 very detailed that seems to be protective, can we
4 override some of the concerns that have been expressed
5 by the states about radiation in general?
6 The disposal facility and generator
7 concerns about the liability and the public
8 perception. And for the disposal facilities, this is
9 almost directly tied to the volumes. They have to
10 make some economic case for themselves, and they can't
11 really do that unless they know, what are the volumes
12 of waste that they could potentially take care of?
13 And then they have to have concerns about
14 how is our taking that waste going to affect our
15 current customers who may not want to send waste to a
16 facility that is now accepting that kind of waste.
17 And they are public -- for the most part publicly
18 traded companies, and have concerns about their public
19 image. And those are also the case for generators.
20 They don't want to be seen as doing something that the
21 public will not accept or see as somewhat bending the
22 rules.
23 Leads to the next point -- public
24 acceptance. One of the things we have to get -- we
25 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

1 RCRA system a bit. It's a little -- it kind of takes
2 us aback to hear people talk about moving into that
3 system as being deregulatory when the history of it is
4 that people who are in it think it's maybe too strict.
5 We've had some concern that things that we
6 do might affect existing management practices at
7 Department of Energy, Corps of Engineers. Corps of
8 Engineers is concerned that their FUSRAP program, you
9 know, not be hampered. There are other cleanup and
10 disposal practices. DOE has their own authorized
11 limits process and are working within that. And they
12 don't want to see something happen that would cast
13 that as a not protective practice.
14 Well, we heard from the states, primarily
15 from the state regulators. They support this concept,
16 and the approach seems reasonable. But to some
17 extent, they're not sure that it's needed. Some of
18 the comments we have gotten from a couple of the
19 states say, "You haven't demonstrated that there's
20 really a need for this."
21 And how would it be implemented in the
22 states. That's another big concern.
23 They have also expressed interest in a
24 coordinated federal approach, and to some extent have
25 been pleased that we and NRC have worked closely

1 together in developing this ANPR.

2 Waste generators -- what we have expected

3 all along, status quo discourages the efficient

4 disposal of material. You should be able to send

5 things that are not high-risk material to

6 appropriately protective disposal sites and not have

7 to -- you know, just because they came from this kind

8 of facility, they shouldn't have to be dealt with in

9 the way that much higher activity, much higher risk

10 material is.

11 We've talked to some -- several of the

12 Subtitle C facility operators. They've expressed some

13 interest in exploring this further. They don't want

14 to commit to anything. I talked a little bit before

15 about the tradeoffs and considerations that they have

16 to go through. Well, for them, probably a big key is

17 the state and public buy-in. If they could be

18 satisfied that the state and the public were going to

19 be accepting of this, then it comes down to basically

20 an economic decision. That's something they're very

21 comfortable with.

22 So we have to define this better. As we

23 go through this with the technical analyses, we have

24 to try to scope out what those wastes are and where

25 the volumes are.

1 Next slide, please.

2 So some of the specific comments we've

3 gotten so far -- as of yesterday morning, we had 115

4 comments in our docket. We have some others that have

5 not been posted to the docket. Most of them have been

6 opposed, but not very detailed. This doesn't show up

7 very well, but in your handout you can -- we have this

8 electronic docketing system now, and anybody can look

9 at the comments that have been posted to this point.

10 So it's www.epa.gov/edocket. And then if

11 you look at -- if you open dockets, and this is the

12 docket number, and the -- if there's a pdf icon, you

13 would select that. If not, you would just select the

14 number of the comment, because they would have

15 commented directly through this electronic docketing

16 system. But if they send an e-mail or a letter, it

17 gets scanned and posted out of a pdf file.

18 So you can all look at the comments that

19 we've gotten to this point. It's not clear how

20 quickly they get posted, and we do have some that we

21 need to get to the docket for them to post.

22 We've also received well over 100 --

23 probably over 200 now -- e-mails and letters to the

24 Administrator, most of which have been highly opposed.

25 We've gotten letters from two Senators thus far --

1 Senators Feinstein and Campbell -- both expressing
2 concern, although in somewhat different ways.
3 Senator Feinstein was much more critical
4 in her concerns. Senator Campbell was more -- asking
5 more a question, which is, "This is what I've read
6 about this, but you can't believe everything you read.
7 So is this really true?" So we have responded to
8 them, and we've also done a briefing for several of
9 the Senators' staffs and may get some additional
10 inquiries in that area.
11 Next slide, please.
12 So who have we gotten comments for? Most
13 are just private citizens who are sending e-mails or
14 letters. They may have read something in the
15 newspaper. They may have read something put out by
16 one of the public interest groups, on our website, or
17 a press release or something, and have some concerns
18 that they are expressing.
19 A few have been on behalf of those
20 interest groups. Also, groups like ASCME, which
21 represents the state and municipal employees' concerns
22 about the people who work at these -- at municipal
23 anthills in particular.
24 States -- so far we have received some
25 comments from the states listed here. Different parts

1 of the state -- Washington, we are getting comments
2 from both the Department of Ecology and the Department
3 of Health.
4 From California, we got comments from the
5 Integrated Water Board but not yet from the California
6 EPA or the Department of Health Services. So they've
7 offered some varying levels of detail and comment on
8 the proposal.
9 One compact has commented, the
10 southwestern compact, and they raised a concern that
11 was also raised by a couple of the states, which is
12 you have to think about the economic impact on compact
13 facilities, low-level waste facilities. This is going
14 to make them economically not as viable as they
15 otherwise would be, and we did raise that issue in the
16 ANPR about compact requirements.
17 One Subtitle C operator who said, "We're
18 not interested in this" -- it was actually a letter to
19 the mayor of the town in which it's located. They
20 apparently have a less-than-friendly relationship with
21 the town, and they were trying to assure the mayor
22 that this is not something that they would be
23 interested in.
24 One mixed waste generator to this point --
25 the University of Michigan -- commented favorably.

1 NRC has sent out the comments directly, and so they
2 are not posted yet onto the docket. Very minor
3 comments, given that they approved -- reviewed and
4 provided language for the ANPR, but generally
5 supportive.
6 We've gotten two offers to treat or
7 dispose of the waste. One said that he can do
8 solidification and disposal in salt domes, and the
9 other one said, "I've got this great patented process
10 for accelerated transmutation, and no problem."
11 (Laughter.)
12 We really expect the bulk of the comments
13 to come in towards the end of the comment period.
14 We've talked with a number of states and industry
15 groups, who are -- and DOE who are pulling together a
16 larger volume of comments. And so we expect those to
17 come in later in the comment period.
18 Next, please.
19 And what have we been doing in that time
20 to meet with the different stakeholder groups in
21 presentations like this? We have talked with
22 different groups of generators, licensees, small
23 generators, mixed waste generators, industrial users.
24 Next week we're going to be talking with some people
25 from NEI and the larger nuclear industry, the fuel

1 cycle facilities.

2 We had a conversation with the National

3 Mining Association and some of the people who are

4 involved in uranium issues. The Department of Energy

5 disposal facilities -- we mentioned we've talked with

6 several of the companies that operate RCRA disposal

7 facilities and their industry trade group.

8 States -- through ASTSWMO, CRCPD, low-

9 level waste forum, organization of agreement states,

10 environmental groups. We've met several times with

11 some representatives, mostly of the national groups,

12 but have also tried to make some contacts at the more

13 local level.

14 And presentations were going to be at the

15 DoD low-level waste conference in May. Health Physics

16 Society will be there in July. We were at waste

17 management. We're going to an International Isotope

18 Society symposium, and also the CRCPD annual meeting,

19 and we were at the low-level waste forum last month.

20 Next, please.

21 Finally, where we expect to go from here,

22 we extended the comment period, as I mentioned, to

23 May 17th. We're going to continue working in that

24 time to develop our modeling approaches and looking at

25 the other options that we have available.

1 And when we finish with the comments, we
2 will have to spend some time going through those, and
3 probably go out to some of the commenters and ask them
4 for more information, more detail, are we
5 understanding what you said, how do we reconcile the
6 different comments we got from groups that may seem to
7 be having the same point of view, and continue that
8 dialogue in the outreach with federal agencies,
9 states, and the other stakeholders.
10 And then we have to figure out, of these
11 possible paths forward, regulatory, non-regulatory,
12 different types of waste, what can we really do?
13 What's the most effective thing for us to do and
14 recommend to our management how we would proceed to
15 the next step?
16 So I will leave it there, and hopefully
17 there is time for questions.
18 VICE CHAIRMAN RYAN: Dan, thanks for a
19 very comprehensive presentation on where you've been
20 and where you are and where you're going. That's a
21 great update.
22 Are there members -- questions from
23 members, please?
24 MEMBER WEINER: Since you've outlined a
25 number of possible steps that you can take with these

1 -- this whole spectrum of waste, I don't understand --
2 and then you said you had all of these comments that
3 were opposed, what is it that they were opposed to?
4 MR. SCHULTHEISZ: Well, most of the
5 comments that we have received to this point is -- are
6 very short and pointed comments from members of the
7 public. We don't want this -- I don't want this in my
8 local landfill. I don't want it to be recycled into
9 consumer products.
10 I don't want it to go to an incinerator.
11 It shouldn't go to any facility that's not designed or
12 licensed for these materials. Radioactive waste needs
13 to be more tightly controlled, and there should never
14 be any deregulation of any kind. This is BRC, and
15 we've fought this before, and we're going to fight it
16 again. And that's essentially what those comments
17 are.
18 To some extent they get a little more
19 nuanced, but fundamentally it's deregulation. We're
20 not going to stand for it.
21 MEMBER WEINER: On a more specific
22 question, you mentioned a couple of things that NRC
23 could do. And what would -- what is EPA's sort of
24 tendency now? Would you favor more NRC, more detailed
25 NRC regulation? What are you really looking at?

1 MR. SCHULTHEISZ: Well, let me go back to
2 the earlier effort that we had in 1999, where we were
3 looking at mixed waste from the generated -- agreement
4 state generated. We approached -- we worked with NRC
5 in that broad approach, and at that time we thought
6 the appropriate thing to do to satisfy these concerns
7 about deregulation and confidence -- that there would
8 be additional confidence if there was some NRC
9 licensing of those facilities involved.
10 And in talking with NRC over that period,
11 it was envisioned as something very simple compared to
12 Part 61 that could be simply a notification. It could
13 be a general license type of an approach. And we
14 thought that would bring some additional credibility,
15 because you would not be losing either regulatory
16 agency. It would be somewhat reduced through a
17 regulation, and hopefully would be more effective at
18 allowing waste to go to a disposal destination.
19 As we went through that process, after we
20 withdrew it, we talked with several of the RCRA
21 disposal facility operators, and they expressed some
22 severe concern about NRC licensing of any kind, and
23 particularly in relation to the relatively small waste
24 stream of commercial mixed waste.
25 They saw that there was absolutely no --

1 no tradeoff for them for this relatively small waste
2 stream, which they thought they could handle
3 effectively, but the economics were not there when
4 stacked up against the potential of the stigma of
5 having -- being an NRC-licensed facility. They were
6 also concerned that that would then open the door for
7 the other additional state agencies to come in and
8 make them do other things, and so they didn't see that
9 as a tradeoff that they wanted to make. And we -- we
10 took that very seriously and had some concerns about
11 the viability of this whole approach.
12 But then when we determined -- we got some
13 support from NRC and DOE to try to look at it again
14 and try to be a little more flexible, and NRC would be
15 involved more at the beginning, we wouldn't kind of
16 run into these surprises we ran into the last time.
17 We decided that this was an opportunity
18 for us to open it up to other waste streams, to look
19 at the system more broadly, and with the potential
20 benefit of having some additional economic incentive
21 for those facilities to maybe accept some NRC stamp of
22 approval.
23 I think they still have their concerns.
24 Not knowing what it might look like is always a
25 concern. You don't want to be too hasty about

1 committing to something when you don't really know
2 what it's going to look like. But we have had
3 discussions with NRC about this.
4 I think in the tradeoffs of public
5 acceptance versus facility acceptance, I think we lean
6 a little more towards the exemption dia, and NRC staff
7 has indicated it leans a little more towards the
8 general licensing approach.
9 And there may be in their general
10 licensing approach some specifics about deferring to
11 EPA for inspections or having an MOU with EPA about
12 inspections and enforcement and notification and those
13 kinds of things, so that the facility wouldn't see
14 anything really different on its day-to-day operation.
15 They still see EPA people, state EPA people. But when
16 you get down to the state level, and you have the two
17 agencies' counterparts, do they accept it as well?
18 And then that's always a concern.
19 MEMBER WEINER: Do you have -- a final
20 question. Do you have any conflict with RCRA
21 requirements? Because I know we ran into this on the
22 Waste Isolation Pilot Plant big time.
23 MR. SCHULTHEISZ: We have tried to, you
24 know, coordinate through our agency workgroup process
25 to -- with the RCRA program to make sure that they are

1 -- you know, we don't want to do anything to undermine
2 that program. And some of the things that we talk
3 about like, you know, extended institutional control,
4 post-closure care, ownership restrictions, those kinds
5 of things are -- you know, we don't want to give
6 people the impression that those facilities aren't
7 protective because they don't require government
8 ownership or they don't have those extended post-
9 closure requirements.
10 But that's something that is brought up
11 continually is, hey, you know, this is a 30 -- this is
12 30 years here, and you have to look at -- on the other
13 side, and so how can that be comparable. You know, we
14 point out that there are many hazardous wastes,
15 particularly the heavy metals, that will be there long
16 after any of the radioactive material has gone away,
17 except with the possibility of uranium-238, which will
18 be around pretty much forever.
19 So we have tried to identify where those
20 areas are and work around them.
21 VICE CHAIRMAN RYAN: George?
22 MR. SCHULTHEISZ: Adam, do you have
23 something to add?
24 MR. CLINGER: I'm sorry. I just wanted to
25 expand on -- my name is Adam Clinger. I'm also with

1 EPA. And I just wanted to expand a little bit on the
2 second question, in terms of what we're hearing and
3 what NRC could do, I think is the way it was phrased.
4 We had had some conversations with some
5 generators that we're pointing out. Again, we have
6 raised this general theme of, why don't we treat
7 similar material similarly, either from the generator
8 side or from the disposer side?
9 And so I guess I wanted to provide an
10 example of each with respect to some sort of NRC
11 requirements. One was with generators saying, "Well,
12 there's some exemption associated with liquid
13 insulation.
14 And some of ours fit into the exemption,
15 and then some of ours don't. And the ones that don't
16 are similar to ones that fit, and so again -- so
17 that's kind of interesting, and we're looking forward
18 to see those articulations and perhaps to turn to you
19 all and say, "Well, is this, again, another way that
20 we collectively can improve the system under this?"
21 And then, more recently, from the other
22 end was some input from the National Mining
23 Association saying, "Well, we have these mill tailing
24 entailments as destinations for certain
25 classifications of waste.

1 And are there other wastes in this broader
2 universe that, again, have similar characteristics,
3 and can we establish performance in the same way that
4 if performance is the metric across the facilities,
5 such that those could potentially, you know, offer
6 disposal options -- again, neither advocating for or
7 against but just sort of articulating, again -- and
8 those are things that come under the existing NRC
9 purview.
10 And depending on, you know, how
11 characterized and what not -- but I just thought I'd
12 raise that as some specifics that we're hearing and
13 that, again, are interesting and trying to navigate
14 through this sort of complicated area.
15 MEMBER WEINER: Thank you.
16 VICE CHAIRMAN RYAN: George?
17 MEMBER HORNBERGER: I know that EPA, of
18 course, does things on a risk basis, and I'm curious
19 just conceptually if it were to be approved to have
20 low-activity mixed waste go to our RCRA facility, is
21 the idea that the risk associated with the radioactive
22 component would be about the same as the hazardous
23 component or much less or greater?
24 MR. SCHULTHEISZ: That's a difficult
25 question for us to answer, because we -- at EPA when

1 we are looking at hazardous waste we typically look at
2 the waste before disposal. We don't really look at,
3 what is the risk from a disposal facility?
4 So it's very difficult to say -- when
5 you've got these larger volumes of -- there's no sum
6 of fractions for hazardous constituents, or anything
7 like that, what the risk from that facility is, what's
8 the baseline risk from that facility if it just takes
9 hazardous waste. And then, what are we adding to it?
10 We would anticipate that the risk would
11 not be significantly increased by the low-activity
12 waste that would be accepted by it. We would
13 anticipate for the most part that those -- the low-
14 activity fraction would be a small part of the overall
15 waste stream going to that facility.
16 If you had -- one of the things we talk
17 about in the notice a little bit is if you had
18 sufficient volumes from some decommissionings or
19 whatever, would it be attractive to an operator to
20 site and permit a facility specifically for low-
21 activity radioactive waste?
22 And in that case, we are doing -- from the
23 agency's perspective, we are being protective within
24 the criteria we apply. And so it's protective. It's
25 appropriate.

1 From the public perception, is it -- I
2 don't know how bad this is now. How much worse are
3 you going to make it? That may be what they are most
4 concerned about.
5 MEMBER HORNBERGER: If I then invert this
6 -- so if we have a mixed waste stream where the
7 radioactive component or -- in fact, potentially much
8 more hazardous than the hazardous side. Where do we
9 stand on resolving those issues? I mean, would that
10 be something that EPA would defer to NRC?
11 MR. SCHULTHEISZ: Well, in fact, the May
12 2001 rule is -- that's exactly what it does is it
13 allows conditional exemption from the RCRA
14 requirements if the waste is disposed of in an NRC or
15 agreement state licensed low-level waste facility.
16 And part of the reasoning for that was
17 that RCRA requires treatment of the hazardous
18 constituents, as long as those conditions are met.
19 And so the toxicity and -- is considerably reduced,
20 either through immobilization or obstruction of the
21 hazardous constituents.
22 And so by comparison to the Part 61
23 licensing requirement, and then just from a practical
24 point of view, if you're putting high Class A or
25 Class B or C waste in there, then the radioactive risk

1 clearly outweighs the limited hazardous risk. So
2 that's exactly what that rule would do.
3 VICE CHAIRMAN RYAN: John?
4 CHAIRMAN GARRICK: In your effort to get
5 a handle on this whole issue, how much consideration
6 was given to international practices?
7 MR. SCHULTHEISZ: We haven't looked,
8 really, to international practices for this. I have
9 to say, we really have not focused on what the
10 international community is doing. We are working
11 within our existing regulatory frameworks to try to
12 determine whether there are existing options that
13 could be made more effective through the type of
14 analyses that we're looking at.
15 Did you have something specific in mind
16 that we --
17 CHAIRMAN GARRICK: Well, I was -- it would
18 just seem that as background you would kind of want to
19 know if there's any precedence whatsoever for
20 definitions of -- for example, of low-activity waste,
21 and I think there are. And all of the other
22 ramifications such as the types of facilities that are
23 involved and used and the strategies that have been
24 employed. And I was just curious as to how much the
25 international experience entered into your preparation

1 of the background material for the --

2 MR. SCHULTHEISZ: No, it really hasn't.

3 I know they do have very low-level waste in some

4 cases, and low and intermediate and --

5 CHAIRMAN GARRICK: Right.

6 MR. SCHULTHEISZ: -- high-level waste, and

7 we have not looked at where those definitions fall to

8 give us any guidance. Maybe we should. I mean, that

9 may be a wise thing for us to do.

10 CHAIRMAN GARRICK: You in your

11 presentation have done an excellent job of

12 articulating what some of the issues are and some of

13 the requirements. One of the problems in getting

14 public opinion is that a lot of the questions that

15 probably should be answered as a basis for offering an

16 opinion are not answered, such as things like

17 definitions and volumes and scenarios and types of

18 facilities that would be involved and how this risk

19 stacks up with other risks.

20 I'm sure you've thought about a lot of

21 these things. You, in a couple of your slides, for

22 example, address the issue of the definition of low-

23 activity waste and some of the requirements for that

24 definition. Do you have any definitions that are

25 under consideration?

1 MR. SCHULTHEISZ: Well, I think the basic
2 would come through the modeling scenarios, and we have
3 not at this point determined what the appropriate
4 level -- dose or risk level to apply to those as a
5 target is yet. You know, we have -- the tradeoffs are
6 there as well, because the volumes depend on, well, if
7 you're looking at one or 10 or 15 or 25, that will
8 change the volumes that are available.
9 But the higher the risk of the material,
10 the more likely it is that people will demand or ask
11 for additional regulatory requirements to build their
12 confidence that the waste is being managed
13 successfully. And then that feeds into the public
14 acceptance, the state acceptance, the generator and
15 disposal facility acceptance. So there are a lot of
16 balancing things that we haven't tried explicitly to
17 weigh at this point, and we're hoping to get some
18 comment to help narrow that down a little bit.
19 CHAIRMAN GARRICK: Is this a staged
20 process in the sense -- or a phased process in the
21 sense that the -- this initial feedback from the
22 public will provide you with some additional insights
23 that you can now go back and define the problem a
24 little better?
25 MR. SCHULTHEISZ: That's what we were

1 hoping for.

2 CHAIRMAN GARRICK: And recycle the whole

3 thing?

4 MR. SCHULTHEISZ: We have very broad

5 concepts, and how do we slice it? What is acceptable,

6 and what is not acceptable? Which of these sort of

7 additional screening or confidence implementation type

8 measures are most important to the public or to the

9 states or the generators or the disposal facilities?

10 And we have been hoping to get some clear -- at least

11 some clear opinions that we can weigh rather than sort

12 of a broad yes or no, this is a good idea or it's not

13 a good idea.

14 CHAIRMAN GARRICK: Yes. One of the real

15 problems with public comment process to me is that the

16 problems that they're being asked to comment on are

17 very poorly defined, and this is no exception. And it

18 makes it very difficult for the public to really

19 appreciate what they're dealing with in terms of the

20 risk that's involved, for example.

21 And I don't know how you solve that

22 problem, but to me, as I read the material that you've

23 supplied requesting comments, there's a tremendous

24 amount of information on process and on the different

25 agencies and their roles, but very little information

1 on, what is the real technical issue here? What is
2 the real risk that we're talking about?
3 And I don't know how you deal with that,
4 but I think the problem here is that all the baggage
5 that is associated with the fear of anything nuclear
6 ends up being the primary basis for the comments,
7 rather than the specifics of the issue that you're
8 trying to solve. And it seems that there must be a
9 better way to address that than the way it's generally
10 done.
11 MR. SCHULTHEISZ: Yes, there should be.
12 And part of the problem is that we worked, you know,
13 internally to develop these things. We work with NRC,
14 and we get comments from DOE, or we talk with our
15 other offices. And so we answer the questions we
16 have, and what comes out -- you know, we may have lost
17 sight in some cases of, well, what's the most
18 effective way to get the public to react?
19 Well, we've answered all our questions
20 about how to say this, but if they're not involved in
21 the process of developing it, there is a gap there.
22 And it's hard from these comments -- the comments that
23 we get, the short statements, to know how much anybody
24 knows about risk or what the difference is between a
25 hazardous waste landfill and a solid waste landfill,

1 or any kind of -- any kind of background.

2 And even some of the ones we get that

3 support us that say, "It's about time somebody took a

4 look at this and looked at it, you know, on a risk" --

5 they don't say anything about what their experiences

6 or qualifications or anything that leads you to say

7 this person knows what they're talking about. And so

8 it's very hard to weigh those comments.

9 And the only thing I can say is that as we

10 move through the process, if we do a proposed rule,

11 there will be additional public comment there, and

12 hopefully at that time we can be better at describing

13 exactly what the numbers are, where they came from,

14 what risks they represent, what are comparable risks

15 from other activities or applications, and hopefully

16 get people to respond to that material rather than, "I

17 read this in the newspaper."

18 CHAIRMAN GARRICK: Right. Okay. Thank

19 you.

20 VICE CHAIRMAN RYAN: Dan, again, thanks

21 for a good presentation. I want to amplify what John

22 said. It's a very complicated arena, NRC and EPA and

23 regulating these materials. You know, we had some

24 additional examples, which I appreciated. And you

25 could go on further.

1 I mean, things like fly ash, which is a
2 common solidification agent in the hazardous waste
3 industry, often has more radioactive material in it
4 than what you might otherwise dispose as a radioactive
5 material that meets whatever criteria might get
6 developed, and so on.
7 With all those examples in mind, and many
8 others we could spend a lot of time on, I think as and
9 if you proceed forward some kind of a primmer, a
10 technical primmer, as Dr. Garrick has said, that kind
11 of outlines some examples and some scenarios that, you
12 know, this might go to this facility or that facility
13 or stay as a low-level waste, or those kind of things,
14 would really help exemplify the vision that you have
15 for what you're trying to regulate.
16 It can very quickly degrade back into the
17 origin-type definitions, which gets very confusing, as
18 opposed to focusing on the radioactive material
19 content and those inherent risks that you are trying
20 to focus on in a forward-looking direction. And I
21 think something that documents and amplifies that
22 shift in basic thinking by example would be extremely
23 helpful in educating not only the public but educating
24 the technical community that, you know, have all sorts
25 of varied reactions to these kinds of things.

1 So, you know, and just the example you
2 gave of the 1999 part, you know, you have received
3 reactions from "no thanks" to "yes, we'll do it, it's
4 great." And those are -- that's the technical
5 community that theoretically knows something about
6 this.
7 So a primmer or something that goes into
8 those more concrete examples I think would be a great
9 asset to you as you go forward.
10 MR. SCHULTHEISZ: Yes. I think we had --
11 related to the '99 one, we had work -- started working
12 on what we called a layman's guide to low-activity
13 mixed waste at the time, and tried to explain some of
14 the basic radiation issues behind that. And I think
15 that's -- you know, increasingly is a focus of our
16 program is those educational and informational
17 materials. So I think that would be something that we
18 will be spending time on.
19 VICE CHAIRMAN RYAN: Jim, do you have a
20 question? Please.
21 MR. CLARKE: Yes, I just have one quick
22 question. You mentioned performance as just being
23 really a key factor rather than design. As you know,
24 the challenges that are experienced with currently
25 favored designs is pretty grief compared to the time

1 over which we'd like these designs to perform.

2 I think you mentioned a national

3 performance database. Does the EPA track on a long-

4 term post-closure performance --

5 MR. SCHULTHEISZ: No, it's not -- and

6 maybe I misspoke, but it's not a performance database.

7 It is a database of site characteristics that EPA

8 developed over the years, primarily in relation to the

9 Subtitle D program, the solid waste program, where

10 there are hundreds and thousands of these landfills of

11 varying descriptions, whether some meet the current

12 standards or some are, you know, older and, actually,

13 simple open and dump type of facility.

14 But those are typically used by the RCRA

15 program when they do sort of national -- this a

16 national program, so they have like this national

17 database of characteristics that you can then sample

18 from as you're doing some --

19 MR. CLARKE: I guess my question probably

20 pertains more to the CERCLA program. But as we

21 contain stuff in place, and put in currently favored

22 covers, I get the feeling that the -- we kind of

23 declare the problem over and go on to the next one.

24 And I was just wondering, is there any

25 interest in the EPA in going back and looking at the

1 efficacy of institutional controls, looking at
2 erosion, looking at, you know, covered performance, as
3 we progress in time? Because there is very little
4 data on this.
5 MR. SCHULTHEISZ: Yes, I agree. And
6 ideally that would be something that we could do. I
7 don't know --
8 MR. CLARKE: We could certainly forecast
9 performance better if we had data.
10 MR. SCHULTHEISZ: I don't know to what
11 extent the Superfund program does that. It's probably
12 to a limited extent. And as far as the RCRA program,
13 there have been -- there is no site that has gone
14 through the complete 30-year post-closure period and
15 then released. Since it's been less than 30 years
16 since --
17 MR. CLARKE: Well, CERCLA has the five-
18 year reviews, but, you know --
19 MR. SCHULTHEISZ: Well, yes. And they are
20 well behind on -- I mean, there is a backlog of those
21 as well that they have to catch up to. But that may
22 be something that we can try to solicit from states as
23 well is, what is their experience in institutional
24 control of the sites?
25 MR. CLARKE: Thank you. I heard national

1 performance database and got real excited.

2 VICE CHAIRMAN RYAN: Any other questions

3 or comments? Ruth?

4 MEMBER WEINER: A quick one. You might

5 look at the experience with the Waste Isolation Pilot

6 Plant, because there your Department of EPA finally

7 exempted the WIPP from the RCRA requirements.

8 And, of course, the state screamed, the

9 certain members of environmental groups screamed, but

10 they went ahead anyway, because the two -- two

11 legislative authorities were in direct conflict. One

12 said, "Don't put it in the ground." The other said,

13 "Do." But the process for resolving that conflict I

14 think might be instructive in some of these cases.

15 MR. SCHULTHEISZ: Okay.

16 VICE CHAIRMAN RYAN: Dan, thanks again to

17 you and your colleagues for being here today and

18 giving us this briefing. And we'll look forward to

19 hear how it's going down the line somewhere when it's

20 appropriate, if you'll be willing to come back.

21 MR. SCHULTHEISZ: All right. Thank you.

22 VICE CHAIRMAN RYAN: Thanks very much.

23 Mr. Chairman?

24 CHAIRMAN GARRICK: Thank you. All right.

25 We're grateful to EPA for allowing the time that they

1 did for questions. That makes the presentations ever
2 so much more interesting.
3 And we're going to now take a 15-minute
4 break, and we'll come back and hear about the DOE
5 bundling approach to agreements.
6 (Whereupon, the proceedings in the
7 foregoing matter went off the record at
8 9:52 a.m. and went back on the record at
9 10:13 a.m.)
10 CHAIRMAN GARRICK: Our meeting will come to
11 order. We are now going to hear from the NRC Staff on
12 their evaluation of DOE's bundling approach. And the
13 Committee Member that will lead this discussion is
14 George Hornberger.
15 MEMBER HORNBERGER: Thanks, John. The
16 ACNW, I think everybody knows, has been following the
17 resolution of the key technical issues, and with
18 considerable interest.
19 And we have two sessions today. This is
20 the first one with the NRC Staff talking about the
21 idea of DOE's to put these agreements together into
22 bundles and respond to them in hopefully a more
23 efficient way doing that.
24 And then this afternoon we will actually
25 here about the schedule for the responses to the key

1 technical agreements.

2 We have three people from the NRC Staff

3 here with us this morning to discuss this, and I think

4 that I will let these people introduce themselves as

5 they go. And Greg, are you going to go first?

6 MR. HATCHETT: Yes. Good morning, I'm Greg

7 Hatchett, Senior Project Manager in the new Division

8 of High Level Waste Repository Safety.

9 As stated before, we came before you at

10 the last meeting and generically discussed, one, the

11 status of the KTI Issue Resolution Process, and two,

12 how we define that process to look at DOE's Technical

13 Bases documents, more affectionately referred to as

14 the Bundling Approach.

15 And to that end today, we want to

16 specifically go over what the staff process is more

17 specifically related to the detailed review of a

18 technical bases document.

19 And before I go any further, but I have

20 here with me also Christopher McKenney, who reviewed

21 the TSPAI portion of the Biosphere Transport Technical

22 Bases document, which is the first one we reviewed.

23 And John Trapp who reviewed the Igneous

24 Activity portion of the Technical Bases Document on

25 Biosphere Transport. As I stated before, we somewhat

1 discussed the overall review process the last time we
2 met.
3 And what we wanted to do today was go into
4 a little more detail about the specifics, a part of
5 the process dealing with the nuts and bolts of the
6 overall review. And then we'll provide you with a
7 summary when we're done.
8 This review process was broken down into
9 five areas. And what you see here in front you is
10 just two of them. It doesn't all fit on this one
11 slide, but this is, again, the receipt of the
12 Technical Bases Document and then the document
13 processing. And, of course, next slide, please. What
14 we're here to talk about more specifically is the
15 Review Team Assessment.
16 Now, as part of this process is when we
17 first received the document and we begin to process
18 that document and set up review assignments.
19 Then we have anywhere between a two-week
20 to a four-week initial review before the team gets
21 together to discuss the Technical Bases Document and
22 the agreements associated with them or bundled in the
23 Appendices as part of the Technical Bases document.
24 What the team does, as part of that
25 process, is, and this again feeding the routine

1 assessment. That two to four week period of time is
2 a lot of prep work. And it gets into things such as,
3 hey, these agreements were created, you know,
4 somewhere between 2000 and 2001.
5 This is prior to the YMRP being approved
6 in 2003. So the agreements, in and of themselves,
7 weren't necessarily linked to any review method in the
8 YMRP. These are just the staff's initial thoughts on
9 what they thought the information, do we need it to
10 provide, to understand whether or not they would a
11 high quality license application.
12 And to that end, we tried to align or map
13 agreements to the review method of the YMRP, which is
14 analogous to what DOE did in their Technical Bases
15 document, which was try to develop a Technical Bases
16 document, which is their approach for, or their future
17 approach for looking at model abstraction in a
18 potential license application.
19 And then take agreements that are in a
20 line with that particular document, whether it was
21 biosphere or engineered barrier degradation, or
22 whether it was water seeping in the drifts, and take
23 agreements that ask questions similar to what might be
24 a potential soft section related to model abstraction
25 and put those agreements into a certain framework.

1 So, that was fortuitous for us, because we
2 were running down the path of trying to get more
3 integrated, and what was driving that was the baseline
4 of risk insight.
5 So the baseline of risk insights were
6 produced back in June of '03, and then we began
7 submitting these technical bases documents, which was
8 their new approach to dealing with agreements on a
9 one-by-one basis, to do it in a more integrated
10 fashion, and the submitted the first one back in
11 September, 2003.
12 So while the staff was moving ahead with
13 its risk baseline, we also got the added benefit of
14 DOE now trying to do things more holistically.
15 So we, the next slide. This routine
16 assessment, again, started with all these inputs in
17 mind. It started by the team considering a baseline
18 of risk insight. And so that necessarily drove
19 everything we did in reviewing the technical bases
20 document and associated agreements.
21 The team would then discuss the scope of
22 each agreement, and try to determine, you know, hey,
23 here we are today in 2003, 2004. How have we, the
24 program evolved from where we started?
25 Are these agreements still relevant? To

1 the extent that some of these agreements really deal,
2 in some sense, with scope. And may not be necessarily
3 linked to DOE potentially making a safety case.
4 So look at the technical bases document
5 very holistically, and then go back and look at the
6 agreements and ask ourselves have we evolved beyond
7 this point, and what effect is our understanding from
8 our baseline of risk insight, have on our, our
9 dispositioning for each individual agreement.
10 So, in some cases, the agreements may not
11 have been fully answered by DOE, in terms of what we,
12 originally the intent of the agreement was. And if we
13 had that sort of a problem, we didn't shift it out to
14 say no, with respect to this agreement, we had better
15 justification or we thought justification didn't exist
16 efficiently enough for us to deal with it in terms of
17 closing an agreement.
18 If we, in fact, thought there was
19 sufficient justification, then we went on to discuss
20 the adequacy of the response in terms of looking at,
21 again, the risk baseline and saying, hey, you know,
22 based on the way we understand the agreement and the
23 weight and the direction that they're going in, we
24 feel that this is adequate enough, we don't need any
25 more information.

1 They've answered the, they've carried the
2 ball, they've answered the mail, we're okay with this.
3 And that has to do with, you know, how we ranked them.
4 Whether it was high, medium or low, as well.
5 So that influenced our decision making
6 process. And at the end of the day, the team
7 summarized its initial review conclusions and
8 identified any action items.
9 Now, again, some of those action items
10 dealt with, well, the team may sometimes want to
11 confirm the justification and documents and may want
12 to review some of the references.
13 And going back to the additional
14 information we thought we might need, you know, what
15 does that look like? How much should we ask for?
16 Again, influenced by our understanding of the, how a
17 repository may perform.
18 And, again, all driven from the baseline
19 of risk insights. So what I want to do now is, again,
20 we broke this thing up into two areas, the biosphere
21 transport documentation, into the biosphere
22 specifically around the total system performance
23 assessment and integration agreements, which Chris
24 McKenney handled. And then the ones we thought were
25 more specifically dealt with, geologic issues, which

1 were covered in the Igneous Activity Agreements. And
2 I'm going to turn it over to Chris.
3 MR. MCKENNEY: Okay, so in September we get
4 the technical base document biosphere in, and we go
5 through initial review. Within the document was seven
6 agreements, were covered by this technical base
7 document.
8 The, which are listed here. And we tried
9 to characterize them. One, by, in part, by the staff
10 who generated them, and in part also, by risk and
11 whether the level of information was there.
12 When we went through our staff review, we
13 characterized that five of the agreements, all TSPAI
14 ones and one of the IA ones were considered, were
15 ranked low risk. And also has efficient information
16 available at the time to report it under review
17 without additional information.
18 Meanwhile, two of the agreements, which
19 dealt with mass loading mainly on igneous activity
20 were, we needed a little bit more information and
21 then, so in December we requested more information for
22 those. Next slide.
23 And here's just a summary of basically
24 what those, for the first five that were all low
25 category, were dealt. We discussed these with you in

1 February at the Biosphere Working Group Meeting. Pat
2 LaPante did for the Center.
3 And on the next one, the, these five,
4 actually the four TSPA ones, were important parameters
5 in biosphere calculations. This is one of these
6 things, going back to how the agreements were formed
7 versus what they would be looked at today.
8 And there are important parameters there.
9 At the time we did the agreements, we didn't have
10 actually the biosphere code integrated in with the
11 rest of the TSPAI, so we were unable to actually run
12 overall risk sensitivity and analyses at the time to
13 say to what degree do they have on bearing an overall
14 one.
15 But now, in the new, with the new TPA code
16 and the newer versions of the TPA code and the risk
17 insights baseline, they are all considered low risk.
18 Next slide, please.
19 The, most of these agreements just focus
20 on completeness of documentation. There weren't real
21 serious technical arguments or issues.
22 As I said we discussed the review methods
23 at the February biosphere meeting. And since they
24 were low and so we did a review of the information
25 provided in the TBD, that we were able to close those

1 issues in February.

2 And now on to the other two issues which

3 were igneous activity which were handled by John

4 Trapp.

5 MR. TRAPP: Yeah, this is kind of a tag

6 team approach. When we did the original breakdown,

7 there were, like I've mentioned, the two different

8 areas. There are two reasons they were broken down.

9 Risk and really the technical backgrounds,

10 who would be best suited to review these various

11 documents. The two that I've mentioned as igneous

12 activity agreements, primarily dealt with mass loading

13 parameters.

14 And it was felt that this, these

15 agreements should be best handled by the geologic

16 people. Next slide. Now why do we have the concerns?

17 Well, there's, if you go back way before we even had

18 the TSPA, when we were first starting to do some of

19 the runs, one of the things that came out of all the

20 sensitivity studies was that mass loading was a very

21 important parameter.

22 When I've done the risk analysis, it's

23 basically shown the same thing. Mass loading is an

24 important parameter, dose is directly proportional to

25 risk.

1 If I carry it a step farther, volcanic
2 ash, if you take a look at it, has some very unique
3 physical properties. If you take a look at the mass
4 loading parameters that you've got for normal material
5 for soils, etcetera, you are dealing with something
6 that's got clay particles, its got cementation.
7 Volcanic ash is very poorly graded, it doesn't have
8 these clay particles. There's no cementation. So you
9 basically, you get different mass loading parameters
10 off of volcanic ash than you would expect off a normal
11 soil where everything is normally documented.
12 In addition, if you go through the
13 literature, and this is where we started getting into
14 our real review of DOE's, just about everything that
15 they were using as documentation came from studies
16 primarily at Mount St. Helen's.
17 And this is a silicic-type volcanic ash.
18 It is not basaltic ash, and there's quite a bit of
19 difference in the physical properties between these
20 two.
21 Chemically, of course, they are totally
22 different, but if you take a look, there's a slight
23 difference in the particle shapes, there's a
24 difference in particle size and there's a difference
25 in the particle sortings.

1 This means that if you're taking a look at
2 these type of things, you are not going to get quite
3 the same mass loading parameters from these two
4 different areas.
5 In addition, if you take a look at,
6 especially Mount St. Helen's, the climatic conditions
7 that you've got there are tremendously different than
8 you would expect in the upper mountain region.
9 Some of the justification that was used by
10 DOE, was they were talking about this would be used
11 for the glacial transition or the full glacial. But
12 even if you go to the amounts of rainfall that you'd
13 expect in the area, during the full glacial period,
14 would still be less than what you've got at Yucca
15 Mountain or in the expected Yucca Mountain area.
16 If you take a look at the studies, again,
17 one of the problems that we had was that all of the
18 studies that we've got to date, really deal with real
19 thin deposits.
20 Deposits which are seven meters or less.
21 If you're talking about the area around the volcano,
22 you'll be dealing with hundreds of feet to, you know,
23 stuff that does taper out to these dimensions, but
24 none of the things larger than a centimeter were in
25 the literature.

1 In addition, the fact was that in
2 everything that has been documented, it was all out of
3 the watershed of the volcano. Now this is not to
4 really criticize what DOE is doing, because DOE did
5 note these same problems.
6 One of the things that we took a look at
7 also, and it's really, was trying to compare the
8 lifestyle of the various people and how this would
9 interact with the various mass loading parameters.
10 And the slide probably is not stated
11 correctly, because they did consider the lifestyle and
12 activities, but the question was, was it appropriately
13 considered.
14 Next slide, please. To basically give us
15 kind of a benchmark, there really is only one set of
16 data that's specific to basaltic ash and mass loading
17 parameters, and this was gathered by the center and
18 some of their work down in Cerro Negro.
19 Now this has also got some significant
20 problems, because it was four years after the eruption
21 and the normal rainfall in that area is about a meter
22 per year.
23 And it was also after Hurricane Mitch, and
24 Hurricane Mitch, by itself you had two meters in
25 rainfall in addition to this whole thing.

1 And if you looked at the volcanic ash,
2 what you saw was it was visibly depleted in finds at
3 the surface. So that was really kind of our summary
4 block, summary things that we had to take a look at.
5 And if you went through the DOE
6 documentation for TBD-12. It appeared that the
7 majority of this information was presented, not in the
8 TBD, but in this backup AMR, which is listed here.
9 And therefore, because of what we felt was
10 a high risk issue, etcetera, we requested specifically
11 that we receive this AMR before we went through our
12 detailed review.
13 We are at the position right now that
14 basically we do have a technical review done. We're
15 in the process of, like I said, no job is done until
16 you've got all the paperwork in the process of
17 complete and this getting written up, etcetera, and
18 that type of thing.
19 And hopefully we'll be done and get it out
20 the door at least by June. Greg.
21 MR. MCKENNEY: So, in summary, we, you
22 know, we, in our schedule, our priority, our level of
23 review were trying to take the risk insights into
24 account and doing the various, for responding to our
25 agreements, and we have two, a continuing review of

1 two igneous activity agreements related to mass
2 loading parameters from the TBD12.
3 MR. HATCHETT: At this point, that
4 completes the sort of overview of our sort of process
5 for reviewing technical bases documents. If you have
6 any questions, we'd be glad to take them now.
7 MEMBER HORNBERGER: Thanks very much. I
8 just, I have one clarification. So on the two IA
9 Agreements, was DOE asked for additional information?
10 That's what I wasn't clear on. Or do you have the
11 AMR?
12 MR. TRAPP: We have got the AMR. We have
13 not completed the write-up yet.
14 MEMBER HORNBERGER: Okay, but you haven't
15 written back to DOE and requested additional
16 information?
17 MR. MCKENNEY: Well, actually on the, back
18 on Slide 6 of 13, we note that on December 23rd, 2003,
19 we asked for a series of documents, and this was one
20 of them.
21 DOE has been trying to get them all, all
22 their, of the AMRs up on, electronically are available
23 to the public and it was just, we were at a transition
24 point at that point, and we did get a hold of it back
25 then.

1 MR. HATCHETT: Our letter stipulated what
2 the five technical bases document where you see at
3 that point that our review for these things were going
4 to be stalled, as a result of not having adequate
5 supporting documentation for what were statements and
6 justifications being made, or trying to be made in
7 these technical bases documents.
8 But here we decided to, back on January
9 30, 2003, they provided us with a letter that said for
10 those five technical bases documents, which included
11 the biosphere transport document, we'll have all the
12 documentation on the web.
13 Or they had made a commitment to have it
14 up on the web by the end of March. But with respect
15 to the technical bases document on biosphere
16 transport, all the documents we requested in that
17 letter have been placed on the website and provided to
18 us via electronic submission.
19 So the staff at that point, in February,
20 in late February, mid to late February, began to do a
21 more detailed review with respect to those two igneous
22 activity agreements. And now they're in the process
23 of trying to finalize that.
24 And John, again, John led that effort with
25 the folks down at the center.

1 MR. TRAPP: And just, yes, there's two
2 points. Was there sufficient information for us to
3 review the TBD? And then I thought you were going to
4 the point, are we going to request additional
5 information? We, are not -
6 MEMBER HORNBERGER: No, we don't know.
7 MR. TRAPP: - at the point where we -
8 MEMBER HORNBERGER: No, I understand that.
9 I just wasn't clear whether or not you had, as an
10 interim, requested, so you've clarified it, I think.
11 Mike. John.
12 CHAIRMAN GARRICK: John, you indicated
13 that, the differences between mass loading differences
14 between St. Helen and the other analogs and Yucca
15 Mountain. Are you able to say something about what
16 those differences mean?
17 Are all the differences in the right, in
18 the wrong direction?
19 MR. TRAPP: In general, the differences
20 appear to require a slightly higher mass loading, than
21 you would directly get from the Mount St. Helen's
22 data, yes.
23 If you take a look at, again, the
24 information that we do have from Cerro Negro, you get
25 numbers which appear on the base of being relatively

1 high. And it's trying to determine why they're high
2 and how they relate, it's been a little bit of a
3 hassle.
4 CHAIRMAN GARRICK: Do you have any sense of
5 order magnitude impact on the dose as a result of
6 these differences?
7 MR. TRAPP: My overall statement would be
8 that's just about it, it is just about an order of
9 magnitude.
10 CHAIRMAN GARRICK: I see, okay. And how
11 are you requesting, what are you requesting DOE to do
12 to -
13 MR. TRAPP: Well, DOE in their
14 documentation, had noted that these difference did
15 exist. And they put in a series of, you can call them
16 whatever you want, adjustments, etcetera, fudge
17 factors and all of this other kind of thing to take
18 care of this. They recognized that there was a
19 problem.
20 CHAIRMAN GARRICK: I see.
21 MR. TRAPP: And the review really was going
22 through what they had done, was it technically
23 justified, did they get through sufficient
24 documentation to warrant that the numbers could be
25 supported.

1 CHAIRMAN GARRICK: I notice that you did
2 give quite a bit of emphasis to following a risk
3 informed process for responding to the agreement.
4 One of the things that the Committee has
5 commented on in the past is, is there any attempt in
6 implementing this process while trying to address the
7 agreements somewhat on a priority basis.
8 In other words, you would think that the,
9 the one thing you'd want to end up with at the time we
10 have a license application, is not a lot of
11 outstanding high risk agreements.
12 You'd like to have the high risk
13 agreements out of the way, and if you have any
14 lingering agreements at that point, they wouldn't be
15 the potential showstoppers, if you will.
16 MR. TRAPP: Well, part of the reason is
17 there are other high risk agreements we're dealing
18 with. For instance, in IA, the IA-102 Agreement which
19 deals with probability is definitely high risk, and
20 we've spent a tremendous amount of time going through
21 that one.
22 In addition, there are other things which
23 programmatically have to get taken care of, the IIRSR,
24 these type of things. And our staff has been working
25 very hard at this.

1 It's simply that with the loading that
2 we've got, which is as fast as we've been able to get
3 through.
4 MR. HATCHETT: Let me try, if I think I
5 understand.
6 CHAIRMAN GARRICK: I guess, one of the
7 other things I'm trying to get at, Greg, is there any
8 guidance coming from the NRC to DOE on this? To
9 encourage the strategy of addressing the risk ones.
10 MR. HATCHETT: We're in the process of
11 reviewing that very point associated with DOE's new
12 schedule submission to us. And we've had, a similar
13 question was asked of us before related to, you know,
14 what are we going to do with these, for instance, the
15 low risk agreements.
16 One of the ways to look at this is, again,
17 to go back and assess these agreements and ask
18 ourselves, with the understanding of our baseline and
19 risk insights, you know, what relevance or how are
20 these low risk items interrelated?
21 And I think for the ones that are
22 interrelated to things that may be medium or high and
23 maybe potentially related to DOE making a safety case,
24 we want to investigate them sufficiently enough to
25 assure ourselves that we're, that, you know, combined

1 affects have been considered going forward.

2 But for those high risk, I mean low risk

3 agreements, that may lend to understanding scope, or

4 adding greater depth or perspective, but it's just,

5 again, things that are in the margins.

6 We're considering looking at those things

7 in a different light in terms of how to disposition

8 them. And so, to that end, we're trying to find a way

9 to more efficiently and effectively address those

10 agreements, in the context of our baseline of risk

11 insights.

12 And also at the same time, once we decided

13 on what our position going forward would be, then

14 communicate that to DOE so they understand how we're

15 going to proceed between here and their proposed LA

16 submission of 1204.

17 So a lot of that kind of in the pre-

18 decisional draft, sort states about how do we do that?

19 And I know those questions have come forward before.

20 Where in fact, that if these things are

21 low risk items, I would say, down the road, if they

22 dealt with compliance issues, that they would still,

23 DOE would still have to provide sufficient

24 justification, whether they are high, medium or low.

25 But we want to go through and scrub that

1 set of information and ask ourselves is that really
2 relevant to the direction you think they're going in?
3 How does that potentially affect, you
4 know, our safety case? Is this just really scope or
5 adding prospective? And if it is, that's something we
6 may be able to disposition differently than the way we
7 have been doing it in the past.
8 So that's just sort of sneak peek, if you
9 will, at what we're thinking about trying to do and
10 different ways of handling that and trying to be more
11 efficient and effective using the staff time and
12 implementing the baseline of risk insight.
13 MR. STABLEIN: Dr. Garrick, excuse me.
14 This is King Stablein with the NRC. I just wanted to
15 add to what Greg said. That in the various management
16 meetings with DOE we have pointed out the value of
17 their getting the information on the high risk
18 significant agreements to us early so that we can deal
19 with those up-front.
20 As far, prior to getting the license
21 application as possible. In some instances, their
22 schedule does not appear to allow them to get us this
23 information as earlier as we would like.
24 But this issue has been raised pretty
25 consistently over the past several months.

1 CHAIRMAN GARRICK: Yeah. Well, of course,
2 the thought here is that one of the reason you employ
3 a risk informed process is that it allows you to have
4 a better technical basis for prioritizing the work.
5 And if that process isn't implemented,
6 then we're not taking, getting the full benefit of the
7 process.
8 MR. STABLEIN: I understand.
9 CHAIRMAN GARRICK: Okay, thank you.
10 MEMBER HORNBERGER: Ruth.
11 MEMBER WEINER: Most of the questions I
12 have relate to scheduling, so I'll just hold them.
13 But I did have one. You mentioned in your review of
14 the biosphere health effect bundle, if you will, that
15 that had not yet been incorporated, the first time,
16 when you started the review, it had not yet been
17 incorporated in the TPA?
18 MR. MCKENNEY: No. When we did the
19 agreements originally in 2000 and 2001, it was not
20 part of the TPA at that point.
21 In about 2001, is when we finally
22 integrated the biosphere model into the code so that
23 we could take overall assessment. It's just, it's
24 just part of the history of how we came up with a lot
25 of these agreements.

1 Whereas, you know, we may, some of, and
2 that's why, in actuality, some of these are, some of
3 these are just justification issues and they may not
4 have been as, the questions may have been written
5 slightly differently if they had been written today
6 under risk insights.
7 MEMBER WEINER: Thank you. My question
8 that I was getting to is, is this, was this an
9 isolated problem that has now been resolved, or are
10 there other areas where something has not yet been
11 incorporated in the TPA and you can't do proper
12 review?
13 MR. MCKENNEY: No, we've incorporated most,
14 all the issues over the years. And again, it's part
15 of the, that's part of the process of bringing the
16 baseline risk insights into the agreement review, too.
17 MR. HATCHETT: We'll have Tim sort of
18 expand on that, if he will.
19 MR. MCCARTIN: Well, even in the case that
20 Chris talking about, I mean we were doing dose
21 modeling outside of the TPA code to give us some ideas
22 of how to pose the questions, etcetera.
23 And do we have everything in the TPA code?
24 Well, of course not. In some areas we're doing more
25 detailed modeling, be it with geochemistry codes or

1 non-isothermal codes to help us structure some of the
2 ideas.
3 We'd like to think most of the big, if not
4 all the big pieces, are in the TPA code from a risk-
5 significant standpoint, but we continue to analyze
6 offline with process models to give us some idea of
7 some of the limitations of the TPA code.
8 MEMBER HORNBERGER: And who are you, sir?
9 MR. MCCARTIN: Pardon?
10 MEMBER HORNBERGER: And who are you, sir?
11 MR. MCCARTIN: Oh, I'm sorry, Tim McCartin,
12 NRC staff.
13 (Laughter.)
14 MR. CLARKE: I just had a question that
15 will help me understand this a little better. And if
16 you look at that slide under igneous activity there
17 are two agreements that are in process right now,
18 they're working on.
19 Were there others related to igneous
20 activity that have been resolved?
21 MR. TRAPP: If I can remember the exact
22 numbers, I believe there are 22 agreements. I think
23 we've resolved something like 12 or 13 of them.
24 There's about eight still outstanding.
25 MR. CLARKE: Okay. Then if I understood,

1 Greg, when you get them all resolved, you'll go back
2 and look at them again to make sure that you didn't,
3 you know as they got resolved independently the
4 integration didn't change?
5 MR. TRAPP: Well, remember resolution is
6 not resolution in the legal sense. Resolution is
7 resolution in the sense that you've got sufficient
8 information that you can do the review. And that's
9 really what we're going for right now.
10 MR. HATCHETT: So, again, to that end,
11 there are a lot of things that are still ongoing with
12 igneous, you know, activity in and of itself.
13 But, we've actually closed 13 of those 20
14 some odd agreements and we're trudging forward, but a
15 lot of that has to do with, you know, DOE providing,
16 you know, in its pre-licensing interaction phase,
17 prior to an LA, sufficient information to resolve
18 them.
19 As King Stablein pointed out, DOE's
20 schedule is driven by the products that they are, that
21 are in development. And that is irrespective of the
22 NRC's risk ranking. So they're doing some work that,
23 something that we consider high risk and they're not
24 going to submit it, until let's say July. Then if we
25 try to ask for it any sooner, the chances of getting

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

2 MR. CLARKE: Yeah, I think I understand.

3 I think my question was more motivated on the basis or

4 risk and not resolution and documentation.

5 But as you resolve these independently and

6 put them into different categories, you know, using

7 risk insights, and if I understood you, you would go

8 back through that process.

9 MR. MCKENNEY: As part of this there's a

10 separate bundle on igneous. There's an igneous bundle

11 that also came in. And part of our scheduling in this

12 case, we did actually delay in part the two point,

13 these two igneous ones to coincide so that the igneous

14 bundle from DOE would come in at the same time, so we

15 would have the ability to look across igneous to make

16 sure that everything was covered in a holistic manner.

17 Rather than doing them one at a time.

18 MR. HATCHETT: Let me try this one more

19 time. I think, I think I understand now where you

20 were going. Let's say, the analogy I would use, let's

21 say they submit a TSPASR. At the end of the day

22 they're going to submit TSPALA.

23 The question is, has anything changed

24 between then and now that we need to be aware of, that

25 also may be linked back to response of agreements and

1 things that we have, besides what's closed. So part
2 of that activity would be we need to confirm whether
3 or not things are still the same, or things have
4 changed?
5 And if things have changed, then have they
6 adequately addressed, you know, the concerns?
7 MEMBER HORNBERGER: John, I had a,
8 something I want to just double check in a response to
9 a question John Garrick put to you. I think I heard
10 you say that your quick, gut-level feeling was that
11 there might be an order of magnitude change in dose.
12 I presume, because you earlier said, that
13 this is directly proportional to mass loading, that
14 there's an order of magnitude difference in the
15 respirable mass from basaltic vulcanism relative to
16 silicic?
17 MR. TRAPP: When you take all the factors
18 into consideration, that would be my rough estimate,
19 yes. The thing that's interesting, if you take a look
20 at the silicic ash, really you might have to worry
21 more about stray health affects from silicosis, then
22 you would have to anything else.
23 MEMBER HORNBERGER: Any questions from
24 staff?
25 MR. COLEMAN: Greg, you've spoken to the

1 Committee before generically about the bundling
2 process and how that's been going. And today you've
3 spoken specifically about biosphere and a number of
4 other reviews of bundles are going on now. I just
5 wondered, are you seeing the interrelated, mutually-
6 supporting, technical rationales that I believe were
7 the basis for DOE submitting these in groups?
8 Is it a more efficient process than the
9 way it had been done before with individual agreement
10 items?
11 MR. HATCHETT: I think in the context of
12 DOE also telling us that this is a first in the
13 evolution of what their safety analysis report may
14 look like.
15 And therefore, somewhat directly related
16 to, you know, the various model abstractions that
17 would be submitted as part of a license application
18 that dealt with post-closure, it gives you, one, in
19 fact, a good idea of their thinking.
20 And it gives you a sufficient road map to
21 understand what they have done. And when I say road
22 map, I mean that's where we run into some of the
23 issues about whether or not the provided adequate
24 technical justification, or whether or not there's
25 some quality issues that lead us to believe that the

1 justification is not, in fact, adequate.

2 And that deals with issues related to

3 transparency, traceability and completeness. As Chris

4 said, the biosphere, TSPAI Agreements basically dealt

5 with documentation, completeness of documentation.

6 And if you have read our recent evaluation

7 report, we had a lot to say about transparency, you

8 know, completeness and traceability. So, as DOE has

9 moved forward to try to address those issues, we are

10 waiting to see how all of those things play in

11 providing better technical bases documents in the

12 future, and we're expecting one at the end of this

13 month on climate and infiltration.

14 MEMBER HORNBERGER: But I take it, again,

15 as you responded to Neil's question, you haven't had

16 any problem in doing the alignment with the WMRP,

17 which you started out saying that was, you thought was

18 a benefit of this?

19 MR. HATCHETT: No, we haven't had a problem

20 with that. The problem clearly gets to the fact of

21 looking into whether or not adequate justification is

22 there and trying to separate that issue from the

23 quality aspect when dealing the transparency,

24 traceability and completeness.

25 And sometimes those two things get marked

1 together. But they, what they do is they provide a
2 road map to say we've done this work and it's
3 represented here.
4 So instead of providing a picture of what
5 they've done, they've provided more of a road map to
6 get to where they actually got.
7 MR. LEE: Greg, for many years Division of
8 Waste Management has had as a goal its pre-licensing
9 consultations, the objective, ensuring that DOE
10 submits a complete and high quality license
11 application. And you've noted, as well as the other
12 staff have today that as a result of some of these
13 reviews, in particular the recent QA evaluation, that
14 DOE might have some work to do in, with regard to
15 ensuring that that license application is complete and
16 high quality.
17 Do you see a conflict between the demand
18 for additional information, with respect to addressing
19 KTI Agreements and the other goal that DOE has to
20 prepare that license application?
21 I mean do you see competing priorities?
22 The same people are basically doing the same work. Is
23 there going to, do you see a, what's your assessment
24 of how this is going to play out, in the context of
25 December, 2004?

1 I mean are you, you're going to get your
2 information to address the KTI Agreement, but how, how
3 good are the license applications going to be?
4 MR. HATCHETT: I'm going to let King
5 Stablein answer your question.
6 MR. LEE: Okay.
7 MR. STABLEIN: Yeah, this is King Stablein
8 with the NRC. Actually, my, that question, of course,
9 needs to be addressed by DOE. The work flow is on
10 their platter that you're asking about.
11 We know that they're extremely busy. I
12 think you're going to here from them later today. But
13 it's a challenge. And their platter is loaded, the
14 NRC staff platter is loaded.
15 I mean, there's an awful lot going on in
16 the high level waste program, but I don't think at
17 this point the NRC staff has made any judgement about
18 DOE's readiness by December, 2004.
19 When the license application rolls in, we
20 hope to be ready to give it a good, complete review.
21 MEMBER HORNBERGER: So, Greg, you said that
22 you anticipate the end of the month having -
23 MR. HATCHETT: Climate infiltration.
24 MEMBER HORNBERGER: - climate
25 infiltration?

1 MR. HATCHETT: Technical bases document.

2 MEMBER HORNBERGER: Do you have any, down

3 the line, any anticipation for others?

4 MR. HATCHETT: Well, I mean, they are going

5 to get up and talk about their schedule.

6 MEMBER HORNBERGER: I know.

7 MR. HATCHETT: So, they'll explain that.

8 But a lot of things -

9 MEMBER HORNBERGER: They've already told

10 you this, what they're going to tell us?

11 MR. HATCHETT: Well, I mean, just by

12 reading the schedule letter.

13 MEMBER HORNBERGER: Okay.

14 MR. HATCHETT: You find out what is

15 supposed to be submitted and how things have shifted

16 from their November 28th schedule letter to this one.

17 Although they appear to be still committed

18 to trying to provide responses to address all of these

19 by the end of August, '04.

20 MEMBER HORNBERGER: Other questions. Tim.

21 MR. MCCARTIN: Tim McCartin, NRC Staff.

22 I'd just like to amplify a little bit of what John

23 Trapp said about the order of magnitude changing mass

24 loading, and to clarify it a little bit.

25 I believe John is looking at the mass

1 loading. However, there are a number of assumptions
2 that go into actually getting the dose between the
3 types of activity, the percentage of time spent in
4 activities. Indoor versus outdoor, etcetera.
5 And what, you know, in order of magnitude
6 increase outside, what that translates to the actual
7 dose, depending on how long the persistence of the
8 mass loading at high levels outdoors, etcetera,
9 there's a lot of factors.
10 And it doesn't necessarily directly
11 translate to an order of magnitude increase in dose.
12 It depends on a number of other assumptions. And so
13 there's, there's a little, it's not quite as linear as
14 one might expect.
15 MEMBER HORNBERGER: Thanks for that
16 clarification. Other questions. Well, thanks very
17 much, that was very informative. We look forward to
18 continuing to learn how things go along this line.
19 It sounds as if we've certainly made
20 progress and we've learned a lot by looking at this
21 first one. And thanks for the presentation. And I'll
22 turn it back to you, Mr. Chairman.
23 CHAIRMAN GARRICK: Okay. While we're a
24 little ahead of the game, with respect to
25 presentations, the Committee is very much behind the

1 game in terms of our preparation of reports.

2 So what we're going to do is use this time

3 until noon, to work on reports. But in order to get

4 ready for that, we need about a five minute break to

5 get reorganized.

6 (Whereupon, the foregoing matter went off

7 the record at 10:55 a.m., and went back on the record

8 at 2:01 p.m.)

9 CHAIRMAN GARRICK: We are going to

10 continue with our session on key technical issue

11 agreements, and, George, this is in your hands.

12 MEMBER HORNBERGER: Thank you, John.

13 We are going to hear from two people, Tim

14 Gunter and Don Beckman, and I guess the thrust of it

15 is, as you recall the question I asked the NRC staff

16 this morning was, well, when are you going to get

17 these agreements, and now I think we're going to

18 learn, right?

19 MR. GUNTER: Right. Can everyone hear me?

20 MEMBER HORNBERGER: And you can introduce

21 yourself, Tim.

22 MR. GUNTER: Okay. Good afternoon. My

23 name is Tim Gunter, and I'm with the Department of

24 Energy, with the Office of Repository Development in

25 Las Vegas. I appreciate the opportunity to speak to

1 you today.

2 We're going to talk a little bit about

3 and get to your question about when will the

4 agreements come in and a few other things.

5 And I'd also like to mention that Don

6 Beckman is here with me from Beckman & Associates. He

7 works with BSC, and he's basically my counterpart on

8 the contractor's side, a KTI completion manager.

9 The items we're going to cover today, just

10 to give you a little background real quick, we'll talk

11 about updating our strategy on how we're approaching

12 the agreement, the status of where we stand in terms

13 of what has been sent in, what is on the schedule,

14 what does the future schedule look like, and then wrap

15 it up.

16 So if you go to page 3, just real quick in

17 terms of background, most of you are aware there are

18 293 key technical issue agreements that DOE and the

19 NRC entered into over a period of about a year and a

20 half starting back in around the year 2000. We

21 discussed this with the committee back in June of last

22 year and told you then of a new approach that DOE was

23 taking sort of informally called the bundling

24 approach, but basically it's where we take agreements

25 of related topics and try to wrap them up in a summary

1 document, a technical basis document, as we call it,
2 which lays out in terms of repository performance and
3 sets sort of the bounds for how these agreements
4 interact with each other and what they mean in terms
5 of the overall project performance.
6 Most of the agreements will be addressed
7 in this fashion, the technical basis documents.
8 However, there are some that don't really fit in well
9 or either they're a group among themselves, and so
10 we'll address those in a smaller group or either
11 individually.
12 Page 4 shows you the major groups based on
13 the performance aspects of the repository. Basically
14 it's sort of the flow of the water through the
15 repository, and I'll run through it very briefly, but
16 if you'd like more details we'll be glad to go into
17 further details on any of them.
18 But basically starting with number one,
19 they're numbered in the order. Climate and
20 infiltration where the water first starts into the
21 surface and then proceeding on down through the
22 unsaturated zone.
23 Using Roman numerals in this fashion makes
24 it a little bit more difficult, but water seeping into
25 drifts, it goes to the top right corner, and number

1 four is mechanical degradation and seismic effects in
2 drift chemical environment.
3 Number five, waste package and drift hill
4 (phonetic) corrosion.
5 Number six. Let's see. Where's seven?
6 Yes, seven, the environment, in-package environment,
7 waste performed degradation and solubility.
8 Colloid transport.
9 Yeah, EBS transport, number nine.
10 Number ten is the unsaturated zone
11 transport.
12 Eleven, saturated zone flow and transport
13 and then volcanic events.
14 Let's see, 12 is biosphere transport and
15 then volcanic events.
16 So those are the 14 major technical basis
17 documents that you will see. Some of them you've
18 already seen. About seven of them we submitted
19 through starting in last fall, September, and we
20 submitted several of them through the end of last
21 year.
22 All right. Moving on to the next slide,
23 we covered the first bullet. You know, the reason why
24 we wanted to use this approach, and that we're
25 fungible into these technical basis documents.

1 Let's see. I'm just reading real quick to
2 see if there's anything I haven't already talked
3 about.
4 Basically, you know, what we've seen so
5 far is we think the approach has been working fairly
6 well. You know, it gives a better perspective of the
7 importance of the agreements.
8 And in terms of schedule, some of the
9 things that have come up related to the technical
10 basis documents, and of course, the completion of
11 those is driven by a number of other documents, such
12 as the analysis and model reports. That would be the
13 key for being able to complete the technical basis
14 documents and the agreements.
15 So in some areas we're going to be
16 proposing to the NRC that we have one of our meetings
17 on the topics to provide them information earlier
18 because of fishing out the schedule, which I'll get to
19 in a couple of minutes. The information is just not
20 going to be available as soon as we would like it to
21 be or as soon as the NRC would like it to be.
22 So we think there may be value in meeting
23 with them, for example, in some of the TSBA (phonetic)
24 work. The results would be available, you know, weeks
25 if not a month or sooner than the actual final

1 document that would be able to be released.

2 Page 6 gives you a little bit of the

3 current status. We've fully responded to 168 of the

4 agreements, and that includes some of the additional

5 information needs that we've received from the NRC

6 staff, and that's out of the total, of course, of 293.

7 To date we've submitted seven of the 14

8 technical basis documents, and there's about 125

9 remaining agreements and additional information needs.

10 And of that number, approximately half -- again, I

11 will get into the schedule in a minute -- but roughly

12 half of those have been delayed to some extent.

13 Some of the reasons for the change to the

14 schedules I touched on earlier, but a little more of

15 the details is some of the model updates that we're

16 doing. There's also, you know, everywhere the NRC's

17 evaluation identified the need for more transparency

18 and flexibility, more defensibility in some of our

19 technical basis documents.

20 So we're putting together a team that's

21 going to review the AMRs from that aspect and try to

22 identify where there may be some improvements needed,

23 and that's going to take a substantial period of time

24 and a pretty large team that's being formed and put

25 together, and this is where Don can give us -- I think

1 he's a lot more familiar with the makeup of the team.
2 If you want to touch on the team just a
3 minute, Don.
4 MR. BECKMAN: Certainly. The team
5 involves five major discipline areas that include both
6 the natural and engineered barrier systems with a mix
7 of both technical personnel and regulatory staff that
8 are looking at each of the individual AMRs from a
9 traceability, transparency and technical defensibility
10 perspective intending to take some of the documents
11 that had a more scientific bent and respond in large
12 part to the results of the NRC's technical evaluation
13 a couple of months ago and improve those particular
14 features in such a way that it will better support the
15 NRC's staff review and preparation of the safety
16 evaluation report because these are essentially the
17 first level of reference behind the license
18 application, which is in parallel preparation.
19 MEMBER HORNBERGER: Don, just out of
20 curiosity, you said regulatory staff. Do you hire
21 former NRC employees or NRC licensees or do you
22 just -- how do people get the experience being a
23 regulatory?
24 MR. BECKMAN: It's a mix. We have former
25 licensee licensing and regulatory staff. We have

1 several former NRC employees, and we have several
2 attorneys that are acting as consultants to the team.
3 So we tried to get a fairly hybridized mix of skills
4 to look at the documents in preparation for your
5 review and the eventual hearings.
6 MEMBER HORNBERGER: Okay. Thanks.
7 MR. GUNTER: Okay. so basically we're
8 trying to incorporate some of the lessons learned from
9 both NRC's evaluation and our own internal assessments
10 that we have performed, which came up with some
11 consistent type of issues that NRC identified.
12 The last bullet here talks about a couple
13 of specific areas, total system performance
14 assessment, integration, and then criticality, and
15 these are two areas that because of the schedules,
16 particularly, for example, the TSPAI completion, it
17 will be probably in the fall some time.
18 So our goal is to try to provide complete
19 answers no later than end of August, and that's the
20 case where we think we would have the information
21 available even though maybe the final document is not
22 publicly available yet.
23 So we would try to extract from that,
24 summarize whatever we need into the response, and then
25 wait on the final document necessary to close the

1 loop, but we would try to address it with the
2 information we expect to have at that time.
3 MR. LARSON: When you say "fully
4 responded" on the top there, that's DOE's evaluation
5 because they're not complete as far as NRC is
6 concerned.
7 MR. GUNTER: Right, and when I say fully
8 responded, I mean DOE has submitted a response that we
9 think fully would address the agreement, and then it's
10 up to NRC to determine whether it is complete or not.
11 MR. LARSON: And so far there's only been
12 93 of those.
13 MR. GUNTER: Right. Ninety-three at the
14 moment, and I understand there's some more that we
15 would expect, another six or so on the way from NRC
16 that would be complete also.
17 CHAIRMAN GARRICK: I notice you used the
18 word "responded to" and "addressed." Are we to read
19 anything in to that?
20 MR. GUNTER: The only thing to read into
21 that, I think, is that we didn't want to say that we
22 would complete the agreements because that's not
23 really in DOE's hands. I mean, we can submit what we
24 believe is a full response, but as we've seen, there
25 is additional information requests coming back from

1 the staff, and then once we satisfy those, they will
2 determine that it's closed or complete, but we didn't
3 want to presuppose completion of the --
4 CHAIRMAN GARRICK: Okay. So it's very
5 much on purpose.
6 MR. GUNTER: Yes.
7 CHAIRMAN GARRICK: Yeah.
8 MEMBER WEINER: Is your success rate
9 improving? I mean, have you noticed that there are
10 fewer back and forth requests for information or is it
11 pretty much the same as it always has been?
12 MR. GUNTER: I think I would have to say
13 that because we submitted this large number of
14 documents last fall, we haven't received any
15 evaluation of those yet. They're still pending review
16 by the NRC staff, and that's the information I would
17 use to answer your question, and I don't have the
18 answer to that yet.
19 I know some of them are on their way.
20 They're coming back closed, and there will be some
21 number of them that will be looking for more
22 information, which is our hope that the percentages
23 improve.
24 I think the technical basis documents in
25 these recent agreements that we submitted last fall,

1 at least from my perspective in reviewing them, they
2 seem to me to be more complete than some of the
3 earlier submittals. So we're hopeful that they'll be
4 more on target.
5 MR. LARSON: Just following up on Dr.
6 Garrick's question, is there a difference between
7 "fully responded" and "addressed"?
8 MR. GUNTER: I think those were used
9 pretty much interchangeably. I guess the only
10 potential difference would be when I mentioned now in
11 the case of trying to accelerate to the end of August
12 those, for example, TSTAI where initially we would
13 have hoped to have final documents from TSGA
14 (phonetic), you know, ready when we address the
15 agreement.
16 We still think we will fully address it,
17 but there will be some information yet to come that
18 will, like I saw, close the loop. So there's no real
19 difference, I think.
20 Okay. Page 7 once again lists the
21 agreement -- I mean, lists the technical basis
22 documents into groups, and you'll see one through 14
23 are the technical basis documents, and in the right
24 column is the number of agreements or additional
25 information needs that have been requested by NRC that

1 are remaining.

2 And the last four that aren't numbered

3 will be groups of submittals that will not have a

4 technical basis document accompanying them, and that's

5 barrier capability and total system performance

6 assessment integration.

7 Criticality, feature events and processes,

8 and then a number of ungrouped agreement responses.

9 Page 8 gives you just a little more

10 breakdown on some of the reasons we rescheduled

11 specific technical basis documents. Technical basis

12 document number four, the first sub bullet there,

13 there was 14 KTI agreements and AINs grouped under

14 that document, which was mechanical degradation and

15 seismic effects, and we've delayed that. It was

16 originally scheduled to be at the NRC in May, and we

17 delayed that to July of this year primarily to

18 incorporate some updated ground motion analyses and

19 also some rock fracture model updates.

20 The next significant change is in

21 technical basis, document number seven, in-package

22 environment, waste form degradation and solubility.

23 There were 12 agreements and additional information

24 needs associated with that, and that's been delayed

25 from April to July, and as given there, the primary

1 reasons were to update the chemistry abstraction
2 model.
3 And then the last significant change to
4 the technical basis document is number 14, the low
5 probability seismic, eight agreements and additional
6 information needs associated with that. And we
7 delayed that from March to June to incorporate model
8 updates primarily related to stress corrosion
9 cracking.
10 That was sort of the big changes, but
11 there was as number of other changes in the schedule
12 also which we sent to NRC on April 2nd of this year,
13 and page 9 shows you a comparison of the new schedule
14 versus the schedule we sent in November of '03.
15 And what is obvious is that although we're
16 holding the end date of August, we're building a
17 significant peak in the July time frame, and May and
18 June are fairly significant months also for us.
19 MR. LARKINS: Now, were all of those
20 updates on the previous viewgraphs to just update the
21 documentation or did some of it involve additional
22 analysis?
23 MR. GUNTER: Well, it was both actually.
24 As I mentioned, some of the models are actually being
25 updated and revised, and that, of course, drives the

1 changes to the technical basis documents which depend
2 on the AMR's analysis and model reports as the basis
3 for our response to the agreement.
4 MR. LARKINS: Okay.
5 MR. GUNTER: Are there any questions on
6 this chart while we're on it?
7 MR. LARSON: The last two months there,
8 are they high probability, low probability -- I mean
9 high consequence risk or low or what?
10 MR. GUNTER: Let's go to --
11 MR. LARSON: -- Jim Mullen in August was
12 61.
13 MR. GUNTER: Okay. If we look at page 10.
14 Yeah, thanks for the lead-in. This is the
15 new schedule, and it shows the breakdown of NRC's low
16 risk, medium risk and high risk. So if you look at
17 August, out of a total of 17, nine are low risk, four
18 are medium risk, and four are high risk, and, Don, you
19 may want to add some details here, but I know that
20 most of these are TSTAI related, criticality, but
21 criticality has low risk ones.
22 MR. BECKMAN: Yeah, these in August
23 involved a performance assessment abstractions and
24 uncertainty and model confidence and validation issues
25 that are dependent on the development of the final

1 TSPA analysis in the model report that documents it.
2 This fall into, in part, the category that Tim
3 mentioned earlier about addressed responsively, but
4 requiring completion of the final documentation before
5 it was supported.
6 The nine in July involved in-package
7 chemistry, waste package corrosion, and basically
8 tunnel stability issues. Those are the risk ranked
9 high by your prioritization approach, and the nine in
10 June involve FEPs, additional waste package corrosion
11 items. The aircraft hazards analysis, for example,
12 constitute those nine.
13 Relative to that, the items that we have
14 now are on schedule to the extent that we're making
15 adjustments to the internal schedule as we need to to
16 accommodate the development of the specific
17 information, but the delivery dates to NRC following
18 the DOE final review are still considered very solid.
19 We have enough float in our schedule to accommodate
20 the internal work that we have to do and still get
21 them to be able to deliver.
22 MR. GUNTER: Okay. If we could go on then
23 to page 11, the next slide just shows basically a
24 work-off curve comparing the previous schedule, and
25 you see we're holding the end date. As we said, we

1 want it due by the end of August, but what that does,
2 as you saw from the earlier schedule, is that it gives
3 us a higher peak rate as we're approaching that end
4 date.
5 And also the April schedule. So you're
6 seeing not as many come in early, and then a steeper
7 ramp-up leading to August.
8 And then I will point out that, you know,
9 at one time we had some that were pushing out past
10 August and into early next year, and we believe
11 dealing with the previous schedule we pulled those
12 back to August.
13 CHAIRMAN GARRICK: Now, what was the basis
14 for that? How did you move that schedule up? Just
15 more resources?
16 MR. GUNTER: More resources. That was
17 about the time that we actually formed under Don this
18 KTI completion group. It was a dedicated team, not
19 fully 100 percent dedicated, but I think close to it,
20 and, Don, you can jump in if you want to add to that,
21 but you know, their focus is on completing these
22 agreements.
23 So along about the time that we initiated
24 the technical basis document approach, Don formed his
25 team of people to help get us through.

1 MR. BECKMAN: Additionally, some of those
2 that trailed out there involved a mix of needs, if you
3 will. Some of them we were able to address by getting
4 some additional dedicated people to provide alternate
5 resolutions to what we had originally planned so that
6 we could be fully responsive and provide a somewhat
7 different answer than we had originally anticipated,
8 and others just involved researching of available data
9 further than we had previously so that we could
10 harvest more information earlier.
11 MR. GUNTER: Okay. If we move to the next
12 slide, this just gives a breakdown, and actually NRC
13 started this table format back when Jim Anderson was
14 here, and we've adopted it to try to be consistent
15 with the way they kept track of things. We just
16 wanted to change the titles to reflect the DOE
17 viewpoint.
18 But you know, if you're interested in the
19 actual details of how a certain -- the agreements in
20 a certain KTI span can go to the table and find out
21 whether everything is. Basically it has got all of
22 the KTI's technical issues listed down the left side,
23 including three which is pre-closure. Although not an
24 official key technical issue, we were treating it like
25 one.

1 And then there's also GEN, general
2 agreement 101, which is listed there, but that will
3 give you the status going across the top of the table,
4 a number of agreements reached. You can see, of
5 course, the total at the bottom, 293. The number in
6 each KTI that we've submitted to the NRC, and then the
7 rest of these sort of make up the number submitted,
8 and it tells you the status, the response submitted
9 that are in the NRC review. Currently our number
10 shows 76.
11 Partial responses submitted, the total is
12 17, and what partially submitted means, in some cases
13 the agreement called, for example, to provide a series
14 of documents or AMR revisions, and maybe they became
15 available not all at one time. Some were available
16 sooner than the others.
17 So we would submit the ones as they became
18 available. So it will be complete when we submit the
19 last piece of the agreement, but that's just really
20 just for tracking purposes.
21 The number of additional information needs
22 that we've received from NRC, again, an individual
23 breakdown and a total of 28. DNS 79, a total
24 remaining to be submitted. Then 93, as we mentioned,
25 were complete.

1 And then you compare. You can compare
2 like the number of agreements reached with the number
3 complete or the number remaining to sort of get a feel
4 for how each group of key technical issues is coming
5 along.
6 MEMBER WEINER: Before you leave that
7 table, do you have any sense of where the high risk
8 agreements are, since every bundle has some high risk,
9 medium risk, and low risk agreements in it? Which
10 section, you know, just roughly, of the agreements
11 already reached, how many are high risk?
12 MR. GUNTER: We have that information.
13 I'll see if Don can help me.
14 MR. BECKMAN: I'm not sure that I can
15 answer you by number account, but the areas in which
16 open high risk agreements reside, if that's the
17 fundamental question --
18 MEMBER WEINER: Yes.
19 MR. BECKMAN: -- the container life and
20 source term contain several of them that are high
21 risk. The repository design of thermomechanical
22 effects have, I believe, at least two that are high
23 risk that involve tunnel stability and rock mechanics
24 properties. TSPAI has four or five.
25 So out of that last 23, the bulk of them

1 fall in those three areas. Igneous activity, the
2 dike drift interaction issue of IA-218 remains high
3 risk, and I'll be glad to share a table with you off
4 line to answer your question more specifically if
5 you'd like.
6 MEMBER WEINER: Sure. I was just thinking
7 that this table would be even more informative if
8 there were some indication in that, well, in each of
9 the columns as to how many or roughly approximately
10 how many of those agreements are high risk.
11 Because the reason for the question is
12 pretty obvious. It seems to me that the high risk one
13 are the ones you're going to want to focus on early
14 on, and I don't know to what extent. I don't really
15 have a judgment to what extent you're doing that.
16 MR. BECKMAN: The practicality of the
17 timing of those items unfortunately depends somewhat
18 on the sequence of the analytical work. For example,
19 one of the items that I missed, there are a couple of
20 them in I believe they're either container labels and
21 source term or radionuclide transport that involve
22 radionuclide solubility and impact its chemical
23 conditions.
24 That analysis is just now being completed
25 and is available in draft form. So its timing, which

1 was one of the delay items that we mentioned earlier,
2 its timing and the availability of the process model
3 results are driving my ability to generate a response
4 to that set of KTIs.
5 Similarly, those which are tunnel
6 stability related, we have just completed doing the
7 seismic runs for the tunnel stability calculations,
8 and I have preliminary results available, and the
9 documentation is being prepare even while we're
10 meeting today.
11 So it is driven more by the development
12 sequence of the analysis, unfortunately, than our
13 desire to move them up in the schedule.
14 MEMBER WEINER: I'll save the rest of the
15 questions.
16 MR. GUNTER: Well, we could have that
17 information. We have that in another table that's not
18 in the presentation. Actually each agreement, whether
19 it's high, medium or low, it's just not summarized in
20 this table.
21 And then we go on to the next slide.
22 I like this because it's easy on the eyes,
23 but it's basically the same information that was
24 presented in the previous table. It just gives you
25 sort of a big picture of, you know, the total number

1 of agreements. Thirty-one, about 32 percent are
2 complete. About 26 percent we have submitted in our
3 NRC review. About six percent are the partial
4 agreement submittals that I discussed earlier, and
5 then about 27 percent still remain for DOE to submit
6 to NRC, and then nine and a half percent NRC has asked
7 for additional information for the agreement.
8 Okay. Just to summarize then, which that
9 last slide pretty much did in terms of status, but 57
10 percent of the 293, the technical issue agreement DOE
11 has responded to, and NRC has formally closed by
12 letter 93 of those agreements. That leaves us 125 of
13 those agreements and additional information requests
14 that we are responding to by the end of August of this
15 year.
16 As I mentioned, there's some agreements,
17 roughly 13 that are associated with criticality and
18 total system performance assessment, which we may want
19 to meet with NRC to provide them some information
20 prior to that information becoming documented in the
21 final documents.
22 And then as I said, by August of this year
23 we will provide a submittal to NRC on all of the
24 agreements with the current status, and for those, for
25 example, TSBA, if we're waiting on the final report

1 will address, you know, when that information would be
2 available and what form and that kind of thing.
3 That concludes my presentation. I'd be
4 glad to take any other questions.
5 MEMBER HORNBERGER: Thanks, Tim and Don,
6 as well.
7 We'll start to my left. Jim. Please use
8 your mic; please use your mic.
9 MR. CLARKE: I know I'm missing something
10 here, but let me ask anyway. If you add 93 to 125, is
11 that all of the agreements? Because that isn't 293.
12 MR. GUNTER: Okay. The 93 is the number
13 closed. One, twenty-five is the number that we have
14 remaining to submit. There is a number of agreements
15 that we've submitted but haven't received an
16 evaluation back from NRC yet.
17 MR. CLARKE: Okay. I understand.
18 MEMBER WEINER: This may be an unfair
19 question, and I can understand why you're still
20 looking at data for some things like their stability,
21 but, for example, corrosion chemistry is corrosion
22 chemistry. It has been around for a long time, and
23 this project has been underway for 20 years.
24 And even if you only come fairly recently,
25 you've been working on this stuff for more than a

1 decade. Do you have any reason why this has been
2 delayed so long and now there's still more delays, why
3 it's taking so long to develop these technical
4 documents?
5 MR. GUNTER: You want to take that one?
6 MR. BECKMAN: I'll try. There are a
7 couple of factors, and I'm not sure that I can give
8 you a comprehensive answer for all of the various
9 aspects.
10 A number of the KTIs that we are
11 addressing at this stage, if you will, particularly
12 for the corrosion properties, there are a couple of
13 different facets to it, one of which is we still have
14 corrosion data from some of the later testing that is
15 being collected and reduced, and that's part of what's
16 going on now at Lawrence Livermore Laboratory.
17 Part of it is that the analytical work to
18 reduce that data and get it into a reportable form
19 that we can then use to translate into the KTIs is
20 still underway. So we're still caught in that work
21 sequence.
22 I'm not sure that I have the information
23 to comment accurately on why the development work has
24 taken so long in that regard. I can tell you what's
25 impacting our ability to get the information collected

1 and submitted to you.

2 Over the last year, there has been quite

3 a bit of additional thinking and development on the

4 project with respect to the treatment of passive film

5 behavior and localized corrosion, and the models have

6 undergone continued evolution, as well as the

7 application of the new data that have come in, and

8 that's about the extent of my personal knowledge of

9 what's going on behind the scenes there.

10 MEMBER WEINER: It's as much, I guess, a

11 rhetorical question as anything else. It just

12 surprises me. I mean, we were talking about

13 passivation 15 years ago, and much of the -- I'm

14 focusing on the chemistry, but the same thing could be

15 said for features, events, and processes. These began

16 to be identified, the ones you could screen out, begin

17 to be identified more than a decade ago, and I believe

18 this is a question that may come up again and again,

19 especially if your schedules keep pushing forward as

20 they do.

21 MR. BECKMAN: I understand.

22 MEMBER HORNBERGER: John.

23 CHAIRMAN GARRICK: This is a very

24 interesting breakdown, and it's very helpful.

25 I notice that two of the KTIs resulted in

1 far more NRC requests for additional information than
2 all of the rest put together, and namely the container
3 life and source term and the TSPA (phonetic).
4 Is the reason for that that these are high
5 risk, have high risk elements to them, or is it
6 quality of response? Can you elaborate on it a little
7 bit? Because there's very little additional KTIs
8 where you have many iterations, whereas these seem to
9 have a whole bunch.
10 MR. BECKMAN: I'm not sure that I can
11 speculate on the cause. That may be something that
12 would be better directed at the staff.
13 There were a mix of reasons from our
14 perspective reflected by the information that was
15 requested. In at least one or two of the cases, we
16 had early on attempted to formulate risk informed
17 responses based on total system performance of some
18 of these, and we clearly missed the staff's mark on
19 the amount of process level information that we
20 provided with them.
21 And my recollection is there was at least
22 one and perhaps two of those in the eight that fell in
23 that category.
24 In several of the other cases, the issues
25 involved some fairly detailed information needs and

1 additional basis information that the staff felt that
2 was needed that we apparently did not include in the
3 first submittal.
4 Again, I think there's a certain amount of
5 it that's part of the natural iteration of information
6 with the staff. There was some of it where we clearly
7 missed the mark of staff expectations or needs for
8 information.
9 We also had a large number of agreements
10 in that category. So I'm not sure that the return
11 rate is that much significantly higher than some of
12 the others in terms of the number of questions
13 resulting from the number of items submitted.
14 CHAIRMAN GARRICK: Does the 23 remaining
15 responses on TSPA, which is more than any of the
16 others and many times more than some of the others,
17 given that that's the document that's going to be the
18 principal basis for the safety case, does that cause
19 you any undue concern?
20 MR. BECKMAN: Of those, they are actually
21 spread among several groups, even though they carry a
22 TSPAI label. I believe we actually have about less
23 than a half dozen, five perhaps that are specifically
24 related to TSPA results. We have perhaps another four
25 or five that are specifically related to TSPA

1 methodology, treatment of uncertainty, treatment of
2 obstructions, guidance, application of guidance of
3 that nature.
4 There are a number of others that though
5 they carry the TSPAI label deal with process model
6 uncertainties in other areas. For example, in drift
7 chemical environment has one item that has a TSPAI
8 label that deals with the propagation of uncertainty.
9 So we're dealing with the other roughly 15 or 16 that
10 carry the TSPAI label in the other technical basis
11 document groups, and they're flowing through the
12 process with their own groups.
13 So with respect to level of concern, only
14 the generic level of concern we have to maintain our
15 schedule throughout, and then as Tim has pointed out
16 a couple of times, the need to get closure on the
17 documentation for TSPA methodology and results as we
18 get into the late summer.
19 CHAIRMAN GARRICK: One final question or
20 comment. Early on you received a considerable amount
21 of criticism for the amount of emphasis that was being
22 given to engineered areas, engineered systems over,
23 say, the analysis of the natural system, and the NRC
24 has always indicated that the safety has to come from
25 both sources.

1 It still looks like that most of the
2 activity centers around the engineered barriers, which
3 surprises me a little bit, given the history. Is this
4 because you feel you have been reasonably responsive
5 with respect to the natural system and its containment
6 capability, or what is the issue?
7 It still seems to be highly emphasizing
8 the engineered barriers as far as the analysis time is
9 concerned.
10 MR. GUNTER: I guess let me ask if I could
11 get you to clarify your question, if you would. In
12 terms of activity, are you referring to the number of
13 agreements and responses related to --
14 CHAIRMAN GARRICK: Yeah, I'm trying to.
15 I'm trying to correlate the agreements with the scope
16 of the safety case or the analysis, and in the earlier
17 presentations that we've heard from the TSPA, not so
18 much from us, but from other sources there was
19 considerable concern about the emphasis on the
20 engineered barrier systems and not much emphasis on
21 the natural setting with respect to its containment
22 capability in the analysis.
23 And so given that, I would have expected
24 this data to reflect more emphasis on the natural
25 setting than it seems to be, and I realize these

1 numbers are difficult to interpret and the
2 correlations are fuzzy, but I was just curious as to
3 whether or not there was a real reason for this
4 because it seems to be that it's business as usual.
5 Most of the action is with respect to the waste
6 package, the near field on the TSPA, et cetera, not on
7 radionuclide transport through the
8 unsaturated/saturated zone, and so forth.
9 MR. BECKMAN: I think part of what you're
10 seeing, Dr. Garrick, is some input reflected by the
11 interest of the NRC staff as well. We're acting in a
12 response role to either issues raised by the staff or
13 questions asked about the responses to those issues.
14 CHAIRMAN GARRICK: We'll ask them the same
15 question.
16 MR. BECKMAN: Yeah. So I think there may
17 be a little artificiality there, driven by --
18 CHAIRMAN GARRICK: Yeah, I'm sure there is
19 because once you reduce it down to these kinds of
20 numbers, you're masking a whole lot of activity. It's
21 very hard to see what's behind them. One of these
22 could be worth ten of another.
23 MR. BECKMAN: Well, again, by example,
24 radionuclide transport, which is the RT category, had
25 effectively half as many issues originally and

1 essentially no additional information needs even
2 though we've submitted up to this point most of the
3 agreements.
4 Recognizing that the staff has still got
5 about half of them in review, but the balance that
6 we're providing from my part of the project is largely
7 driven in response.
8 MEMBER HORNBERGER: Mike?
9 VICE CHAIRMAN RYAN: No questions. Thank
10 you.
11 MEMBER HORNBERGER: Tim, on your Slide 7,
12 the remaining KTI agreement responses list volcanic
13 events as one. Can you tell me which one that is?
14 MR. BECKMAN: There are actually two.
15 MEMBER HORNBERGER: I was going to say
16 because on the slide we were just looking at, Slide
17 12, there are two.
18 MR. BECKMAN: Yeah, that's an artifact of
19 the way we've chose to manage the groupings, not
20 necessarily any technical implications there at all.
21 IA-217 has to do with ASHRE distribution
22 and its effect on dose and as dependent to a great
23 extent on the overall system model. The second one is
24 IA-218, which is dike drift interaction and is more
25 functional process model level. So they're being

1 handled separately, and it's an accounting issue.

2 MEMBER HORNBERGER: Well, okay. I guess

3 we've spent enough time on that interesting table.

4 I was curious. One thing that piqued my

5 curiosity, on your Slide 8 you mention that you're

6 considering stress corrosion cracking under a low

7 probability seismic events heading. Why isn't that

8 under corrosion or CLST?

9 MR. BECKMAN: I'll try to give you a

10 thumbnail sketch of the seismic consequences model,

11 and I may not be able to do it justice, but we'll give

12 it a try.

13 The seismic consequences model, because of

14 the large ground motions introduced by the low

15 probability seismic events, results in the waste

16 packages bouncing and impacting end to end,

17 particularly at the very, very low probabilities.

18 The original finite element analysis that

19 was done on the waste package structure had a very

20 coarse grid size which resulted in what were termed

21 patch failures, which were dimensionally unrealistic

22 in terms of the way we expected that package to

23 actually behave.

24 We did some additional review and

25 evaluation of the modeling and brought in some

1 additional expertise to the project. That effort
2 concluded that the actual failure model of the package
3 is because of the nature of the impacts and the
4 stresses introduced would be on the order of tightly
5 closed stress corrosion cracks rather than patches
6 unrealistically defined by a finite element grid.
7 So we're probably overusing the shorthand
8 here somewhat, but it's a fairly substantial change in
9 the realistic direction of the modeling that was done
10 of that particular set of consequences.
11 MEMBER HORNBERGER: But it is a modeling
12 then. I think I understand now. It's failure in
13 direct response to seismic stresses.
14 MR. BECKMAN: That's correct.
15 MEMBER HORNBERGER: Not corrosion.
16 MR. BECKMAN: That's correct.
17 MEMBER HORNBERGER: Okay. Because, I
18 mean, the reason that it struck me that you're
19 bundling these to put like things together, not to
20 scatter stuff all over.
21 MR. BECKMAN: Yeah, it was a little bit of
22 a misdirection. I apologize for that.
23 MEMBER HORNBERGER: Okay. I understand.
24 Any questions from staff? Neil.
25 MR. COLEMAN: Actually I have a question

1 for the NRC staff based on Slide 10, and I think they
2 have the right people here to answer this. I just
3 wondered if staff would care to comment on the kind of
4 planning that they've done, perhaps considering the
5 risk ranking of these many agreements that are coming
6 in.
7 As you can see, it sort of resembles the
8 bow wave of a ship. There's a really large number
9 coming in and perhaps the risk baseline work that the
10 staff have done will help prioritize these reviews.
11 I just wondered if you could comment on
12 that and any planning that you have done for that.
13 MEMBER HORNBERGER: A volunteer? who's
14 going to surf on this one? Tim.
15 MR. McCARTIN: Well, this schedule hasn't
16 changed that much. We're aware of the agreements and
17 when they were coming in. We continue to both do our
18 own analyses to help us be better ready to review
19 things. We continue to talk with the Department of
20 Energy to get a better sense of their analyses.
21 I'm not quite sure what your question is
22 pointed at. If you can put it a different way, I'm
23 not -- the schedule is what the schedule is. I mean,
24 we're working within those constraints.
25 MR. COLEMAN: Well, let me just say, for

1 example, the higher risk rank agreements, would those
2 be reviewed first as a priority?
3 MR. McCARTIN: Well, each bundle has a
4 variety of agreements in it, and certainly as we've
5 said, we will look deeper into high risk items, but
6 you know, the bundle has a package of agreements that
7 are all interrelated, and I don't know. You can't
8 necessarily pull out a few high risk things and do
9 them separately with the other ones. I'm not sure
10 there's a lot of --
11 CHAIRMAN GARRICK: The problem here is the
12 groupings are not done by risk, but rather by the
13 system, and so each basket has a mix of all levels of
14 risk.
15 MR. COLEMAN: Well, I'm actually referring
16 just to individual items.
17 CHAIRMAN GARRICK: Right.
18 MR. CAMPBELL: May I add something here?
19 CHAIRMAN GARRICK: Yes.
20 MR. CAMPBELL: This is Andy Campbell. I'm
21 Chief of the Performance Assessment in the High Level
22 Waste Division.
23 When we review these bundles, we have
24 usually a mix of agreements from different KTIs.
25 Those are submitted as attachments to what's called a

1 technical basis document, and those attachments refer
2 to the technical basis document.
3 So we really have to review the whole
4 bundle. We certainly use risk information in that
5 review and will continue to use our understanding of
6 risk insights in that review. But it's difficult, and
7 it wouldn't be very productive to pull out of that
8 just the high risk agreements and only focus on them.
9 We have to look at the whole bundle and evaluate it in
10 the context of risk.
11 MR. COLEMAN: Well, I would just add one
12 other thing. We noticed from the biosphere example
13 this morning that two agreements on igneous activity
14 were separated from that group. So that's the one
15 that we've gotten to hear about in more detail.
16 That's sort of what brought up the question.
17 MR. McKENNEY: This is Chris McKenney.
18 In the biosphere one, we also had another
19 thing which is we also had the schedule for the IAA
20 agreements, and there was that confounding factor of
21 the fact that the two higher risk IA agreements we
22 wanted to wait and, in part, one, we needed
23 information needs that we didn't need for the other
24 five of the agreements that were in that bundle
25 itself, and also there was to be an IA bundle that

1 came in in the first few months of the first quarter
2 of '04, and that to review all of those together, all
3 of the IA issues together was much more resource
4 efficient. I don't want to say intensive.
5 But that was one of those issues of why
6 that was split in that direction, and you know, that's
7 the other issue beyond risk, is beyond risk we still
8 have to look at staff resources and what makes sense.
9 MEMBER HORNBERGER: Any other questions?
10 Don, I notice that your team is called the
11 KTI completion team, and you're the manager and the
12 calendar ends there in August. So you guys have a
13 cruise lined up for Alaska in September?
14 (Laughter.)
15 MR. BECKMAN: Actually I am hoping, but
16 I'm not confident.
17 MR. GUNTER: That's because you'll be
18 doing other things.
19 MEMBER HORNBERGER: That's what we all
20 assumed.
21 MR. LESLIE: This is Bret Leslie from the
22 NRC staff.
23 I actually have kind of two questions.
24 One, given Don's response that in August for the TSPAI
25 agreement you're going to address where you're at,

1 could you define a little bit more clearly what do you
2 mean "address responsively"?
3 MR. BECKMAN: Sure. The schedule for the
4 development of the TSPA model report right now, as of
5 the time I left late last week, extended into
6 September for the final publication process. We
7 expect to have in July the calculational results for
8 the TSPA model runs themselves, plus the confidence
9 building activities that go along with that, as well
10 as the beginning of the documentation or the draft of
11 the documentation that addresses the TSPAI items that
12 are not quantitative in nature. There are a number of
13 methodology issues that will end up being documented
14 in the report.
15 So it's our intention at that point in
16 time to provide, in effect, an attachment to a
17 licensing letter from BSC via DOE to you that would
18 describe those results by the end of August.
19 We have also recommended that we hold one
20 or a series of meetings at the Appendix 7 format to
21 discuss those results with you as they come out in
22 preliminary form, if that would be constructive for
23 the staff to begin to understand what the final end
24 model results look like.
25 MR. LESLIE: And that kind of leads to my

1 second question which would be the timing of the
2 description or these Appendix 7s or technical
3 exchanges. What time frame are you looking at?
4 MR. BECKMAN: I guess that's under some
5 discussion internally, and I may want to defer to Tim
6 for that, but we expect to have some of the non-
7 quantitative information available in the next month
8 or six week, and then the preliminary results, as I
9 said, will start coming out -- the numerical results
10 will start coming out in the July time frame.
11 MR. GUNTER: But there's really two parts
12 to that answer. One is that it depends on the
13 availability of the information. That would be the
14 key for when you'd hold the meeting, and then the
15 other part that is still under discussion is DOE and
16 NRC needs to come to an agreement that these meetings
17 actually would be beneficial to the NRC staff or their
18 understanding.
19 MR. LESLIE: Thank you.
20 MEMBER HORNBERGER: Okay. Well, thank you
21 very much. Thanks for letting enough time to have us
22 address the questions and thanks for your responses.
23 CHAIRMAN GARRICK: Thank you.
24 MEMBER HORNBERGER: Back to you, Mr.
25 Chairman.

1 CHAIRMAN GARRICK: Thank you.

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

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

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

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

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

2 We provided a preliminary risk insights

3 baseline back in June of 2003. Some of the concepts

4 have changed. Some of the ratings have changed. So

5 I want to go through the philosophy of how we've

6 changed in terms of the risk insights.

7 Finally, I'll spend a brief time talking

8 about our next steps.

9 So moving on to Slide No. 3, first I want

10 to start off to say that we're in the process of

11 finalizing this report right now. The risk insights

12 based on the report is part of the NRC's high level

13 waste risk insights initiative, and this initiative is

14 an ongoing effort to increase the use of risk

15 information in the NRC high level waste repository

16 program.

17 It consists of compiling and synthesizing

18 risk information to better support risk informed pre-

19 licensing activities, to support our license

20 application review and other regulatory activities and

21 decision making.

22 As you are aware, we began this effort in

23 early 2002, and we provided preliminary results to the

24 ACNW in April of 2002.

25 We began development of the risk insights

1 baseline report in late 2002. In June of 2003, in
2 response to a Commission staff requirements
3 memorandum, we provided a preliminary report on the
4 risk insights baselines, which did not contain the
5 results from performance assessment.
6 We reported on the status of our
7 activities in the risk insights initiative to the ACNW
8 in July of 2003, and the risk insights initiative,
9 again, as I said earlier, was described to the ACNW in
10 February of 2004.
11 Now, after we briefed the ACNW back in
12 that July briefly, the ACNW wrote a letter in August
13 and provided us some recommendations. The report
14 we're finalizing adopts the terminology from the white
15 paper on risk informed performance based regulations,
16 which was one of your recommendations.
17 In addition, the report incorporates the
18 risk assessment that supports the finding, which was
19 again another one of your major recommendations in
20 that August letter.
21 Moving on to Slide No. 4, the risk
22 insights based on report obviously gives the risk
23 insights, but the idea is to identify the important
24 parameters, models and assumptions that are used to
25 describe the system at Yucca Mountain.

1 The report also addresses uncertainties,
2 and it provides a framework for an informed and
3 focused approach for NRC's review.
4 Moving on to Slide No. 5, the risk insight
5 baseline report, the risk insights themselves, again,
6 are based on performance assessment results, subsystem
7 analyses, and auxiliary calculations, and I'll go
8 through the two examples today that hopefully
9 illustrate this factor or fact, and the report also
10 includes references to the detailed risk analyses.
11 The baseline report includes system level
12 insights and detailed risk insights, again, supported
13 by quantitative risk information and the uncertainties
14 are described.
15 One thing I want to say is that the risk
16 insights are organized around an integrated subissue
17 approach, and this is the structure which is used in
18 the Yucca Mountain review plan and the integrated
19 issue resolution status report. So you're seeing a
20 migration from agreements to the application of the
21 Yucca Mountain review plan, going back to the
22 technical basis document and addressing Neil's
23 concern, what we're trying to get at is the big
24 picture and how things are integrated so that we're
25 trying to address things a little more holistically.

1 So because we've adopted that structure in
2 the risk insights baseline report, on some of the
3 subsequent slides you'll see abbreviations like ENG-1
4 or UZ-2. This represents those acronyms associated
5 with that structure, associated with the integrated
6 subissue approach.
7 Finally, the baseline report talks about
8 the rating of the significance of the insights, and
9 here's one of the major changes. Before we talked
10 about risk significance in that preliminary report.
11 Now we talk about significance to waste isolation, and
12 again, this was addressed by Jim Dana in February and
13 also Tim McCartin to a certain extent in past
14 presentations has kind of shown how we get to the
15 significance to waste isolations by looking at
16 radionuclide release or the waste package stability.
17 So let's move on to Slide No. 6. The
18 NRC's risk insights are intended to assist the staff
19 in its pre-license interactions with DOE and in
20 reviewing a potential license application. So it's
21 not just for issue resolution.
22 I want to point out he staff has not made
23 any determinations regarding the technical condition
24 for adequacy of the repository at Yucca Mountain at
25 this time, and if DOE submits a license application

1 for a repository at Yucca Mountain, the staff will
2 review the information provided by DOE and make its
3 determinations based on the information available at
4 that time.
5 So let's move on to the second part of the
6 talk, the right insights rating. That's on Slide 7.
7 The rating of the significance of the
8 insights helps to prioritize our activity, focus staff
9 resources, and support risk informed project
10 management and decision making. And, again, I alluded
11 to this in an earlier slide. The ratings in this
12 report were finalized and consider the potential
13 effect on waste isolation capability.
14 In particular, we focus on waste isolation
15 capability by looking at the effect of a process
16 feature event on the integrity of the waste package,
17 on the release of radionuclides from the waste forum,
18 and transport of radionuclides through the geosphere.
19 And, again, Jim Dana had a nice table of
20 how each radionuclide is assessed in each of these
21 three areas. This is the same chart that Tim McCartin
22 has done before.
23 So let's move on to Slide No. 8. The risk
24 insights ratings are divided into high significance,
25 medium significance, and low significance, and again,

1 this is for the potential of a significant effect on
2 waste isolation capability, and again, the waste
3 isolation capability is tied back to the effect on the
4 integrity of these packages, effective on the release
5 of radionuclides from the waste form and waste
6 package, and the effect on transport of radionuclides
7 through geosphere and biosphere.
8 Moving on to Slide No. 9, this slide is
9 really for your use to help understand the subsequent
10 slides up to page 15, and I will only briefly go
11 through the next slides as I want to try to spend some
12 more time on the two examples later in the
13 presentation.
14 It should be noted about 20 percent of the
15 ratings of the risk insights have changed from that
16 preliminary report in June of 2003 to the present.
17 Further, the ratings have changed both
18 ways. In other words, for instance, we've had three
19 risk insights that were rated high in the preliminary
20 report. They're now medium, and also we've had two
21 that were medium in that preliminary June 2003 report
22 that now reflect a high rating.
23 So one of the examples I'm going to go
24 through is to try to explain why a rating might
25 change. The items listed in the subsequent slides

1 were in the preliminary risk insights baseline report,
2 dated June 2003. There is only one rating on the
3 subsequent slides. That means the rating remained the
4 same.
5 I've tried to highlight if a rating has
6 changed by putting it in yellow, in italics, and tried
7 to identify this was the preliminary rating, and now
8 this is the rating in this updated report.
9 One other point I want to make out, that
10 some of the new insights have been added in the report
11 we are finalizing, and are underlined.
12 So let's move on to Slide No. 10. Again,
13 if you have questions about individual one, I'd like
14 to try to wait until the end to come back to it, but
15 a couple of points on this slide. this is a clear
16 example where the changes go from a higher rating of
17 the preliminary report to a lower rating in the final.
18 report, and in effect, this is one of the examples I'm
19 going to talk about later, and this is because you had
20 pointed out in your August 2003 letter you have no
21 risk information to support your rating.
22 Okay. Let's move on to Slide No. 11.
23 Here I want to point out that there were only two
24 changes. They were both in the radionuclide release
25 and solubility limit area where we changed the rating

1 on waste form degradation from a high to a medium, and
2 the mode of release, that being a vective versus
3 diffusive, from a medium to a low.
4 Moving on to Slide No. 10, in this case
5 this deals with issues in the unsaturated zone, and
6 there were two risk insights that increased in their
7 significance, one from a low to a medium, being long
8 term climatic change, and the second seepage from
9 medium to a high.
10 And I also want to point out that the
11 other example today that I'll talk about is from the
12 natural setting, and this will be the hydrologic
13 properties of the unsaturated zone. So this is one
14 where the rating remained the same, but we want to
15 provide you some information so that you understand
16 how we came up with that rating.
17 Let's move on to Slide 13. This one is
18 kind of boring. There are no changes. So I'm going
19 to go on to Slide 14.
20 Here I want to make a clarification for
21 the record. The first bullet, probability of igneous
22 activity, should not be read as a probability of
23 igneous activity as high. No, that's not what we
24 mean. But the risk insight is that the probability of
25 igneous activity has a high significance to waste

1 isolation. So don't read that as probability of
2 igneous as high. It's related to the risk insight.
3 One other thing is that here DOE has
4 consistently indicated that failures from igneous
5 intrusion are one of the dominant contributors, and we
6 have added new insight based upon our own results and
7 also based upon what DOE has been projected in their
8 total system performance assessment.
9 So moving on to Slide 15, again, here's
10 another boring slide that there are no changes, but
11 those are the ratings that we have, and now I'd like
12 to move on to Slide 16, and perhaps I'll slow down a
13 bit here.
14 Like I said, I want to go over two example
15 today. I chose this first example primarily because
16 it was an area singled out by the committee in your
17 August 13th, 2003 letter on risk significance ranking
18 of the agreements and the use of risk information to
19 resolve issues, and in particular the committee noted
20 that there were no supporting risk assessments
21 associated with the rockfall issue.
22 In addition, in March you wrote a letter
23 to the Commission, March 4th letter on the instability
24 of emplacement drifts where you again addressed this
25 issue. So I felt that this was one that you'd be

1 interested in hearing about and that's why I chose it.
2 Finally, this example illustrates how a
3 rating changed to give you an idea of the thinking
4 process that went into the revision between the
5 preliminary and this report we're finalizing right
6 now. The idea of these two, one engineered, one
7 natural, is keeping with how we perceive Part 63, but
8 also it allows you to see how we don't just use the
9 total system performance assessment results, i.e.,
10 dose, alone, but we also try to understand how this
11 system is operating from intermediate outputs from the
12 performance assessment and how we discuss the
13 remaining uncertainties. I'll do that in both of
14 those examples.
15 So moving on to my first example,
16 accumulated rockfall under engineered barrier. This
17 slide tries to capture the essence of what the risk
18 insight is. Basically mechanical loading from
19 rockfall that accumulates that accumulates from
20 degradation over time may lead -- may lead -- to
21 failure of drip shields in the waste package. The
22 failure of the drip shields in waste package will
23 depend on the rate of accumulation of the rockfall in
24 the drift, building that static load on the drip
25 shield, and the threshold load bearing capacity of the

1 drip shields in the waste packet.

2 In addition, this process of rockfall and

3 drip degradation on the outside of the drip shield

4 could also potentially have impacts on the waste

5 package and drip shield temperatures, which again

6 because corrosion is temperature related, they'll have

7 some kind of secondary effects.

8 So moving on to Slide No. 18, the first

9 thing I want to talk about, change in the rating

10 reflect two things. One, we agreed in June of 2003 we

11 didn't have the risk assessment results to support the

12 ranking. We have completed some preliminary

13 consequence analysis results, and I'll get to that in

14 the next slide. That's one of the bases for why we've

15 changed this rating.

16 The second is, you know, this is not a

17 static document. The idea is that we're going to

18 change it as a function of time, as we gain new

19 information from additional risk insights, but also as

20 DOE changes its design or firms up its design, we will

21 do additional analyses to assess whether maybe a

22 change in the drip shield design actually now has a

23 much more robust drip shield, whereas, when we were

24 doing our preliminary calculations we had a different

25 design.

1 So, in essence, we're looking at
2 projecting the potential damage using this new what we
3 believe will be a more robust design. We are doing
4 some process level modelings to insure that it is
5 going to be a robust design.
6 This has to do primarily with adding
7 additional structural supports to allow the drip
8 shield to withstand larger rates of accumulation of
9 rockfall.
10 So in this risk insight example, we talk
11 about how potential temperature effects with that
12 added rock outside the drip shield could effect the
13 creep rate failure of the drip shield. Also, again,
14 how much rockfall accumulates and the rate at which it
15 accumulates will impact the potential interaction
16 between the drip shield and the waste package.
17 We discussed briefly the effect of drift
18 degradation on seepage, and the impacts on low
19 probability intrusive igneous activity.
20 Now, in the report, we try to frame these
21 uncertainties based upon what we know, either from the
22 existing risk insight or for someplace else. For
23 instance, we might refer to what we've talked about on
24 seepage.
25 Well, if we have on average about 20

1 percent of all the waste packages already seeing
2 seepage, then we kind of know it can't be more than
3 maybe a factor of four higher, even if all of the
4 drift degradation occurred and it miraculously didn't
5 act as a capillary barrier. So we have some ways to
6 try to address the range of these uncertainties.
7 This is an example where the insight was
8 supported from results from a total system performance
9 assessment calculation. In this example it's a
10 conditional dose. I'll talk a little bit more about
11 that in this next slide.
12 And I also want to point out this is,
13 again, a snapshot of where we are. Additional work to
14 refine our understanding of the likelihood and the
15 extent of the rockfall is ongoing and we basically
16 described a little bit more about that in the two
17 letters that we replied to your March letter to the
18 Commission.
19 So on Slide No. 19, we realize that this
20 isn't risk, okay, first of all, but this helps us to
21 understand what the potential risk significance is.
22 This is the conditional peak expected dose.
23 First, the red line is the base case.
24 This is the peak does. This is what we expect. These
25 other two are conditional. Okay?

1 A hypothetical case where we failed all of
2 the drip shields, and this is from the TPA 41 code
3 results. So we failed all of the drip shields at year
4 one. So let's just say all of the rockfall failed all
5 of the drip shields in year one.
6 Now, we know that's not realistic, but it
7 certainly bounds the potential response. So that's
8 the effect of just failing the drip shield in year
9 zero.
10 As I said on the previous slide, one of
11 the issues in the interaction between the drip shield
12 and waste package because it's not just the drip
13 shield that may fail. It might also impact the waste
14 package as well. So what we also did is to fail all
15 of the drip shields and waste package at time zero.
16 Again, we realize this is unrealistic, but
17 we're trying to place this where if this was realistic
18 and the probability was one, this would be what the
19 risk is. But we know it's much -- we believe it's
20 much less than this, and so as we become more
21 realistic, we think we have defined where risk could
22 be. It's probably going to be lower than that. It's
23 not going to be driving it higher.
24 So in essence what we're saying is as we
25 conduct these results and do this in a more realistic

1 manner, we believe that these results are coming
2 down, and so we don't think it's as big a deal as it
3 was before.
4 So now I'd like to move on to my second
5 example. So this concerns the hydrologic properties
6 of the unsaturated zone. This may be something near
7 and dear to Dr. Hornberger's heart. I did it because
8 it's partly geochemistry and I'm a geochemist by
9 profession.
10 But on this slide, again, I try to capture
11 what the risk insight is, and basically we're talking
12 about the transport time of unretarded radionuclides
13 from the repository to the water table on the order of
14 a few tenths of years for float paths that occur
15 primarily within fracture welded or zealotized tuff
16 units. So we're not talking about the hydrologic
17 properties of the various rock units underneath the
18 repository horizon. What we infer in the longer
19 transport times, on the order of several hundred
20 years, are estimated for areas beneath the repository
21 with a non-welded vitric or glassy Calico Hills unit
22 is present, and I'll give you a little more geology
23 and understanding of what these insights really are in
24 the next couple of slides.
25 But the insight really is that the aerial

1 extent and thickness of the geology actually plays a
2 part in how the repository performs. Now, it might
3 not be all that clear from a dose result. In fact, it
4 might be less than a factor of two, but if we look at
5 intermediate outputs, we might see how this plays out.
6 Where is it that the staff should focus
7 on? Should DOE take credit for unsaturated zone
8 retardation?
9 So let's move on to the next slide, slide
10 21. As we point out in this report that we're
11 finalizing, it's really the thickness of these non-
12 welded, glassy units and aerial extent that play a
13 part in this, and while the report doesn't include
14 direct results from dose, we refer to previous
15 analyses, and this isn't a case where we've conducted
16 assessments using the earlier version of the TPA Code
17 3.2, and Jim Wirely identified that the presence of a
18 non-welded vitric unit decreased an expected dose by
19 a factor of five.
20 So several years ago we didn't take into
21 account that this unit was there, that it had any
22 potential for performance, and as we increased our
23 realism, we saw, hey, it actually reduces dose by a
24 factor of five.
25 In addition, as part of our continuing

1 risk analyses, I personally have attempted to assess
2 how the change in the repository footprint, from that
3 in a site recommendation to the license application
4 might impact the thickness and the aerial extent. And
5 basically what I've done is use the TPA 41J code and
6 kind of overlaid in on the map of the thicknesses of
7 these units, changed it in this next slide, and ran
8 the results.
9 And, again, because of the shifting of the
10 footprint of the repository, it probably -- you know,
11 it may reduce dose by a factor of two. So, in
12 essence, they've moved to an area where there's less
13 of the glassy Calico Hills non-welded unit.
14 But, again, as I said earlier, sometimes
15 we look at intermediate outputs to better understand
16 the system, and we try to compare these intermediate
17 results to total system performance assessment input
18 parameters. So, for instance, when we look at our own
19 calculations, this is going to tell the staff, okay,
20 if the Department of Energy is taking credit for
21 retardation or the hydrologic properties' unsaturated
22 zone, this is where you need to look. This is the
23 idea of trying to use the risk insights to focus where
24 the staff should be looking.
25 So on Slide 22, the busy slide, but I'll

1 walk you through. The first observation is that there
2 are four curves to the left of the slide, and those
3 reflect Subarea 2, which is the dark blue open
4 squares, and these are subareas. We split the
5 repository footprint into discrete subareas and model
6 that within the TPA code.
7 So Subarea 2 in the open squares, dark
8 blue. Subarea 8 in the orange filled triangles or
9 orange filled squares. Subarea 9, in light blue
10 filled triangles or diamonds. Excuse me. And then
11 finally, this pink one is Subarea 10.
12 And the point here is that there's a very
13 big difference in behavior in the distribution of
14 unretarded radionuclide transport time in the
15 unsaturated zone for different areas of the
16 repository. Okay?
17 So let's move -- that's kind of the
18 intermediate output. So what are we going to look at?
19 So let's go to the next slide.
20 And this is a graphical depiction of the
21 input parameters of our TPA code, and again, Subarea
22 2. In this case the Calico Hills non-welded glassy
23 unit is in red and the thicknesses in meters are these
24 number. So there's 44 meters of non-welded, vitric in
25 Subarea 7. So again, longer transport time for

1 unretarded radionuclides.

2 So Subarea 2, 8, 9 and 10 have very little

3 Calico Hills non-welded, vitric. So we are going to

4 look, you know, if DOE claims this as a barrier.

5 We're going to be looking at the thickness and how

6 they've mapped out the extent of these units. What is

7 their basis for that?

8 This goes to the requirements in Part 63

9 on describing the capability of the barrier. So it's

10 not just about risk. We're looking at what Part 653

11 requires.

12 So I'm going to move on to the final two

13 slides to kind of say what our next steps are and how

14 we intend to apply the risk inside. Perhaps you've

15 gotten a little feel for that in these last two

16 examples.

17 But we are in great -- we talked about

18 this earlier today. You know, the PA group is

19 integrated in this team approach to reviewing these

20 technical basis documents. We use the risk insight

21 baseline. We frame to the staff, with the staff

22 what's important in this technical basis document

23 based upon the risk information that we have now.

24 And so we use the baselines to review the

25 technical basis documents and any agreements that are

1 brought in not in a technical basis document.

2 We're in the process right now of

3 incorporating into this iteration of the integrated

4 resolution status report. We're trying to get the

5 staff to focus on, okay, now we have a Yucca Mountain

6 review plan. Let's bring in these risk insights and

7 say what are the most important things.

8 Just like I showed in this unsaturated

9 zone one, you know, let's not talk about what's not

10 important. Let's talk about what's important, and

11 let's write to what's important.

12 And so the idea is to have this revision

13 a major step that we really want to do in completing

14 this integrated issue resolution status report, is to

15 take a more risk informed approach to that by pulling

16 in the risk insights baseline ideas.

17 As appropriate, we intend to incorporate

18 the risk insights baseline insights into the

19 development of the NRC's inspection program, and

20 finally, we'll be using that to develop our

21 performance confirmation review capability.

22 So in conclusion, our next steps are kind

23 of laid out here. In essence, we are continuing to

24 conduct a focused set of risk analyses. We intend to

25 complete these analyses and update the risk insights

1 report.

2 Again, new risk information becomes

3 available from DOE through their pre-licensing. You

4 know, as DOE provides us information, either their

5 performance assessment results or design documents, we

6 can refine our analyses.

7 We plan to update the risk insights

8 baseline report as appropriate before the anticipated

9 license application, and staff plans to expand in that

10 updated report to include the repository, pre-closure

11 repository system.

12 So, in essence, I've kind of run

13 through -- well, I gave you a half hour to grill me.

14 CHAIRMAN GARRICK: Thank you, thank you.

15 Okay. Ruth, do you have any questions?

16 MEMBER WEINER: Yes, I do.

17 First of all, I want to thank you, Bret,

18 for a very thorough explanation of how you are using

19 risk insights. I think that was really very

20 informative. It was great.

21 I have a couple of questions. Are your

22 risk rankings the same as DOE's? Do you use theirs?

23 How does that interaction work?

24 MR. LESLIE: That's a great question.

25 You'll note that we don't say risk ranking anymore in

1 this report.

2 MEMBER WEINER: Yes.

3 MR. LESLIE: We say "significance to waste

4 isolation."

5 MEMBER WEINER: Okay.

6 MR. LESLIE: Again --

7 MEMBER WEINER: Which, by the way, I'm

8 reading that into it.

9 MR. LESLIE: Right. DOE and EPRI, to an

10 extent you'll hear in this next presentation, actually

11 gives a pretty good summary of the differences between

12 the three of us, but we're also trying to -- we're not

13 just doing risk, okay, and the reason is Part 63 is

14 not just risk. Okay?

15 It tells us a couple of things. It tells

16 us, yes, you have to comply with the dose limit, but

17 you also have to be able to demonstrate you have

18 capability of barriers, and these are barriers

19 important to waste isolation.

20 So we're trying to tie how we move forward

21 and use risk information back to what our regulatory

22 framework is.

23 So DOE has approached it from just saying,

24 "Well, if it's a difference in dose, then it's

25 important or not," and we're trying to say, no, as we

1 see it, if you're going to go forward with these
2 barriers, then these things are important. These are
3 the areas.
4 So we aren't looking to tell DOE to do it
5 our way. We're allowing them to use how they want to
6 do. What we have been very clear with the Department
7 of Energy is we will be evaluating what is in their
8 performance assessment to see how they describe the
9 capability of the barriers, not their words. It's
10 what's in their code that matters to us.
11 MEMBER WEINER: well, so far, if you look
12 at these issues from the point of view of protection,
13 how good the barrier is, do you see any significant
14 difference between your assessment and DOE's?
15 MR. LESLIE: The unsaturated zone is a
16 good one, the example I give. We believe, based upon
17 what we know about gravity and how water flows
18 vertically through fractures, that when you get to a
19 porous medium that has a lot of matrix permeability,
20 things should slow down. Okay?
21 Well, the Department of Energy has most of
22 their capability in a fractured Topopah Spring tuff
23 with limited matrix fracture interaction. We need to
24 understand the difference. I don't think that they're
25 doing the Calico Hills non-welded any differently than

1 us. That's a difference that we're going to say and
2 look at, how they have taken credit for the Topopah
3 Spring.
4 MEMBER WEINER: I'll hold.
5 CHAIRMAN GARRICK: George.
6 MEMBER HORNBERGER: So, Bret, you said you
7 were going to do the Calico Hills for me, but also for
8 you because of the geochemistry, but all I saw was
9 unretarded. So here --
10 MR. LESLIE: Well --
11 MEMBER HORNBERGER: -- here all along I
12 was thinking that the Calico Hills was important
13 because it was zeolitized. So it's not.
14 MR. LESLIE: Well, actually, no. You
15 bring out a really important point. It turns out if
16 you have too many zeolites, you end up clogging up the
17 matrix porosity and permeability. So it becomes
18 acting like if it were a fractured rock.
19 So you bypass all of that capability by
20 having too much. Okay? So it's kind of Goldilocks.
21 If you've got nothing, there's no chemistry. Okay?
22 If you've got no zeolites in there.
23 But when we talk about the non-welded,
24 vitric Calico Hills, we're still talking about eight
25 to ten percent zeolite, but it acts as a porous

1 medium. So it's this range in geochemistry of the
2 mineralogy basically that affects the hydrologic
3 parameter.
4 So, yeah, the chemistry is a little subtle
5 there, but it's there.
6 MEMBER HORNBERGER: I see. Okay. I
7 thought you had forgotten it.
8 I noticed in one of the changes in your
9 risk insights was to move long-term climate change
10 from low to medium. Can you give me some insights on
11 why your insights changed?
12 MR. LESLIE: I will attempt to, and
13 hopefully Tim can help me out here, but I'll take a
14 first stab at it.
15 It actually goes -- well, let me see if I
16 have that. That's probably on Slide 12.
17 They kind of go hand in hand, seepage and
18 long-term climate. The NRC and the Department of
19 Energy have different approaches for long-term
20 climate. Okay? We can assess how the Department of
21 Energy takes into account long-term climate. In
22 essence, after 600 years they start to change climate,
23 and I think at maybe 1,000 years, they really change
24 climate. All right?
25 So that means that the present day

1 infiltration rate is only active for a short period of
2 time, and so the majority of the repository actually
3 sees this long-term climate change.
4 The NRC approach actually doesn't have
5 this long-term climatic change until much later. How
6 does that impact? Why is it important?
7 Well, it turns out that the Department of
8 Energy's approach to allowing water to seep into the
9 drifts has this cutoff, okay, and it's a function of
10 depercolation rate. So, in essence, when you jack up
11 the infiltration rate, which they do with this long-
12 term climatic change, then you jack up the percentage
13 or increase that percentage of seepage.
14 And so they're kind of tied together. It
15 turns out that the seepage is more important, but the
16 long-term climatic change actually affects the
17 seepage. So it's not one to one.
18 Tim?
19 MR. McCARTIN: Yeah, Tim McCartin.
20 Yeah, that's pretty much it, but the one
21 side aspect is some additional concern with respect to
22 the water chemistry and, you k now, estimating the
23 amount of seepage will impact some of the things that
24 might evaporate on the waste container, and so getting
25 a better handle of the environment of the waste

1 package corrosion. So there's kind of some cumulative
2 effects here, but it's clear the long-term climate
3 change seepage with this additional concern about the
4 chemistry on the waste package.
5 MEMBER HORNBERGER: So I think I
6 understand it now, but now what I don't understand is
7 why seepage is rated high and long-term climate change
8 is rated medium.
9 MR. LESLIE: Well, the seepage is the --
10 I mean, long-term climate is the grandchild of
11 seepage, basically. Seepage itself, I mean, there are
12 a lot of processes that affect seepage, all right,
13 whereas long-term climate is here is your input.
14 There's more uncertainty with seepage,
15 drift degradation, how they've actually abstracted it.
16 You can think of the long-term climatic change as kind
17 of one input into seepage. All right, and so
18 therefore if you take into account all of those
19 different porosities that impact what that seepage
20 percentage is, that's why it's more important.
21 MEMBER HORNBERGER: All right. So I guess
22 I really do understand this, but I'm still mystified
23 as to why it was low before and medium now. I don't
24 understand what changed in either the DOE case or your
25 analysis.

1 MR. LESLIE: Well, I think as you pointed
2 out in August of '03, we didn't present our analyses,
3 and that's 20 percent of our changes. We changed 20
4 percent of the things, and this is because we did our
5 best, thinking what we thought we knew. Okay? And so
6 now we've collated all of our insights into one
7 document, the dose results and intermediate inputs.
8 Our thinking has changed.
9 MEMBER WEINER: Could I ask a follow-on
10 question to George's?
11 MR. LESLIE: Sure.
12 MEMBER HORNBERGER: Sure.
13 MEMBER WEINER: So in your example here,
14 the seepage is going from medium to high.
15 MR. LESLIE: That is correct.
16 MEMBER WEINER: Does that mean more water
17 is seeping?
18 MR. LESLIE: No. It just means we're
19 going to spend more time on this issue than we had in
20 the past. We're going to focus more. This is the
21 rating of the risk insight.
22 MEMBER WEINER: I see. So it means that
23 you are --
24 MR. LESLIE: Previously we didn't think --
25 MEMBER WEINER: You just didn't think it

1 was important.

2 MR. LESLIE: -- it was critical. Now we

3 think it's much more important.

4 MEMBER WEINER: Okay. Thank you.

5 Because the burden of the question was if

6 you have more water, you are decreasing the

7 possibility of saturation deliquescence and basically

8 increasing the initiation of corrosion, but I

9 understand now. Thank you.

10 Sorry to interrupt.

11 CHAIRMAN GARRICK: No interruption.

12 Mike.

13 VICE CHAIRMAN RYAN: It's interesting.

14 You made a comment, I think, in the early part of your

15 talk about how you've got to transition from the risk

16 insights into the Yucca Mountain review plan. Could

17 you give us -- did you mention a little bit about that

18 or--

19 MR. LESLIE: Well, yeah, I can mention it.

20 I don't think I actually said that we're going to

21 bring the risk insights into the Yucca Mountain.

22 VICE CHAIRMAN RYAN: I may be misquoting

23 you, but if you could talk a little bit more about how

24 you go from A to B that would be great.

25 MR. LESLIE: Sure. In February, Jim Dana

1 had a couple of slides on how the risk insights
2 baseline report, the Yucca Mountain review plan and
3 the integrated IRS relate to each other, and I'll try
4 to reproduce that now.
5 The Yucca Mountain review plan says do a
6 risk informed review. It provides a lot of review
7 methods and acceptance criteria for all of the major
8 abstractions that I went through today. It allows a
9 detailed review of each of the areas. It says in the
10 introductory sections associated with these
11 abstractions, use risk information to conduct your
12 review. Okay?
13 So where is this risk information coming
14 from? The risk insights baseline report.
15 Now, the integrated IRSR is the staff's
16 evaluation or application, I should say, of the Yucca
17 Mountain review plan review method to what we know
18 now, and so what we're trying to do is we're trying to
19 take the responses that we've written back to DOE on
20 these technical basis documents and the information we
21 have now, and rather than write agreement by
22 agreement, let's look at the big picture. What is
23 important?
24 Okay. Staff, try to write to this. So
25 it's kind of we're trying to, as we do this integrated

1 issue resolution status report, we're trying to
2 implement the Yucca Mountain review plan and the risk
3 insights baseline report.
4 VICE CHAIRMAN RYAN: Thanks. That's
5 helpful.
6 CHAIRMAN GARRICK: Okay. I wanted to ask
7 a couple of process questions here in terms of the
8 benefit of what you're doing. It seems pretty clear
9 that in invoking the risk insights initiative that you
10 are getting a better understanding of what's going on.
11 I guess a question I'm asking is related to the issue
12 that we raised before, is how is this better
13 understanding being used to make the review process
14 more efficient.
15 Because it's not clear to me that what
16 you're doing would be any different whether or not you
17 did any risk insights. In other words, I'm thinking
18 back of the probabilistic risk assessment policy
19 statement and the language associated with all of the
20 things that you want to get in terms of benefits from
21 implementing that thought process, and one of the
22 things, of course, is burden relief.
23 MR. LESLIE: That's correct.
24 CHAIRMAN GARRICK: And I haven't seen much
25 evidence of that.

1 MR. LESLIE: That's a big question, and
2 let me see if I can hit a couple of different aspects.
3 Early on in 2001, we basically -- DOE first said we
4 think we're going to use risk information to identify
5 why we don't need to supply this information, and we
6 said this is a good thing. You're allowed to do that.
7 Come back to us to say why we shouldn't do this.
8 Okay?
9 They have backed away a lot. They
10 submitted a few examples, but primarily it's DOE's
11 choice to say this is an undue burden, in particular.
12 That burden question is one that you have to think
13 about because, in essence, is it an undue burden to
14 ask the licensee to justify the technical basis, and
15 the answer is I don't think so.
16 So they would either have to come in and
17 say from a risk perspective this is not important and
18 we're not going to take credit for it in our
19 performance assessment as a barrier.
20 That kind of thing, oh, sure. We can get
21 rid of a lot of agreements if they chose to have a lot
22 fewer barriers. But, again, we're responding to what
23 the Department of Energy is proposing, and we have to
24 review that, and we have the issue resolution process,
25 as Greg said earlier today, is about, you know, what

1 is the goal.

2 The goal really is for the staff to be

3 able to conduct an efficient and effective licensing

4 review, and that means just as we just said in the

5 staff evaluation. We are trying to focus to make sure

6 that the Department of Energy provides adequate

7 justification for what they're saying. We need to be

8 able to assess whether there's an adequate

9 justification, again, more or less depending up how

10 much the Department of Energy wants to claim credit

11 for.

12 I hope I tried to --

13 CHAIRMAN GARRICK: Yeah. That's useful.

14 MR. LESLIE: -- address that.

15 CHAIRMAN GARRICK: But, on the other hand,

16 DOE is basically providing you with the information

17 you're asking for.

18 MR. LESLIE: That's correct. And I guess

19 the way I would say, and I'll think back to some of

20 the words Greg said, if we started today, I don't

21 believe we would have 293 agreements. If we had

22 started with a risk insights baseline --

23 CHAIRMAN GARRICK: Now you're getting to

24 where I'm headed.

25 MR. LESLIE: Okay. I don't think we would

1 be at 293 agreement.

2 CHAIRMAN GARRICK: Right. Okay, okay. So

3 what you're really saying is that we're kind of pilot

4 testing this whole process, this whole way of

5 thinking.

6 MR. LESLIE: I wouldn't say pilot testing.

7 I mean, yeah, part of what we have been very good at,

8 we have been very good at assessing risk. Okay? Now

9 what we need to focus on is managing risk, and there

10 are differences.

11 If we have a lot of people on performance

12 assessment who, you know, are just so used to doing

13 the assessments, but then now we're trying to focus.

14 Okay. Now we're in a different framework. This is

15 where we now have to start applying the risk

16 information.

17 And that's a cultural issue and it's a

18 management issue. How we go forward in each of these

19 processes. How do we incorporate our risk insights

20 into our performance confirmation review capability?

21 How do we take the risk insights into the development

22 of the inspection program? How do we do this when we

23 review the integrated IRSR sections.

24 I think Greg may want to add something to

25 this, as well.

1 MR. HATCHETT: This is Greg Hatchett from
2 the staff.
3 When you refer back to the initial policy
4 statement on risk, one of the things we have to
5 understand is that risk is a two-edged sword. In some
6 cases --
7 PARTICIPANT: Only two-edged?
8 MR. HATCHETT: Just, you know, in
9 simplistic form. In some cases as you have seen,
10 we've changed ratings upward from medium to low,
11 meaning at one phase of this we didn't think it was
12 that significant. Now we understand it to be more
13 significant, and it can have just the opposite effect
14 on something we thought was high, now has a lower
15 rating.
16 But at the end of the day, we can't do
17 DOE's work for them. So going back to the earlier
18 presentation, we may believe and agree from a
19 philosophical point of view that an issue may be low
20 risk, but we can't close that issue out if they
21 haven't provided adequate justification. So we can't
22 just say just because we agree with the assertion in
23 the document, you still haven't provide adequate
24 justification to support that. So we can't actually
25 do that for them. They still have to unbundle this

1 web of reference documents to try to bring to the
2 surface that work that they have done to provide the
3 justification for their position.
4 So, again, while we might agree in
5 principle, we can't necessarily close an item because
6 they haven't transparently demonstrated.
7 CHAIRMAN GARRICK: Thank you. Thank you.
8 MEMBER HORNBERGER: It sort of seems that
9 there's a Catch-22 here because the previous speakers
10 from DOE said that what they were doing was responding
11 to requests from the NRC staff.
12 CHAIRMAN GARRICK: Yes.
13 MEMBER HORNBERGER: And so how do we
14 reconcile this?
15 MR. McCARTIN: Tim McCartin, NRC.
16 I might differ a little bit from Bret
17 saying if we did it today we'd have less than 293, and
18 let me just put that in a slightly different way. I
19 feel we've been risk informed for a long time. We
20 started performance assessment analyses 20 years ago,
21 and over the last 20 years, the sophistication has
22 improved.
23 And as it has been improving, you've seen
24 manifestations of it. The KTIs that were set -- I
25 don't know -- I'll say maybe ten years ago, that was

1 done on a risk basis. We looked at what are the
2 things, given our understanding today and performance
3 calculations, that are most significant.
4 As time has gone on, we've been able to
5 refine them. When the 293 agreements were done, there
6 was some PA input, and there was some understanding,
7 but you can see, okay, here's the set. Then you can
8 start to be a little more sophisticated, a little more
9 focused, and things start falling off the importance
10 list. Some become low.
11 And I think we are evolving with time,
12 and --
13 CHAIRMAN GARRICK: Right. The only thing
14 I'd say, Tim, and you're absolutely right; you can't
15 do safety analysis without it having an inherent
16 component of a risk perspective.
17 But on the other hand, the performance
18 assessments that were performed as a basis for the ten
19 years ago development of key technical issues was not
20 probabilistic to the same degree that it is now, and
21 it's very hard to get into any kind of prioritizing or
22 ranking in any kind of quantitative form without at
23 least moving in that direction.
24 But you're right. The safety analysis
25 can't be done by competent people without some element

1 of risk being involved.

2 The one thing though that I'd like to say

3 is that I would assume, based on what you have been

4 doing of late -- and I think that the last year we've

5 seen a great deal more emphasis on being risk informed

6 and risk oriented than in prior times -- and that

7 would lead me to something that Bret kind of

8 telegraphed, and that is that repository, too, I would

9 expect in the technical exchange meetings that occur

10 during the equivalent of the issue resolution phase,

11 we would be seeing a great deal more emphasis on a

12 risk perspective.

13 In the technical exchange meetings that I

14 observed, and that was only a couple of them, the

15 concept of risk was just simply not very evident, and

16 so that to me is kind of encouraging to hear you say

17 that.

18 MR. LESLIE: Yes, and, in fact, I attended

19 most of the early technical exchanges, and after the

20 first one, one of the first things we were requested

21 from the Department of Energy for all subsequent ones

22 was to start to provide that risk perspective, you

23 know, so that they would always have a total system

24 performance assessment.

25 It's not the same sophistication as we go

1 forward, but again, this gets back to that we've been
2 trying to do this for quite some time.
3 And the other aspect, I actually think
4 this risk insights baseline report is very important
5 for risk communication within the staff, and this is
6 part of having everyone -- the reason we wrote it at
7 the level which we wrote it is so that an informed
8 public and an informed staff member can think outside
9 of their box and understand what we've presented so
10 that they start to see the whole perspective and the
11 risk perspective as we go forward.
12 You know, I agree with Tim. We've been
13 doing lots of analyses, but we as performance
14 assessment staff have to spend a lot of time making
15 sure that we are explaining what we are doing to all
16 of the staff so that everyone understands and has the
17 same basis of information.
18 So I'm actually kind of excited about
19 going forward.
20 CHAIRMAN GARRICK: Just one further
21 question. this one is more of a technical question on
22 the presentation on Slide 19. Now, this is with
23 respect to rockfall on engineered barriers, a specific
24 event, but is this another piece of evidence that
25 after a few thousand years you get no contribution or

1 little contribution from the drip shield as far as
2 peak dose is concerned?
3 MR. LESLIE: I'm going to actually ask Tim
4 to try to address this one, if he can.
5 MR. McCARTIN: Well, certainly in our
6 analyses, the drip shields are failed before 10,000
7 years, if you're talking about the blue curve.
8 CHAIRMAN GARRICK: Yeah.
9 MR. McCARTIN: Yeah.
10 CHAIRMAN GARRICK: Well, I'm talking about
11 the fact that the blue and red converge.
12 MR. McCARTIN: Right, right.
13 CHAIRMAN GARRICK: And pretty rapidly.
14 MR. McCARTIN: Right. At the end there in
15 the base case, the drip shields are all failed also,
16 yeah.
17 CHAIRMAN GARRICK: Right, right. Okay.
18 MR. CLARKE: Can I ask you a question?
19 CHAIRMAN GARRICK: Yes, you may.
20 MR. CLARKE: What are you transport
21 assumptions there? You've got the doses at the
22 compliance point; is that right?
23 MR. LESLIE: That's correct.
24 MR. CLARKE: So is this unretarded
25 transport?

1 MR. LESLIE: Oh, no. I mean, the only
2 thing that the blue and the green lines that are
3 different from the base case or that we set the drip
4 shields to fail at zero years, and for the green case,
5 the green triangles, the drip shields and waste
6 packages fail at zero years.
7 So everything else is the base case. So,
8 no, it's not unretarded transport.
9 MR. CLARKE: I guess it was made to scale
10 probably.
11 CHAIRMAN GARRICK: Yeah. Okay. Any
12 questions from staff? Yes, Mike Lee.
13 MR. LEE: In the spirit of grilling the
14 speaker, a number of years ago the center sponsored an
15 expert elicitation on climate, and I'm still having
16 some trouble as to understanding why climate has been
17 kicked up as a medium risk issue. I understanding the
18 coupling. I mean, I understand the relationship with
19 the coupling between climate and seepage, but my
20 recollection is the elicitation, I believe, was
21 effective, and we can get clarification from the
22 center because they're on the phone, in at least
23 bounding the estimates of precipitation.
24 MR. LESLIE: You know, I don't have that
25 portion of the risk insights report at the tip of my

1 fingers.

2 MR. LEE: Okay.

3 MR. LESLIE: I think we're going to have

4 to get back to you with a better answer. I tried to

5 address it, and I don't know if Tim has anything more

6 to add.

7 MR. McCARTIN: It's not so much something

8 has changed with climate as much as a concern about

9 the kinds of chemistries that might develop such that

10 that estimate is more significant than it was before

11 because of how it might affect near field chemistries.

12 MR. LEE: Okay. So as a parameter it's --

13 MR. McCARTIN: We're not suggesting that,

14 oh, now climate is changing far more radically, but

15 there might be the uncertainty in that estimate. It's

16 a little more important because of the role it will

17 play in the chemistry.

18 MR. LEE: All right. So you're really

19 basically saying there's a stronger coupling, if you

20 will, between climate change and seepage.

21 MR. LESLIE: Yeah, and subsequent

22 downstream effects that impact those.

23 MR. LEE: Okay.

24 MR. LESLIE: Okay?

25 MR. LEE: Thank you.

1 CHAIRMAN GARRICK: Any other questions
2 from any other person?
3 (No response.)
4 CHAIRMAN GARRICK: Thank you very much,
5 Bret.
6 MR. LESLIE: Sure.
7 CHAIRMAN GARRICK: We are scheduled for a
8 break at five o'clock, a 15 minute break. I'm going
9 to take license and liberties here and declare a ten
10 minute break now and then a five minute break then.
11 So let's take a ten minute break right now.
12 (Whereupon, the foregoing matter went off
13 the record at 3:55 p.m. and went back on
14 the record at 4:07 p.m.)
15 CHAIRMAN GARRICK: All right. Our meeting
16 will come to order. We're now going to hear from the
17 Electric Power Research Institute, and in particular
18 from John Kessler, who we've learned, we've heard from
19 many times before and we welcome him back once again.
20 And look forward to whatever he has to
21 say. John.
22 MR. KESSLER: Eastern Representative of
23 EPRI, right? I guess I'd like to, before I start my
24 formal presentation, I'd like to react to two things
25 Bret said.

1 One, I kind of got clarified during a
2 break, but I heard Bret imply that, you know, DOE was
3 going to apply for a barrier, or take credit for a
4 barrier. That that was going to prompt a lot of
5 regulatory review and it's a break, I understand, that
6 the amount of regulatory review for a particular
7 barrier will be commensurate with its risk importance,
8 for lack of a better way. And that's great to hear.
9 The other thing that wasn't so great to
10 hear was the discussion about, well, if we knew what
11 we, if we knew then what we knew now about the 293
12 Technical Agreements, perhaps there wouldn't be 293 of
13 them.
14 Okay, we know something now, why are there
15 still 293? When we've got three different groups, or
16 more, describing a whole bunch of these with low risk
17 priority, why are we continuing with the ball rolling?
18 It's got to be for other reasons, and I'll
19 just leave it at that. Next viewgraph, please. So
20 what I'm going to go through today, is I'm going to
21 whiz through our 2003 TSPA end results.
22 Basically, my talk is based on part of
23 what we produced in December of '03, the end of the
24 year report for last year. So I'm going to refer to
25 stuff that was produced last year.

1 I'll spend more time talking about our
2 view risk prioritization, our measure of risk
3 importance, our main findings. I'll provide, again,
4 just a few brief comments on DOE's Risk Prioritization
5 Report, the one they presented in 2002.
6 And then I'll spend a bit more time
7 commenting on NRC's risk prioritization work as it was
8 documented last year. So this is sort of a, first
9 stuff Bret just talked to you about that was produced,
10 or that we commented on in our December of '03 report,
11 and so I'm not going to be talking about the most
12 recent stuff that Bret presented to you today. Next.
13 Okay, also here's my disqualifies. We're
14 considering only the normal release mode at present.
15 That is container and cladding must fail for the
16 diffusive release to begin. The drip shield failure
17 allows invective releases to begin, where the local
18 flow is high enough.
19 Invection and diffusion through the
20 unsaturated zone and saturated zone to the 18
21 kilometer fencepost is essentially our normal release
22 mode.
23 What are currently not in the EPRI model
24 is igneous activity. I will say that at the time that
25 we did this report and what I'm going to say today, we

1 hadn't completed an igneous eruptive scenario and we
2 made certain comments about how we thought that
3 igneous was probably pretty important.
4 I will advertise that in about two months
5 we'll come out with a report that suggests that the
6 igneous release is not very risk important.
7 We also did not include human intrusion
8 and we haven't included colloid transport. Next. We
9 used a simplified logic tree approach to probabilistic
10 TSPA. It's not Monte Carlo, or I should say it's
11 actually partially Monte Carlo in the sense that some
12 of our submodels, we do use a Monte Carlo approach,
13 for example, on container failure distribution, which
14 you don't see in this logic tree.
15 So we have a limited number of branches
16 which involved a lot of expert judgement to pare it
17 down to this logic tree, with discreet probability and
18 parameter values for each branch. We have
19 uncertainties on the net infiltration. A focused flow
20 factor, which is essentially the amount that the
21 water, how it distributes itself when it gets down to
22 the repository horizon.
23 Is there a lot of focusing into small
24 area, or is there essentially no focusing that kind of
25 percolates down pretty evenly?

1 Seepage fraction gets to something that
2 Bret talked about in his talk, which is this idea,
3 we're not really sure once we get the percolation down
4 to the top of the repository, how much actually gets
5 in?
6 There are some alternative conceptual
7 models there, and we essentially are putting a
8 probability on which of those conceptual models we
9 think is correct, that governs then how much seepage
10 we actually think would drip in.
11 Solubility and alteration time. This is
12 radionuclides solubility and the waste form alteration
13 time, we think that the chemistry, local geochemical
14 conditions will govern both of these more or less
15 together. So we combined those branches.
16 And then use the SC retardation is the
17 last set of branches in probabilistic tree. Next.
18 Again, quickly, just showing that we have split our
19 climate up only into three different stages.
20 We assume greenhouse, which is very
21 similar to their monsoon climate for basically the
22 first thousand years. Since that we are assuming that
23 perhaps greenhouse gases might lead to something like
24 a monsoon climate.
25 We'll return to interglacial for the next

1 thousand, and then, based on a bunch of sensitivities
2 we said let's just move it to full glacial maximum and
3 be done with it. We don't see that much sensitivity
4 to climate change.
5 And here are the net infiltration numbers,
6 with the uncertainties that we used in millimeters per
7 year. Next. Here's the distribution of the seepage
8 fraction and seep flow rate versus the local
9 percolation rate for these two alternative conceptual
10 models.
11 So what this is saying is that we have to
12 get up, in this base pace, we have to get up to
13 something like 73 millimeters per year of seepage, to
14 start getting any water to drip into the repository
15 and then you would get this flow rate.
16 For the high seepage case conceptual
17 model, you can see we get larger fractions of the
18 repository that would be wet with larger flow rates
19 through them. Next.
20 Here is our drip shield and container
21 failure distributions. Essentially, this is the drip
22 shield failure distribution with time. And here is
23 essentially the waste package failure distribution
24 with time.
25 We're assuming one drip shield and one

1 container are assumed failed in placement, but those
2 failures are not co-located so we basically don't
3 assume we've got them right on top of each other.
4 Next.
5 We also have cladding failure rates that
6 depend on whether we have a dripping system or
7 essentially a dry or just a humid air system in
8 failure distribution versus time. Next.
9 We have a saturated zone model that's
10 pretty pared down, in the sense that we have a
11 fracture matrix interaction in the first 13 kilometers
12 through the volcanic and then we've got classic porous
13 flow model with absorption and the last five
14 kilometers to the accessible environment. Next.
15 Okay. Just to show you that we do do some
16 intermediate results, rather than just jumping you
17 right into the means of the dose distributions, here
18 is an example of a radionuclide mean concentration
19 exiting the engineered barrier system.
20 And, as we would expect, we've got, in
21 terms of concentrations, U238 being the highest
22 concentration just because it dominates what's in the
23 system in terms of what gets BBS versus time. Next.
24 Okay, I'm going through this quickly
25 because I want to get to the risk prioritization and

1 I'm just trying to set the stage here a little bit.

2 I call this the compliance zone, but you

3 get it. Here's the 15 millirem for ten thousand years

4 kind of fencing off. And here is our mean result, a

5 probability weighted mean result.

6 And, yes, it is very low. And that's

7 because of the assumptions that we're making about

8 diffusion dominated and how the containers and drip

9 shields and the cladding lasts, the flow through the

10 system, etcetera.

11 So what we're essentially finding is, is

12 that the ten thousand year dose risk is something

13 like seven orders of magnitude lower than the Part 63

14 limit. Even in a million years, we're only up at

15 about a millirem per year to the RMEI.

16 I actually threw this up for Mike, so I'm

17 glad he's back. This one is actually for ICRP-72

18 dosimetry. And what you see, when we use ICRP-72

19 dosimetry along with assumptions we made about

20 inhalation and dust loadings, is that we don't have

21 neptunian-237 dominating out here, but we have

22 thorium-229, I think that's are dominating

23 radionuclide for ICRP-72 dosimetry. Next.

24 Okay, here it is with FGR-11 dosimetry.

25 Essentially, everything is about the same, except the

1 neptunian-237 came up by about an order of magnitude.
2 And that's, again, because of the differences in
3 dosimetry for that particular radionuclide, along with
4 assumptions that we made about dust loadings and
5 inhalation.
6 VICE CHAIRMAN RYAN:: Which part of that,
7 John, would you say is controlling? The dust part of
8 the dose conversion factor part, can you tell which
9 has more influence?
10 MR. KESSLER: Inhalation is, are, for these
11 actinide is our dominant dose contributor.
12 VICE CHAIRMAN RYAN:: Right, but I'm
13 asking, you said the dose conversion factor is changed
14 and your assumption about dust loading changed or they
15 were the same in both cases?
16 MR. KESSLER: The same in both cases.
17 VICE CHAIRMAN RYAN:: Okay, so it's just -
18 MR. KESSLER: Right, it's just the
19 difference between ICRP-72, okay?
20 VICE CHAIRMAN RYAN:: I got you, okay.
21 Thanks.
22 MR. KESSLER: All right, now to the point
23 that I wanted to make here that's going to get into
24 the risk insights. Is that we're saying complete
25 function failure of any two barriers, will not cause

1 the ten thousand year dose to increase above the Part
2 63 limit.
3 And I've got a few examples to follow
4 here. But basically, this conclusion really colors
5 our risk insights. Okay. Along with, of course, the
6 basis that the model that sat behind it, which is why
7 I wanted to rush through it. Next.
8 Okay, some examples of contributors to the
9 low dose risk estimates. Slow container and drip
10 shield degradation rates. Repository is in the
11 unsaturated zone which means a small fraction of the
12 repository is contacted by flowing ground water rather
13 than all of it.
14 We have limited diffusive release from
15 failed containers via tortuous pathways. That's all
16 a benefit of being in the unsaturated zone, along
17 with, you could say the engineered components.
18 So this is sort of a mixed bag of
19 engineered and naturals features and I can't really
20 separate one from the other, and nevertheless, it's an
21 important component.
22 Solubility limitations and then travel
23 time in the UZ and SZ are sorption delays most
24 actinide and cesium and stronium. You need to
25 remember that. And it just reminded me that we can't

1 forget about all these actinide that fell off the dose
2 list because of all these important barriers that are
3 a lot of the natural ones.
4 And this actually meant that we didn't
5 even have to model for our longer term models, cesium
6 137 and stronium 90, because they didn't get anywhere
7 by the time they decayed. Next.
8 Okay, sensitivity studies. We use them as
9 most others do to test the robustness of the system.
10 If some components don't perform as anticipated, along
11 with of course understanding the insight it gets you
12 in your system, as well. The results are dependent on
13 other system components functioning as advertised. We
14 know that.
15 That the results we get are based on the
16 assumption that the other parts of the system behave
17 in the way that we expect with their uncertainties.
18 Examples, again, just from the ICRP-72
19 dosimetry one, is that say, let's, just using this one
20 as the sensitivity study, not that it's important for
21 the ICRP-72 one.
22 The drip shield doesn't function. I'm
23 going to show you the same, essentially the same ones
24 that you just saw from Bret, but with our results. So
25 it worked out rather well. Next.

1 Okay, drip shields failed to function.
2 Again, what we see is that we have a little bit
3 earlier release so it gets up above the ten to the
4 minus six we had before out at long time periods.
5 Pretty much the same behavior. Next.
6 That's just now waste packages only failed
7 to function with everything else functioning as
8 advertised. We do get higher releases, again, still
9 very low in ten thousand years, and our peak is up
10 closer to ten millirem per year, but still lower than
11 background. Next.
12 Now let's take them both out. So drip
13 shield and waste packages failed to function. So I'm
14 following right along. I just split them up in three
15 viewgraphs rather than one. And we do get higher
16 doses within ten thousand years, but it still hasn't
17 even reached one millirem per year in ten thousand
18 years, with both of these barriers taken out.
19 And our peak is up around background now.
20 Next. So our preliminary conclusions are that our
21 probabilistic analysis results in very low doses and
22 that many natural and engineered features contributes
23 to those low doses.
24 We also found that complete failure to
25 function of any two or even more, in some cases,

1 depending on which barriers you pick, a component will
2 still not cause the regulations to be exceeded. And
3 both of the above contribute to confidence, while some
4 processes and parameters remain uncertain. Next.
5 Okay, now switching into the, our risk
6 prioritization work. While certainly our motivation
7 was the KTI Agreement Item Completion Process, we felt
8 that doing risk prioritization has its value all the
9 way through what will be actually decades-long
10 licensing processes, you think through construction
11 and receive and possess and operation and eventual
12 closure.
13 So we think that, certainly that risk
14 prioritization work has value throughout the entire
15 long licensing process. And certainly there's a
16 three-year regulatory review period for construction
17 authorization that we had our thoughts around as we
18 developed this work, too. So our purpose was to
19 develop an independent understanding of the risk
20 importance system steps.
21 Identify a potential approach to
22 completing risk important work, and then at the
23 appropriate time during repository development or
24 operation, one of our concerns was that we seem to see
25 a lot of stuff front-end loaded in terms of when it

1 seemed to be, needed to be done, regardless of when
2 that risk from that barrier might actually come along
3 in repository operation.
4 I'm going to explain that a little bit
5 better as I get along here. So our approach was to
6 develop a working definition of what is risk
7 important. Do some TSPA sensitivities.
8 The one offs, the one ons, the hazard
9 index work that you've seen from other presentations
10 I've made elsewhere, at least some of you have. And
11 the evaluation of DOE and NRC work. Next.
12 Our definition of high risk importance
13 turns out to be pretty similar to DOE's. In the sense
14 that we talk about thefts or barriers who uncertainty
15 range causes the current estimate of dose risk to vary
16 by one millirem per year or more.
17 So when we talk about uncertainty range,
18 it includes conceptual model or parameter uncertainty.
19 Dose risk means the output distribution treated
20 probabilistically of dose, so I like to keep the two
21 words together, dose risk.
22 The dose risk in the first ten thousand
23 years is considered. Rationale, Part 63 in Yucca
24 Mountain, review plan require risk informed approach.
25 Next.

1 Our conclusion that no single barrier or
2 theft is of high risk importance. The examples of the
3 theft barriers considered, non-infiltration rate,
4 degree of flow focusing and seepage fraction flow
5 rate.
6 We're saying invective release at early
7 times is relatively unimportant. Engineered barrier
8 still provide protection. UZ/SZ travel times aren't
9 shortened to the point of ineffectiveness, even for
10 the high values of infiltration and focusing.
11 Same with solubility and waste form
12 alteration time. Technetium and iodine are already
13 essentially solubility unlimited. Actinide
14 solubilities would have to be much higher to even
15 begin to approach being risk important on their own.
16 And plutonium colloid uncertainty is also,
17 in our opinion, not sufficiently large to get us up to
18 where we get doses, these dose risks over one millirem
19 per year.
20 And waste form alteration time is already
21 assumed to be about a thousand years, which we think
22 is sort of at the low end of the range, now. Next.
23 Continuing examples of barriers considered
24 for UZ/SZ retardation, KDs of zero shift the actinide
25 arrival times, but again, we don't see significant

1 dose increases because of that.

2 Drip shield waste package LA-22 cladding.

3 If one or even two fail, the others back them up and

4 we still don't get a dose risk increase of one

5 millirem per year in ten thousand years. Next.

6 So what are we left with? We would say

7 that we only have, for lack of a better word, common

8 mode failures that we may need to worry about here

9 that may be risk significant.

10 But its effects that if they occur could

11 cause multiple barriers to fail to function as

12 advertised, as we believe the normal release scenario.

13 So some examples could be unexpectedly

14 corrosive local environmental conditions that could

15 cause early failure of drip shield, waste package and

16 cladding, might also cause local solubility limit

17 increases.

18 So you are essentially failing the

19 functionality of several barriers here. Disruptive

20 events. They could have a potential short circuiting

21 of multiple barriers would include igneous activity,

22 major rock fall, which is what NRC, we just heard

23 about from them, maybe thermally or seismically

24 induced.

25 Not human intrusion because single waste

1 package penetration just isn't enough, so we don't
2 even consider human intrusion a disruptive event that
3 would result in a common mode failure.
4 And I just throw it on here to be
5 inclusive, not because we've done much analysis, but
6 dramatically higher repository temperatures that
7 really could cause things to fall apart, might be one
8 of these common mode failures. Next.
9 Getting back to my opening comment. Work
10 that is not of high risk importance should not be
11 required to be completed. Probability that multiple
12 models or uncertainty ranges are inadequate and all in
13 the wrong direction is low.
14 Much is already known and preliminary DOE
15 estimates of risk importance is the basis to
16 prioritize work. The LA should be accepted by NRC at
17 this time. Meaning if DOE wants to take the risk of,
18 in this pre-licensing phase, of coming into NRC with
19 certain information or not certain information, that's
20 a risk that I think they should be allowed to take.
21 NRC review of the license application is
22 going to be independent anyway, and if DOE's call is
23 that they don't need that work because it is of low
24 risk importance, that should be DOE's call. Next.
25 Having said that, we do recognize some

1 information is required in all areas. We're certainly
2 well aware of the Part 63 requirements that say you
3 have to understand your system to some extent,
4 regardless of its risk importance. I'm adding those
5 words, even though it's not quite written exactly like
6 that.
7 So, we're certainly not saying no
8 information is required. The degree of information
9 should be relative to the risk importance. We do
10 feel, however, that the current amount of information
11 in areas of lesser importance to risk is probably
12 adequate already.
13 And we understand that determinations of
14 what is important, are based on assuming the current
15 TSPA submodels are correct. And the decision to
16 proceed with prioritization and KTI Agreements should
17 be solely at DOE's risk.
18 NRC should not require DOE to perform all
19 the agreements, and certainly not those low ones.
20 Especially if DOE feels they're low. Next.
21 So when should risk important work be
22 completed. And it sent as sort of step-wise licensing
23 issue. When is that work needed to support the
24 particular licensing phase you're in?
25 I'm making an analogy here to Part 50

1 Reactor Licensing. Granted they're under revised
2 licensing now for any new reactors that come along,
3 but I sort of view Yucca Mountain being that sort of
4 an analogy to the earlier Part 50 space.
5 Which was the level of detail and
6 construction in the preliminary safety analysis report
7 is lower than in the operation, final safety analysis
8 report. That is we need some time to learn and
9 understand the system.
10 The level of detail needs to be associated
11 with a need for a particular barrier. The sense that
12 there's little to no public associated with
13 construction for a lot of the post-closure natural
14 barriers.
15 So I would argue less information about
16 them is required at the time of construction LA and
17 you'd need more information about them later in the
18 regulatory process.
19 And more information is required about the
20 surface facilities and subsurface handling because
21 those are going to come along next in the licensing
22 process.
23 What this is trying to build in, is that
24 there's a lot of time to learn and to do more work.
25 And that you don't need to know everything up-front to

1 proceed with the next phase of licensing.

2 What you need to know is what you're going

3 to incur the risk about in the next phase of the

4 repository development. Next.

5 So here's just sort of an example of

6 degree of information required for the various parts

7 of the system. We're saying at site recommendation,

8 in all of these areas from transportation through the

9 engineered barriers and the saturated zone, and the

10 natural barriers, you needed just preliminary

11 information.

12 At the time of the construction permit

13 you're going to need to know more about transportation

14 and surface handling facility. Maybe a bit more about

15 rock stability, because you're actually going to have

16 to start building it during the construction permit.

17 But these other, sort of post-closure

18 parts of the system, you still wouldn't need to know

19 as much information, because you're not incurring that

20 risk yet.

21 And receive and posses you would need to

22 know more and so on through closure when you would

23 finally have to have complete information for full

24 barrier reliance. Next.

25 Okay, now I'm going to shift into our

1 evaluation of DOE and NRC risk prioritization
2 activities. I'll do a real quick review of DOE's
3 based on their risk information report back in August
4 of 2002.
5 And I'm relying on essentially two
6 different pieces of information that I had when I did
7 this evaluation. Dave Esh's presentation to you last
8 June, along with this preliminary risk insights,
9 baseline of risk insights that occurred also in June
10 that Bret talked about. Next.
11 Regarding the DOE approach, our measure of
12 risk importance is fundamentally the same as DOE's.
13 The effect on probability weighted dose on the order
14 of point one to point one, to one millirem per year.
15 You consider risk important.
16 DOE considered alternatives, but rejected
17 them. We agree with that, and that they talked, they
18 thought about importance based on conditional
19 probabilities, the focus on most likely consequence
20 rather than the mean of distribution.
21 And they said in their report that neither
22 of these approaches provides a means for assessing the
23 role of a TSPA model components in meeting the
24 requirements that had been established by the NRC. We
25 agree with that.

1 DOE found only waster package degradation
2 was of high risk significance. And as I pointed out
3 earlier, we disagree. Even waste package degradation
4 uncertainty is only of high risk significance coupled
5 with other failures. Next.
6 In terms of our evaluation of the NRC
7 report, I'll start back with a letter that, NRC letter
8 to DOE back in the beginning of '03.
9 NRC encourages the use of risk assessments
10 and sensitivity analyses to help identify data, models
11 and barriers that are most important to repository
12 performance and to focus available resources on those
13 items. We very much agree with that.
14 Later on, in NRC staff remarks to ACNW,
15 the amount of technical basis for the analysis should
16 be commensurate with the uncertainty, this
17 significance and pessimism introduced into the
18 analysis. We partially agree. Certainly we agree
19 that if it's risk significant the analysis should be
20 a high.
21 Regarding uncertainty, we would say the
22 uncertainty, only if it's risk significant. We may be
23 able to live with a very large uncertainty in some
24 barriers or some thefts, if, even that large band of
25 uncertainty doesn't affect risk much, I would say that

1 we can live with that.

2 Pessimism, I would say that it's only in

3 those cases where it may cause something else to

4 appear risk significance, would we worry about

5 pessimism. Next.

6 Also, on that same presentation to ACNW,

7 where Dave Esh said the NRC agrees that the margin

8 between the analysis results and the performance

9 objective can be considered when risk informing.

10 That seems clear enough and fundamentally

11 consistent the DOE and EPRI approach. Then there was

12 some concerns about combined effects that I think are

13 less clear.

14 There was an example of several unrelated

15 parameters, that together contribute to the highest

16 risk, which I'll talk about on the next slide and then

17 a little bit later.

18 There was an artificial equation that was

19 provided as an example of how an outcome could be

20 affected based on changing uncertainties. Next.

21 Okay, from Dave's presentation to the

22 Committee last June, he gave this one example from

23 their results which show just essentially that the

24 first five realizations were the highest realization

25 here.

1 And what he's point out was that in the
2 highest realization three parameters are near edge of
3 their uncertainty range and others are elsewhere.
4 Well, this certainly isn't surprising.
5 We would expect for the highest
6 realization you would get some parameters that are out
7 toward the edge of their distribution and others could
8 be somewhere else.
9 That's, like Monte Carlo would get you,
10 when certain parts of the system contribute the most
11 to your outcome. What it seemed like was that NRC was
12 concerned that additional information collected on all
13 three parameters will result in worse ranges.
14 Meaning that they were arguing now, okay,
15 this is a combined effects and therefore you need to
16 go get information on all three. And what I'm arguing
17 is that it doesn't seem likely that new information is
18 going to tend to move them all in a worse direction.
19 And that somehow didn't seem to get
20 factored into their thinking. Next. Also in that
21 presentation and in the report they talked about this
22 artificial equation where the outcome was this
23 particular formula here. They selected some base case
24 ranges for each one of these three parameters and some
25 new uncertainty ranges, and they showed that for the

1 selected base and new ranges that if all three
2 parameters shifted to the new ranges, the probability
3 weighted outcome is much larger than if each
4 parameter range is shifted to its new range one at a
5 time.
6 And this seemed to be NRC's argument
7 against using just the one off sensitivity studies
8 that DOE was doing in its risk prioritization report.
9 What wasn't discussed and what I didn't understand was
10 what's the likelihood that the new information you
11 might collect about these three parameters would cause
12 all three parameter ranges to shift to the new values.
13 I didn't understand that. Such an
14 approach may make it impossible, I would argue, to
15 prioritize work. You don't know what the new
16 uncertainties are going to be, whether they're going
17 to be shifted, especially in that direction, until all
18 the work is completed.
19 It requires some speculation on new
20 uncertainty distributions and which combinations of
21 distributions you might get. And my concern is that
22 this is just not a practical approach. Next.
23 So my concerns about NRC's combined
24 effects thoughts, that it is well understood that
25 particular combined effects cause the highest dose

1 realizations. Another example, if you have high net
2 infiltration, high corrosion and high solubilities and
3 you use a faster transport, which is a combination of
4 these kinds of parameters, you're going to get a
5 higher dose.
6 The above effects are largely independent.
7 So the question is what's the likelihood that new
8 information would cause multiple independent factors
9 to all or even mostly shift in the wrong direction.
10 Hence, speculation about what we might
11 have wrong that would require, that would require
12 additional work if risk informed, should not be based
13 on the concern that new information will cause several
14 barriers to all change in the wrong direction. Next.
15 In the review of essentially the first
16 baseline of risk insights report. There was a
17 statement in their that staff judged risk significance
18 by evaluating the impact of the requested information
19 could have on current risk estimates and uncertainties
20 in the risk estimates, taking into account the
21 performance of multiple barriers, i.e. defense and
22 depth.
23 So this suggests that NRC is considering
24 more than a traditional uncertainty assessment
25 approach. I think Bret talked to you about that.

1 That it's not just the uncertainty assessment, but
2 somehow the need for multiple barriers is worked into
3 their risk importance. I would argue and say, okay,
4 well fine, there's a regulatory requirement for
5 multiple barriers, but let's not mix this up with risk
6 significance that you do when you get TSPA results and
7 work on trying to understand the risk significance
8 there. Next.
9 More on the philosophy that was in that
10 first NRC risk insights report. It says generally the
11 risk significance of an agreement is associated with
12 the level of uncertainty addressed by the agreement
13 and the relationship of the uncertainty to risk.
14 We agree it's a good approach. The level
15 of uncertainty, I would argue, just depends on whether
16 it's a risk important level of uncertainty or not.
17 NRC does provide a nice, clear example of what they
18 mean by this approach.
19 And they talk about high risk importance.
20 Now I understand things have changed, but this is just
21 an example here of uncertainty in rockfall initiators
22 and we certainly believe that NRC's rockfall model was
23 quite conservative and we certainly understand why
24 then they would consider this high.
25 Lower risk importance would be the

1 uncertainty in the waste package mechanical integrity.
2 They were worried about, again, the difference between
3 initiators and the other things that follow behind it.
4 And I can understand that difference in ranking based
5 on that philosophy. Next.
6 The also talked about evaluating the
7 agreements is not as simple as the above example,
8 because many of the agreements are complex and
9 interrelated, thus they had used judgement.
10 Indeed, many of the agreements are
11 interrelated. In retrospect, it would have been nice
12 to have simplified the final set of agreements, rather
13 than leaving the current hodgepodge, but there we have
14 it.
15 Hence, it is necessary to use judgement in
16 determining risk importance, and we agree that we're
17 going to have to use some judgement. Next.
18 NRC states its risks insights are based on
19 TSP calculations and they include all of this
20 supporting evidence. That's great, all appropriate.
21 However, DOE should have already considered all of the
22 above when developing its conceptual models and
23 parameter ranges.
24 And I would argue that if NRC feels DOE
25 did not do that properly, then that is largely a

1 separate issue and they'll need to do more research.
2 Next.
3 NRC subjectively modified its quantitative
4 risk assessments to determine risk importance to
5 somehow include the concept of multiple barriers.
6 There words about safety significance of individual
7 barriers.
8 The effect essentially is to raise some of
9 the issues higher in risk importance than traditional
10 risk assessment approaches support on their own.
11 NRC introduces the concept of risk
12 potential and I was real unclear on what that meant.
13 But it seems to have to do with radiotoxicity and
14 specific radionuclides, but it was unclear.
15 If so, this is not necessarily supportable
16 based on current levels of understanding of the more
17 radiotoxic nuclides. In other words, some are really
18 well understood. We know what's, we know what's going
19 to happen with those radionuclides and even though
20 they're theoretically highly radiotoxic, we still
21 don't care about them.
22 An example might be plutonium. If you
23 really understand that it has low solubilities and
24 high KDS and colloids aren't that important. It's
25 radiotoxic but it's not that, we shouldn't even be

1 thinking about its potential in the sense of what's
2 high risk and low risk.
3 Does the mere existence of a postulated
4 risk potential imply risk significance, is the
5 question I'm asking. Next. IN NRC's Attachment 2,
6 they divided up their risk insights into these seven
7 areas. Next.
8 They found no high risk important issues
9 in the following, water infiltration, percolation and
10 seepage. We agree and we still agree that there's
11 still not high risk importance. NRC finds shallow
12 infiltration to be of moderate importance to its
13 potential effects in neptunian-237. I believe this
14 now is the one that's high, Bret? Okay, seepage,
15 okay.
16 We disagree with the moderate importance.
17 Infiltration uncertainties won't cause even close to
18 a significant change in overall dose.
19 We're concerned that this is one of those
20 risk potential items, simply because it involves
21 neptunian-237. Flow and transport in the UZ not high
22 risk importance. We agree.
23 Biosphere and RMEI we agree but for
24 slightly different reasons that I won't get into here,
25 in terms of difference in our models and approaches.

1 Next.

2 They have some high risk important EBS
3 degradation items. Some chemistry issues governing
4 nature of salts that could develop on the drip shield.
5 We agree in principle, as local chemical conditions
6 could in some models cause a common mode failure.

7 When we wrote this, this is what we
8 believed. We've done a lot more work now trying to do
9 some analysis to address TRB's concerns that they're
10 going to talk about next month. And we no longer feel
11 that there's much of a chance that local chemical
12 conditions could cause a common mode failure.

13 The existence of a passive film on the
14 waste package. We disagree. We think that 100
15 percent of the packages can fail and those risks won't
16 rise by one millirem per year. They also thought, at
17 the time, that rockfall was a high risk importance,
18 and again we disagree because we feel that NRC's
19 rockfall model is conservative, so has biased their
20 risk assessment. Next.

21 They thought that retardation in the
22 alluvium was high risk importance, we disagree.
23 Again, even no alluvium retardation does not cause
24 dose risk to rise by anywhere near one millirem per
25 year.

1 There are many other engineered and
2 natural barriers that back that barrier up. Medium
3 risk important items about the amount of transport in
4 fractures verses porous media.
5 We agree that these are of some
6 importance, although still not high. Next. In terms
7 of igneous activity, there were several item. We
8 agree that in principle igneous activity is a higher
9 risk importance due to its possibility of common mode
10 failures.
11 And I mentioned earlier that since we
12 produced our report in December, 2003, we've done some
13 more work and we think that there's been a lot of
14 neglect and mitigating factors that we think will
15 dramatically, meaning orders of magnitude, lower
16 igneous eruption dose risks, and we'll publish that
17 work in a couple of months. Next.
18 So our conclusion is that the EPRI normal
19 release scenario dose risks are very low. The EPRI
20 and DOE approaches determining FEP center barriers of
21 high risk significance are fundamentally the same.
22 Essentially, standard probabilistic
23 sensitivity analyses are only used. Additional
24 combined effects consideration do not seem to be risk
25 informed, from what I can tell.

1 EPRI partially agrees and partially
2 disagrees with NRC's approach to determining risk
3 significance. The disagreement is in the areas
4 related to combined effects and risk potential.
5 And I just want to say that NRC may have
6 a good reason to require work to support multiple
7 barriers. It is a Part 63 requirement, but let's not
8 confuse those regulatory requirements with risk
9 significance. That's it.
10 CHAIRMAN GARRICK: Thank you. I would call
11 that a marathon sprint.
12 (Laughter.)
13 CHAIRMAN GARRICK: Mike, you got any
14 questions?
15 VICE CHAIRMAN RYAN:: I'm still catching up
16 with the presentation. That was a lot of information.
17 I'll hold off for the moment, thanks.
18 CHAIRMAN GARRICK: Okay, George.
19 MEMBER HORNBERGER: John, first of all, I
20 know your life is pretty busy and perhaps even busier
21 than normal now, so I'll thank you for making time to
22 come here and do this presentation for us.
23 I know you did it on short notice and I
24 wanted to let you know we appreciate.
25 MR. KESSLER: No problem, glad to be here.

1 MEMBER HORNBERGER: So much for being nice.
2 (Laughter.)
3 MEMBER HORNBERGER: Actually, my first
4 question is for staff. Does, can the NRC staff
5 require the DOE to submit all of the agreements before
6 the license?
7 MR. MCCARTIN: Yes.
8 MEMBER HORNBERGER: Okay, that's what I
9 thought. So I don't, I don't think that there can be
10 any requirements. I think that probably we're talking
11 more good feeling about interacting. That would be my
12 sense.
13 MR. KESSLER: Okay.
14 MEMBER HORNBERGER: John, I thought it was
15 quite interesting the way you presented this stuff,
16 but, I forget which slide it was, but it was, you had
17 the degree of information required to each licensing
18 step. And you had Roman Numerals One, Two and Three.
19 And it, I wasn't, I thought there might
20 have been a disconnect there in some of your, from
21 some of your other conclusions. For example, why is
22 it at closure that there should be complete
23 information for full barrier reliance on the drip
24 shield, if in fact your uncertainty analysis and
25 everything else shows you that you're -

1 MR. KESSLER: It's a matter of what you
2 describe, they are two separate issues. In the sense
3 that what is complete information is relative to its
4 relative risk importance.
5 So, the amount of information that's
6 considered complete for some particular barrier or
7 theft that may be of lower risk importance, is going
8 to be a lot less information than some barrier or
9 theft that's of higher risk importance.
10 MEMBER HORNBERGER: Don't you kind of mean
11 enough, rather than complete?
12 MR. KESSLER: Enough, sure.
13 MEMBER HORNBERGER: Yeah, okay. That
14 helps. And also just, I ask you, as you said, you
15 were commenting on the earlier staff presentation.
16 MR. KESSLER: Yes.
17 MEMBER HORNBERGER: And what you heard
18 today Bret give is that they are no longer using risk
19 significance. They are using important to waste
20 isolation. Does that resolve some of your concern
21 about risk significance?
22 Because it's clear that Part 63, does
23 require multiple barriers and the staff does have to
24 review that.
25 MR. KESSLER: It does help that they're

1 getting away from risk significance tied to, you know,
2 solely probabilistic, you know, uncertainties and
3 information like that.
4 The question is what is important to
5 waster isolation? How does one determine that and
6 what are the regulatory requirements for demonstrating
7 importance to waste isolation?
8 What I'm asking is, is that, okay, they're
9 talking about important to waste isolation. If it has
10 to do with what are the, we have to have multiple
11 barriers and therefore we think that maybe what
12 they've got now is something that's high for a
13 particular barrier, that's great.
14 I still would argue then that we've gotten
15 away from the relative importance of some of these
16 things they consider high to overall dose risk. And
17 therefore, something that's maybe high, say net
18 infiltration, using against seepage, may not be that
19 important to dose risk.
20 But it may be important to that particular
21 barrier. Okay. So what is DOE supposed to do with
22 that, when they have something that's called high for
23 a particular barrier, but it may not be that high for
24 dose risk.
25 Somehow there has to be some sort of

1 understanding that what's the dominant thing we're
2 after here. To me that's public health and safety.
3 That's the dose risk number for, in regulatory space.
4 And that should be what we focus on. I'm
5 now concerned that if switch to importance to waste
6 isolation, we've moved so far away from its relative
7 importance to overall dose risk, that there again, may
8 not be good focusing of resources.
9 MEMBER HORNBERGER: Okay, so then I guess
10 I would ask you, then, how you would address the
11 following kind of question that has been raised.
12 If we have such a robust waste package
13 that we don't get any doses in the compliance period,
14 then the geosphere doesn't matter at all.
15 MR. KESSLER: I wish that people would stop
16 saying that.
17 MEMBER HORNBERGER: So do I.
18 MR. KESSLER: You've seen analyses from
19 your own staff that suggest that there are other
20 components of the system that matter a heck of a lot.
21 Bret showed waste packages and drip shields failing to
22 function.
23 I showed waste package and drip shields
24 failing to function. We are having doses that are
25 higher, but they are not huge. Both of us are showing

1 doses that are still less than background.

2 And compared to what the doses could if no

3 barrier function, we are getting a huge amount of

4 performance from things other than the drip shield and

5 the barrier.

6 MEMBER HORNBERGER: Thank you, thank you.

7 MR. KESSLER: So, I don't like it when

8 people say that.

9 MEMBER HORNBERGER: That's exactly what I

10 was hoping you would say. So wouldn't you then say

11 that there are components of the geosphere that are

12 important for waste isolation?

13 MR. KESSLER: I would say that there are

14 components of all the barriers that could be important

15 to waste isolation, if other barriers didn't function.

16 So if you are interested in defense and

17 depth, you want to show some basis for showing that

18 those barriers exist. Okay?

19 MEMBER HORNBERGER: Right.

20 MR. KESSLER: And the amount of work you do

21 to show the basis for those barriers and how much they

22 exist should be, in my mind, more a function of the

23 overall impact on dose risk and less on, you know,

24 showing that a particular barrier is there.

25 MEMBER HORNBERGER: I think we probably

1 agree. I'm not sure, that last twist in the road may
2 have gotten me. I mean we're agreeing that, I mean my
3 point is obviously that the staff is saying that we
4 want to show that there are natural barriers that are
5 important for waster isolation.
6 MR. KESSLER: Right.
7 MEMBER HORNBERGER: And therefore, in an
8 evaluation of what is important for waste isolation,
9 some of these barriers will have high significance.
10 VICE CHAIRMAN RYAN:: George, I take kind
11 of a view too, that you can't say that, well you made
12 that sort of hypothetical statement if the packages
13 work the geosphere doesn't matter.
14 To me, I think about them all as important
15 to safety more or less, but it's not one substituting
16 for another anywhere along the line. That's the key
17 to me to keep it straight is that, you know, if you
18 said, if you said, for example, the package is
19 perfect, it works great, the geosphere doesn't matter.
20 The probability of the package failing is
21 zero, the probability of the geosphere failing is one.
22 You know what I mean? So, it doesn't work that way.
23 That's why that statement doesn't hold water.
24 So I don't think about them in terms of
25 importance to risk significance separate from one

1 another. It has to be a system. That's the whole
2 point of a probabilistic approach, is that it's a
3 system and you're trying to describe the behaviors
4 within the system. Not trading one off versus another
5 component. Does that make any sense? No, yes? Okay.
6 MEMBER HORNBERGER: Well, I should perhaps
7 clarify. When I posed that question, it was to
8 irritate John, not because I believed it. And what I
9 wanted to stimulate was exactly his response.
10 Because what he said was that, no, the
11 geosphere is important. And I believe that the staff,
12 that is what they're aiming for in folding in that
13 aspect of Part 63 that requires multiple barriers into
14 their risk insights.
15 And you may quibble with the work risk
16 there, but I think that Bret today, now, was very
17 careful not to say this is a risk ranking. It is an
18 importance ranking of some type.
19 MR. KESSLER: That's good. That is a good
20 change in approach. I would agree with that. I guess
21 all I'm saying is that I'm still not understanding,
22 well maybe not until it's put into practice.
23 What is the balance between how much
24 emphasis is placed on defending multiple barriers
25 versus how much emphasis is placed on defending the

1 things that are most important to dose risk?

2 MEMBER HORNBERGER: Yeah, and you can tell

3 that we're, we're worried about the same thing because

4 we keep pressing, well, exactly how are you going to

5 use these risk insights to prioritize. So we have the

6 same feeling.

7 CHAIRMAN GARRICK: Ruth.

8 MEMBER WEINER: First of all, I'm very

9 happy that somebody besides me uses the term dose

10 risk. Thank you very much.

11 MR. KESSLER: I tried to come up with

12 something when we have this particular criteria.

13 MEMBER WEINER: Yeah, we're always having

14 to explain to people what it is. I want to get back

15 to your slide that talks about when should risk

16 important work be completed?

17 And I'm going to ask you, I mean that's a

18 nice idea to say that because some of these barriers

19 don't matter until a long time in the future, you

20 don't need to, the level of detail that you need in

21 assessing the efficiency of the barrier doesn't, you

22 don't need that much level of detail until after the

23 construction, until after the construction phase.

24 Could you tell, give me a counter-argument

25 to that? Because I'm sure you know what the counter-

1 argument is. In other words, okay, why don't we do
2 that? Why aren't we, why isn't NRC saying, okay, the
3 level of detail you need for construction is lower so
4 we'll just go ahead and, we'll get our details later,
5 we'll go ahead with construction now.
6 And let DOE come in with the more detailed
7 resolution of these KTIs at a later date. Why, what,
8 you've given a nice argument, interesting argument for
9 doing that. What is the argument for not doing that?
10 MR. KESSLER: I don't know. You're asking
11 me to take a different position than the one I have?
12 MEMBER WEINER: Yeah, I'm asking you -
13 MR. KESSLER: I think that part of what
14 we're thinking is this is merely a first of a kind.
15 We do have a few repositories that have gone before,
16 and there are other repositories that are under
17 development or at least under investigation worldwide.
18 But this is more of an analogy to, you
19 know, where we were at the beginning of reactor
20 licensing. In that there was more we didn't know, so
21 you wanted sort of this two stop or multiple stop
22 licensing process, with certain degrees of
23 information.
24 John, probably knows more about this than
25 all the rest of us put together in terms of this came

1 about, but what we're also trying to come in here with
2 is that there's a lot of time.
3 And what is it you need to know? Was it
4 you can find out ten years from now, that you want to
5 pull into the licensing process? Not, forgetting
6 about the things you need to know now to proceed into
7 the next stage of repository development.
8 And all I can say is that it makes a lot
9 of sense to have your, your information collection and
10 even your arguments and how much information is needed
11 to be based on what are you at in the repository
12 development process.
13 MEMBER WEINER: Don't you want to eliminate
14 at this stage any possibility or almost any
15 possibility, since we always talk probabilities, of
16 the smoking gun?
17 I mean the logical argument against this
18 is so what if you're down line, you've begun
19 construction and you find out something in one of
20 these details that is something that you didn't before
21 and that's very -
22 MR. KESSLER: That's why you have a
23 regulation for a reasonably maximally exposed
24 individual at a fraction of the background with
25 defense and depth through multiple barriers, with

1 already requiring to know a lot of information up-
2 front, that you can't guarantee that you won't have
3 any surprise that really is bad, but you could have
4 sure done a lot to minimize it between the regulation,
5 the, I would say the degrees of conservatism that are
6 in the compliance regulation.
7 The amount of information that's already
8 been collected is things you've done to help mitigate
9 something like that happening.
10 MEMBER WEINER: So you would argue for some
11 degree of conservatism?
12 MR. KESSLER: I would argue that it is a
13 tool you could use if you wanted to and you need to,
14 and you understood what was happening when you used
15 the conservatism.
16 It is best to do what I believe this
17 Committee suggests, which is to know, at least have
18 some understanding of what your best estimate dose
19 risk is. Not just the conservative one.
20 Otherwise, you don't know what that tool
21 is? You don't know whether that's helping you or not.
22 MEMBER WEINER: Okay, thank you.
23 CHAIRMAN GARRICK: Well, I have a number of
24 questions, but I'm going to have to table them for the
25 most part, and we'll get to you some other time, John.

1 But I'm, just to draw you out a little
2 bit, I want to play a game with you. And that is
3 supposing you suddenly became the Czar of the Yucca
4 Mountain Repository and you had complete control of
5 the design.
6 And that you also had something to say
7 about the regulatory impact. Can you just highlight
8 very quickly some of the things about the design that
9 you would change or do differently?
10 MR. KESSLER: Well, I'm not the Czar. I
11 don't appreciate everything that's gone on in the
12 program and I would say that there are certain things
13 that maybe would have been nice to have started
14 earlier, in terms of research and kept them going, a
15 bit of hindsight.
16 But at the time decisions were made,
17 sometimes they were, you know, understandable why
18 things were cutoff or other research went ahead.
19 I don't know. I don't know what I would
20 change. I can understand, fundamentally, why the
21 design has evolved the way it has, based on
22 information that came along.
23 I mean once we knew something more about
24 what the net infiltration numbers were, there were
25 design changes that were made there.

1 That's probably the dominant example of
2 what's driving a design change in terms of what we
3 understood about net infiltration. That's
4 understandable why that was done. I'm not quite sure
5 what you're asking me.
6 CHAIRMAN GARRICK: Well, I'm just, well I'm
7 asking you that there's two basic barriers here. One,
8 the natural barrier system, and two is the engineered
9 barrier system.
10 There are things you can do with the
11 natural barrier system of a design nature. Richard's
12 barrier is one example. There's a lot of things you
13 can do with respect to the engineered barrier system,
14 and there's a lot of things that are being done that
15 strike some people as being extremely conservative and
16 other people not conservative enough.
17 But, just to pick specific examples,
18 looking at the drip shield in the waste package.
19 These are, these are where a lot of the attention is
20 as far as the resolution of the agreements is
21 concerned and as far as the performance of the
22 repository.
23 And they are utilizing very exotic designs
24 and very exotic materials that are costing a great
25 deal of money. And I'm just curious, given the level

1 of expertise you have, the extent of continuity you
2 have with the project.
3 The amount of analysis you've been
4 engaging with respect to performance. What are some
5 of the things that you've learned from that, that
6 would suggest changes in, say, just those two
7 features?
8 MR. KESSLER: Well, if I predicate my
9 remarks thinking about the results of our performance
10 assessment, which show doses around, there was risks
11 of around ten to the minus six millirem per year at
12 ten thousand years.
13 I would say that there are some
14 opportunities for backing off on conservatism, making
15 your life easier, things along those lines that could
16 be done.
17 I think that some of what the Science and
18 Technology Program is doing will get at some of those
19 issues. I hope for their continuity so that longer
20 term things than might actually help save money, since
21 we know that is one of their goals, is brought to
22 bear. Perhaps supporting some barriers that DOE, for
23 whatever reason, have chosen not to support as well,
24 could perhaps be better supported with some additional
25 work.

1 It might ultimately get pulled back into
2 the licensing process. One would hope that that would
3 continue as well.
4 CHAIRMAN GARRICK: One final minor
5 question. At the outset you presented your, the EPRI
6 general approach of a simplified logic tree and you
7 indicated that you did not, it was not a Monte Carlo.
8 That confused me a little bit because you
9 followed that up with saying that you did calculate
10 uncertainties at these branch points of your logic
11 tree. What did you, how did you calculate your, and
12 I assume your uncertainties are probability
13 distributions. How did arrive at your probability
14 distributions?
15 MR. KESSLER: Perhaps I didn't explain it
16 well, but it, we are using the logic tree approach,
17 but we weighed each branch. You know the outcome we
18 get from branch by its weight, its probability weight
19 and then we sum them up -
20 CHAIRMAN GARRICK: But how do you get the
21 distributions themselves? Monte Carlo is nothing more
22 than a method of doing probability arithmetic.
23 MR. KESSLER: Right, right.
24 CHAIRMAN GARRICK: It's not a magic wand
25 for creating probabilities.

1 MR. KESSLER: Well, we're ordering them by
2 outcomes. So, you know, we have a fifth percentile
3 and a fiftieth and a ninety-fifth percentile based on
4 our probabilities. Is that what you're asking?
5 CHAIRMAN GARRICK: No, I'm asking how you
6 get the fifth percentile. The distribution. How do
7 get the probabilities at the branch points?
8 MR. KESSLER: They are based on data, based
9 on expert judgement, some are both.
10 CHAIRMAN GARRICK: Okay, are these
11 basically discreet probability distributions -
12 MR. KESSLER: Yes.
13 CHAIRMAN GARRICK: - that you, you -
14 MR. KESSLER: Right, right. So on this one
15 we only have, we only have three branches. We don't
16 have, we don't have a continuous range. We have three
17 branches. So that this is a discreet value of
18 parameters that affect net infiltration that we've
19 assigned a probability of .05 to, and so on.
20 For these solubilities out here, we have
21 three solubility numbers we'll pick for, say,
22 plutonium and we will assign probabilities to those
23 numbers.
24 CHAIRMAN GARRICK: And those assignments
25 are basically based on your state of knowledge about

1 those?

2 MR. KESSLER: Yes.

3 CHAIRMAN GARRICK: Okay, very good. As
4 George said, we are very pleased that you, on short
5 notice, came and visited with us. We hope it will
6 happen again. These are always stimulating
7 discussions and you kind of represent the conscience
8 of industry and we appreciate having that input and
9 we'll look forward to seeing you again.

10 And what I'm going to do is, unless
11 somebody else has a question. Do you have a question?
12 Jim, anybody from staff? I'm going to adjourn the
13 Committee for five minutes. We will not need the
14 Court Reporter in the next session.

15 (Whereupon, the foregoing matter was
16 concluded at 5:06 p.m.)

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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on Nuclear Waste 149th Meeting

Docket Number: n/a

Location: Rockville, MD

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Alex Patton
Official Reporter
Neal R. Gross & Co., Inc.

Dan Schultheisz

Improving Radioactive Waste Management:
An Overview of EPA's Low Activity Waste Effort

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Radiation Protection Division

Presentation to the
Advisory Committee On Nuclear Waste (ACNW)
April 21, 2004

Presentation Overview

- Advance Notice of Proposed Rulemaking (ANPR) Status and Purpose
- Environmental Concerns
- Regulatory Context
- Discussion of ANPR
- Stakeholder Reaction/Public Comment
- Next Steps

2

ANPR Status

- Published November 18, 2003 (68 FR 65120)
- Comment period extended by 60 days through May 17, 2004
- Additional outreach to stakeholders
  - Public interest groups: need additional time to ensure local communities are aware

3

What is the ANPR?

- Goal is to solicit public comment and information on a wide variety of low level radioactive waste disposal issues
- Is not a proposed rule, but presents broad concepts and asks many questions
- Does not affect existing regulations or programs
- Provides a vehicle for public dialogue to help guide EPA in determining next steps

4

Address Environmental Concerns

- Efficient disposal of waste discouraged by limited disposal options, dual and inconsistent regulation
- Some waste stored on site by generators
- Long transportation routes to the few current disposal sites
- Some wastes inconsistently or not regulated at all for radioactivity
- Result: Potential increased exposure and risk to human health and the environment

5

Improve Regulatory Context

- Radioactive waste disposal is governed by a fragmented and inconsistent system:
  - Low-Level Waste
    - Only 3 sites operating (SC, WA, UT)
    - Capacity limited and will become more so
    - Type of waste accepted limited (e.g., mixed waste)
  - Uranium/Thorium Mill Tailings (large volumes)
    - NRC decision removed certain legacy tailings from regulatory system (e.g., FUSRAP)
  - Technologically Enhanced Naturally Occurring Radioactive Material (large volumes)
    - No Federal, inconsistent State regulation
    - Existing disposal practices may warrant additional scrutiny (e.g., land spreading, uncontrolled burial)

6

EPA's Previous Activities

- We have historically focused on mixed waste, often in conjunction with NRC
  - EPA/NRC guidance on MW disposal, sampling
  - NRC position on cesium-contaminated EAF dust
  - "Low-priority" enforcement policy for storage
  - May 2001 rule defers to NRC requirements
- ANPR is outgrowth of 1999 proposal focused on MW from NRC/State licensees
  - Broader consideration of potential wastes
  - "Bigger picture" look at origin-based system

7

EPA's Overall Approach

- Identify additional protective options appropriate to potential risks of disposal
- Apply consistent methods to evaluate the risks of radioactive material, regardless of origin
- Target lower-activity wastes as suited to such considerations
- Maintain appropriate regulatory controls

8

Greater Protection and Improved Waste Management

- Additional, protective disposal options should result in:
  - Greater public health protection
  - More efficient use of resources in risk reduction
  - More efficient site cleanups
  - More efficient State decision-making (vs. case by case consideration)

9

Elements of EPA's ANPR

- Introduces concept of "low activity"
  - No current statutory or regulatory definition
- Focuses on radiation content rather than origin
  - Evaluate safety for the material in question
- Articulates potential universe of "low activity"
  - Mixed waste, TENORM, Low-level waste, Uranium or thorium ore processing waste, NRC exempt or "unimportant quantities"
  - Could include DOE waste as well as commercial

10

Elements of the ANPR (cont.)

- Discusses methods and modeling to be used to define "low activity" waste
- Identifies hazardous waste landfills as potential destinations for "low activity" waste
- Discusses regulatory and non-regulatory mechanisms
- Asks many questions in all areas

11

Defining "Low-Activity"

- Risk modeling is primary way to limit amount of radioactivity in disposal cell
  - Long-term performance of unit
  - Post-closure site use
  - Facility worker exposures
- Risk modeling is same type of analysis used to judge safety of LLW facilities
  - Projected performance, not design, is key factor
  - Behavior based on chemical characteristics
- Other supporting criteria can be applied
  - "sum of fractions", activity/volume caps, waste form

12

Hazardous Waste Landfills

- Have explicit design and engineering requirements, robust regulatory framework
- Are designed to contain chemicals that present significant risk to public health
- Have been used for radioactive material
  - Examples: TENORM, Uranium mill tailings
  - Case by case consideration
- ANPR asks for comment on other types of landfills (e.g., solid waste landfills)

13

Making it Safe

- Demonstrate protectiveness by evaluating RCRA engineering/technology with performance modeling
- Adopt same standards of protectiveness that are applied in other radiation applications and for other pollutants
- Apply other measures common to radioactive waste disposal as necessary to increase confidence

14

Regulatory Approaches

- Some action by NRC is necessary to address waste from licensees, such as:
  - Licensing of disposal facility
    - Specific license (facility must apply)
    - General license (license granted by rule)
  - Exemption for disposal facility
  - Regulation of generator (material transfer)
- DOE "authorized limits" process similar to exemption (described in DOE Orders)

15

Non-Regulatory Approaches

- Exploring potential to supplement existing waste management regulatory system through
  - Guidance on disposal practices
    - Support State decision-making
    - Example: EPA "Guide for Industrial Waste Management"
  - "Best Practices" programs
  - Industry-specific MOUs
    - Example: American Hospital Association goal: eliminate mercury waste by 2005
    - Identify other opportunities for waste reduction

16

Major Uncertainties

- Volumes of eligible waste depend on technical analyses, other criteria
- Need & level of NRC oversight not clear
- Level of State support/adoption not clear
- Disposal facility/generator concerns over liability, public perception
- Public acceptance (focus on this action)
- What factors will influence decisions?

17

Perceptions and Reactions

- Action is deregulatory and less protective (environmental groups)
- Concern existing management practices will be cast in negative light (DOE, USACE)
- Support for concept and approach, unclear on need and implementation; interest in coordinated Federal approach (States)
- Status quo discourages the efficient disposal of material (waste generators)
- Interest in exploring further, key is State and public "buy-in" (subset of RCRA-C operators)

18

Comments So Far

- As of 4/20, 115 comments in docket
  - Most opposed but not very detailed
  - See www.epa.gov/edocket
    - Select "View Open Dockets"
    - Docket # OAR-2003-0095
    - Select pdf icon if present
- >100 emails and letters to Administrator
- Letters from Sens. Feinstein, Campbell
- Briefing for Senate staff

19

Who Has Commented?

- Vast majority are private citizens
- A few on behalf of interest groups
- States (SC, CA, WA, OR, IL)
- One Compact (SWLLRWC)
- One RCRA-C Operator (No Thanks)
- One MW generator (U. of Michigan)
- NRC
- Two offers to treat/dispose
- Expect bulk of comments near May 17

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Stakeholder Activities

- Meetings and conference calls
  - Generators (licensees, NMA, DOE)
  - Disposal facilities
  - States (ASTSWMO, CRCPD, LLW Forum)
  - Environmental Groups (local and national)
  - Presentations
    - DoD LLW Conference
    - Health Physics Society
    - WM'04
    - International Isotope Society

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Next Steps

- Extended Comment Period Scheduled to Close May 17, 2004
- Continue technical exploration of options and methods
- Evaluate and analyze public comments and continue dialogue/outreach with Agencies, States and other stakeholders
- Develop recommendation on future course(s) of action

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2

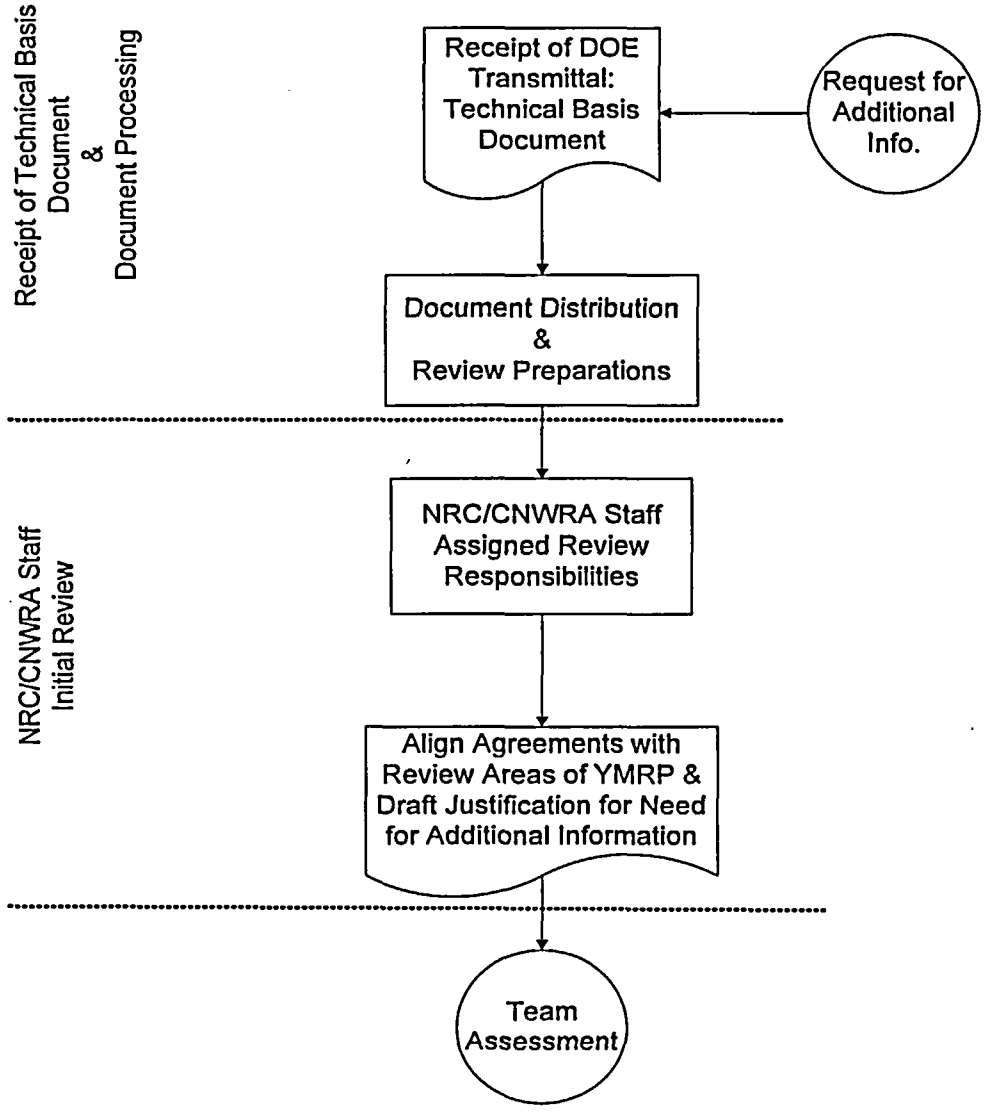
Issue Resolution

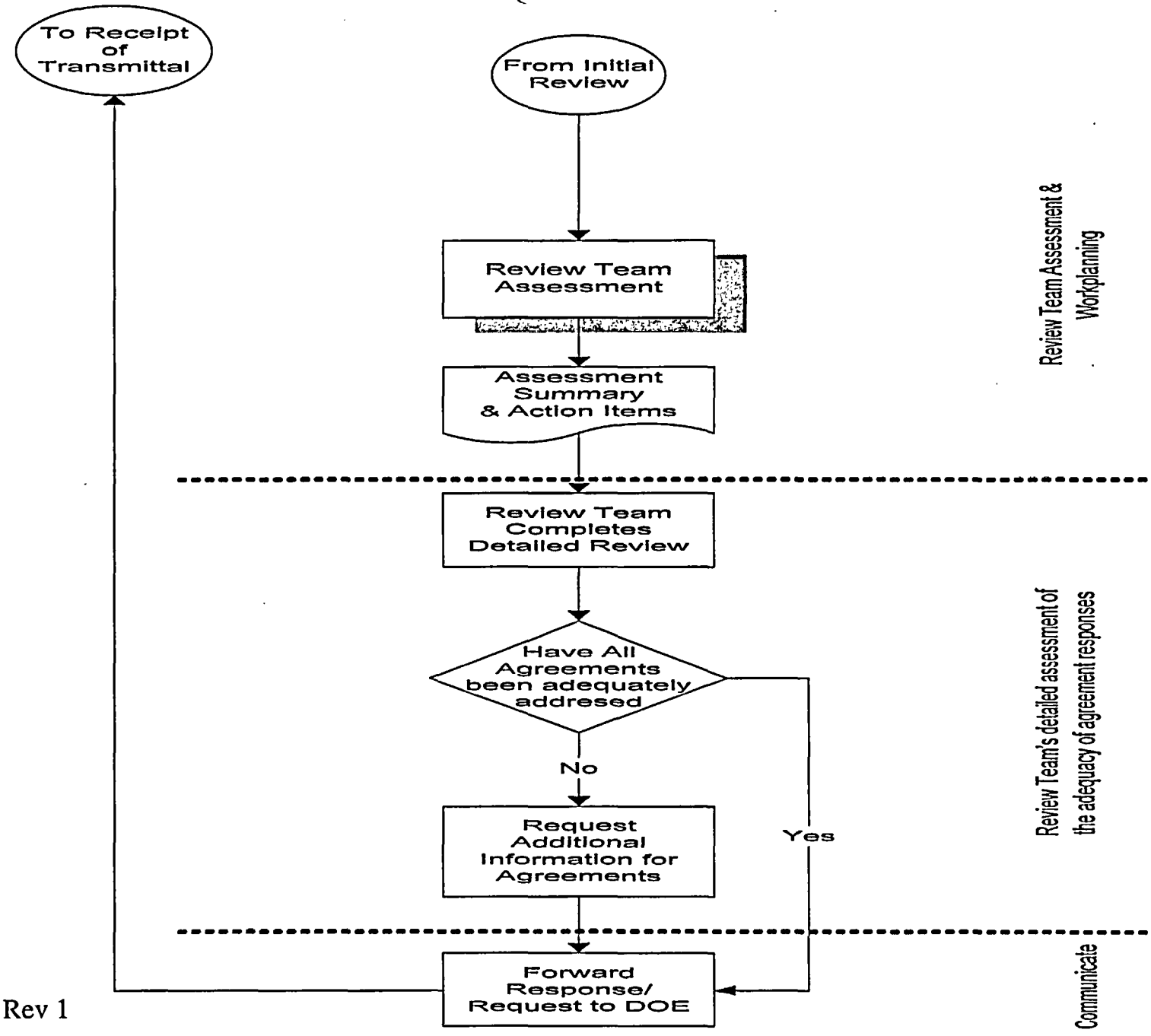
149th Meeting of
Advisory Committee on Nuclear Waste
April 20-22, 2004

Gregory Hatchett, Christepher McKenney,
& John Trapp
Division of High Level Waste Repository Safety
U.S. Nuclear Regulatory Commission

OBJECTIVES

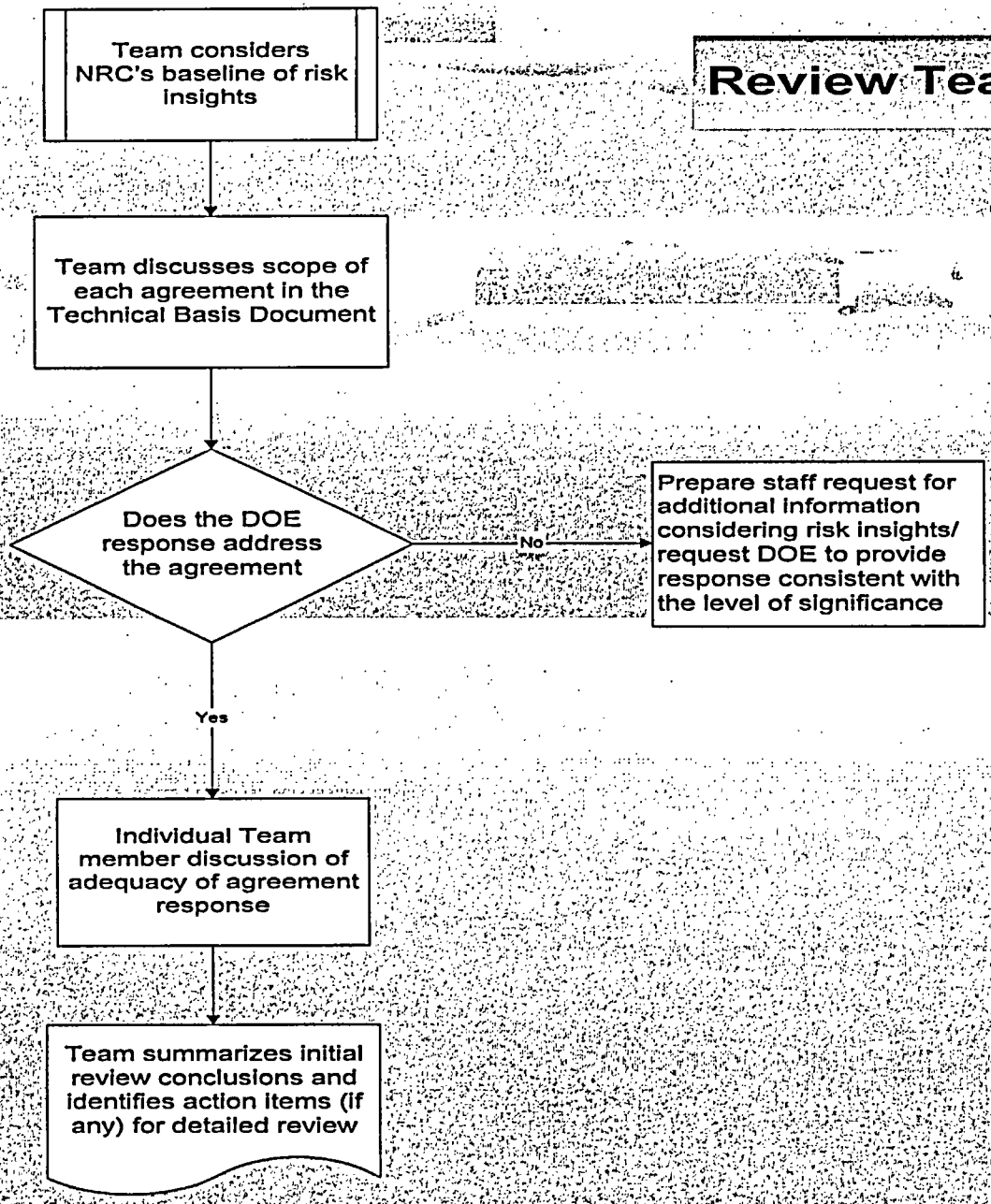
- Discuss Staff Process for Reviewing Technical Basis Documents
- Describe Team assessment process using Technical Basis Document No. 12, "*Biosphere Transport*" as an example
- Summary


Receipt of Technical Basis Document & Document Processing
Receipt of DOE Transmittal: Technical Basis Document
Request for Additional Info.
Document Distribution & Review Preparations
NRC/CNWRA Staff Initial Review
NRC/CNWRA Staff Assigned Review Responsibilities
Align Agreements with Review Areas of YMRP & Draft Justification for Need for Additional Information
Team Assessment


To Receipt of Transmittal
From Initial Review
Review Team Assessment
Assessment Summary & Action Items
Review Team Completes Detailed Review
Have All Agreements been adequately addresed
No
Yes
Request Additional Information for Agreements
Forward Response/ Request to DOE
Review Team Assessment & Workplanning
Review Team's detailed assessment of the adequacy of agreement responses
Communicate

Review Team Assessment

Thursday, April 15, 2004



Technical Basis Document Review

- Staff agreed to produce two responses related to Technical Basis Document (TBDoc) No. 12: Biosphere Transport
- Responses were categorized into "Biosphere/Health Effects" and "Geologic/Igneous Activity" related agreements
  - Biosphere/Health Effects: TSPA 3.33, TSPA 3.34, TSPA 3.35, TSPA3.36 and IA 2.15
  - Geologic/Igneous Activity: IA 2.11 and IA 2.14
- On December 23, 2003, NRC forwarded letter to DOE requesting additional references to complete detailed reviews of TBDocs. This included TBDoc 12: Biosphere Transport

Biosphere Transport: Total System Performance and Integration (TSPAI) Agreements

- Four TSPAI biosphere-related agreements
  - TSPAI 3.33: Justification of site soil partition coefficients (Kd's)
  - TSPAI 3.34: Justification of site soil to plant transfer factors
  - TSPAI 3.35: Justification of crop interception of key radionuclides
  - TSPAI 3.36: Document uncertainty in soil leach factors
- One Igneous Activity "biosphere agreement"
  - IA2.15: Clarify external exposure to ash included in dose calculations

Biosphere Transport: TSPAI and Related Agreements cont'd

- Important parameters in biosphere calculations
  - At the time of the agreements, the biosphere model was not integrated within the TPA code.
  - Overall system results could not be used to evaluate biosphere model sensitivity.
- Overall Low Risk to Waste Isolation
  - Newer versions of TPA integrate biosphere model.

Biosphere Transport: TSPAI and Related Agreements cont'd

- Agreements focus mainly on completeness of documentation.
- Review methods were discussed at the ACNW's February 2004 Biosphere Workshop.
- NRC staff has completed its review of 5 Biosphere KTI agreements and provided a response to DOE closing those five agreements (NRC letter dated February 4, 2004 – ADAMS Accession No. ML040360425).

Biosphere Transport: Igneous Activity Agreements

- Primary concerns relate to correct mass loading parameters to use in calculating dose from contaminated volcanic ash.
  - Igneous Activity (IA) Agreements 2.11 and 2.14 were evaluated.

Biosphere Transport: Igneous Activity Agreements cont'd

- Why geologic concerns?
  - Mass loading has high significance to Waste Isolation; dose proportional to mass loading parameters.
  - Volcanic ash has unique physical properties.
  - Literature on volcanic ash cited by DOE is primarily from silicic volcanoes (i.e. Mt St. Helens) :
    - Different physical properties then basaltic ash,
    - Different climatic conditions,
    - No data on rate of change of mass loading if deposit over 1 cm thick, and
    - All measurements outside volcano watershed.
  - Data did not appear to consider the lifestyle and activities of the RMEI.

Biosphere Transport: Igneous Activity Agreements cont'd

- Only known data on mass loading specific to basaltic ash collected by CNWRA at Cerro Negro (Nicaragua):
  - 4 years after eruption, and
  - After Hurricane Mitch (2 meters of rainfall).
- Commensurate with the risk insights associated with IA Agreements 2.11 and 2.14, more detailed review of AMRs, specifically "Inhalation Exposure Input Parameters for [the] Biosphere Model," is on going.
- Expected completion date of June, 2004

Summary

- Staff follows a risk-informed process for responding to agreements.
  - Schedule, priority, and level of review
- Low significance to waste isolation agreements (5 of the 7) were closed out in February.
- Continuing review of two Igneous Activity agreements related to mass loading parameters.

Update on the Risk Insights Report

149th Meeting of the
Advisory Committee on Nuclear Waste
April 21, 2004

Bret W. Leslie, Ph.D.
U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety & Safeguards
Division of High-Level Waste Repository Safety
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Outline

- Summarize risk insights baseline report
- Risk insights ratings
- Examples of risk insights
- Next steps

Risk Insights Baseline Report

- Part of the NRC's high-level waste risk insights initiative
- Preliminary draft of the report provided to Commission in June 2003
- Risk insights initiative was described to ACNW in February 2004
- The final report adopts terminology from White Paper on Risk-Informed, Performance Based Regulation

Risk Insights Baseline Report

- Risk insights
  - Identify important parameters, models, and assumptions
  - Consider uncertainties
  - Provide an "informed" and focused approach for NRC's review

Risk Insights Baseline Report

- Risk insights based on performance assessment results, subsystem analyses, and auxiliary calculations
- System-level insights and detailed risk insights
- Supported by quantitative risk information and uncertainties are described
- Baseline includes rating of significance of the insights (i.e., significance to waste isolation)

Risk Insights Baseline Report

- NRC's risk insights are intended to assist the staff in its pre-licensing interactions with DOE, and in reviewing a potential license application for Yucca Mountain
- The staff has not made any determinations regarding the technical conditions or adequacy of a repository at Yucca Mountain at this time
- 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 information available at that time

Risk Insights Ratings

- Rating of significance helps to prioritize activities, focus staff resources, and support risk-informed project management and decision-making

- Ratings considered potential effect on waste isolation capability:
  - Effect on waste package integrity
  - Release of radionuclides from the waste form
  - Transport of radionuclides through geosphere

Risk Insights Ratings

- **High significance**
  - Potential for significant effect on waste isolation capability
- **Medium significance**
  - Some effect on waste isolation capability
- **Low significance**
  - Little effect on waste isolation capability

Risk Insights Ratings

- **Following slides list the risk insights and their ratings**
  - **Items listed were in the preliminary risk insights baseline report dated June 2003**
  - **If only one rating is in the parentheses following the phase, then the ratings in the two reports are the same**
  - **If the rating has changed, *the risk insight is highlighted in yellow and is in italics,* and the rating in the preliminary report is provided, followed by the rating in the final report (e.g., *Medium → High*)**

- **<u>Some new insights have been added in the final report and are underlined</u>**

Risk Insights Ratings
High (H), Medium (M), Low (L)

- **ENG1 - Degradation of Engineered Barriers**
  - Persistence of a passive film (H)
  - Waste package failure mode (M)
  - Drip shield integrity (M)
  - Stress corrosion cracking (M)
  - Juvenile failures of the waste package (L)

- **ENG2 - Mechanical Disruption of Engineered Barriers**
  - *Effects of accumulated rockfall on engineered barriers (H → M)*
  - Dynamic effects of rockfall on engineered barriers (L)
  - *Effects of seismic loading on engineered barriers (L → M)*
  - Effects of faulting on engineered barriers (L)

Risk Insights Ratings
High (H), Medium (M), Low (L)

- **ENG3 - Quantity and Chemistry of Water Contacting Engineered Barriers and Waste Forms**
  - **Chemistry of seepage water (H)**

- **ENG4 - Radionuclide Release Rates and Solubility Limits**
  - ***Waste form degradation rate (H → M)***
  - **Cladding degradation (M)**
  - **Solubility limits (M)**
  - ***Mode of release from waste package (M → L)***
  - **Effect of colloids on waste package releases (M)**
  - **Invert flow and transport (L)**
  - **Criticality (L)**

Risk Insights Ratings
High (H), Medium (M), Low (L)

- **UZ1 - Climate and Infiltration**
  - **Present-day net infiltration rate (M)**
  - ***Long-term climatic change (L → M)***

- **UZ2 - Flow Paths in the Unsaturated Zone**
  - ***Seepage (M → H)***
  - **Hydrologic properties of the unsaturated zone (M)**
  - **Transient percolation (L)**

- **UZ3 - Radionuclide Transport in the Unsaturated Zone**
  - **Retardation in the Calico Hills non-welded vitric unit (M)**
  - **Matrix diffusion in the unsaturated zone (M)**
  - **Effect of colloids on transport in the unsaturated zone (M)**

Risk Insights Ratings
High (H), Medium (M), Low (L)

- **SZ1 - Flow Paths in the Saturated Zone**
  - Transport distance in the saturated alluvium (M)

- **SZ2 - Radionuclide Transport in the Saturated Zone**
  - Retardation in the saturated alluvium (H)
  - Matrix diffusion in the saturated zone (M)
  - Effect of colloids on transport in the saturated zone (M)

Risk Insights Ratings
High (H), Medium (M), Low (L)

- **DIRECT1 - Volcanic Disruption of Waste Packages**
  - **Probability of igneous activity (H)**
  - ***Number of waste packages affected by eruption (M → H)***
  - **<u>Number of waste packages damaged by intrusion (M)</u>**

- **DIRECT2 - Airborne Transport of Radionuclides**
  - ***Volume of ash produced by an eruption (H → M)***
  - **Remobilization of ash deposits (M)**
  - **Inhalation of resuspended volcanic ash (H)**
  - **Wind vectors during an eruption (M)**

Risk Insights Ratings
High (H), Medium (M), Low (L)

- **DOSE1 – Concentration of Radionuclides in Ground Water**
  - Well-pumping model (L)
- **DOSE2 – Redistribution of Radionuclides in Soil**
  - Redistribution of radionuclides in soil (L)
- **DOSE3 – Biosphere Characteristics**
  - Characterization of the biosphere (L)

Risk Insight Examples

- Two examples
  1. *Effects of accumulated rockfall on engineered barriers ($H \rightarrow M$)*
  2. Hydrologic properties of the unsaturated zone (M)
- First example illustrates how a rating changed between preliminary (June 2003) and final report (April 2004)
- The examples illustrate how ratings are derived from system-level performance assessment results (dose) and from intermediate outputs from the performance assessment, and discuss the remaining uncertainties

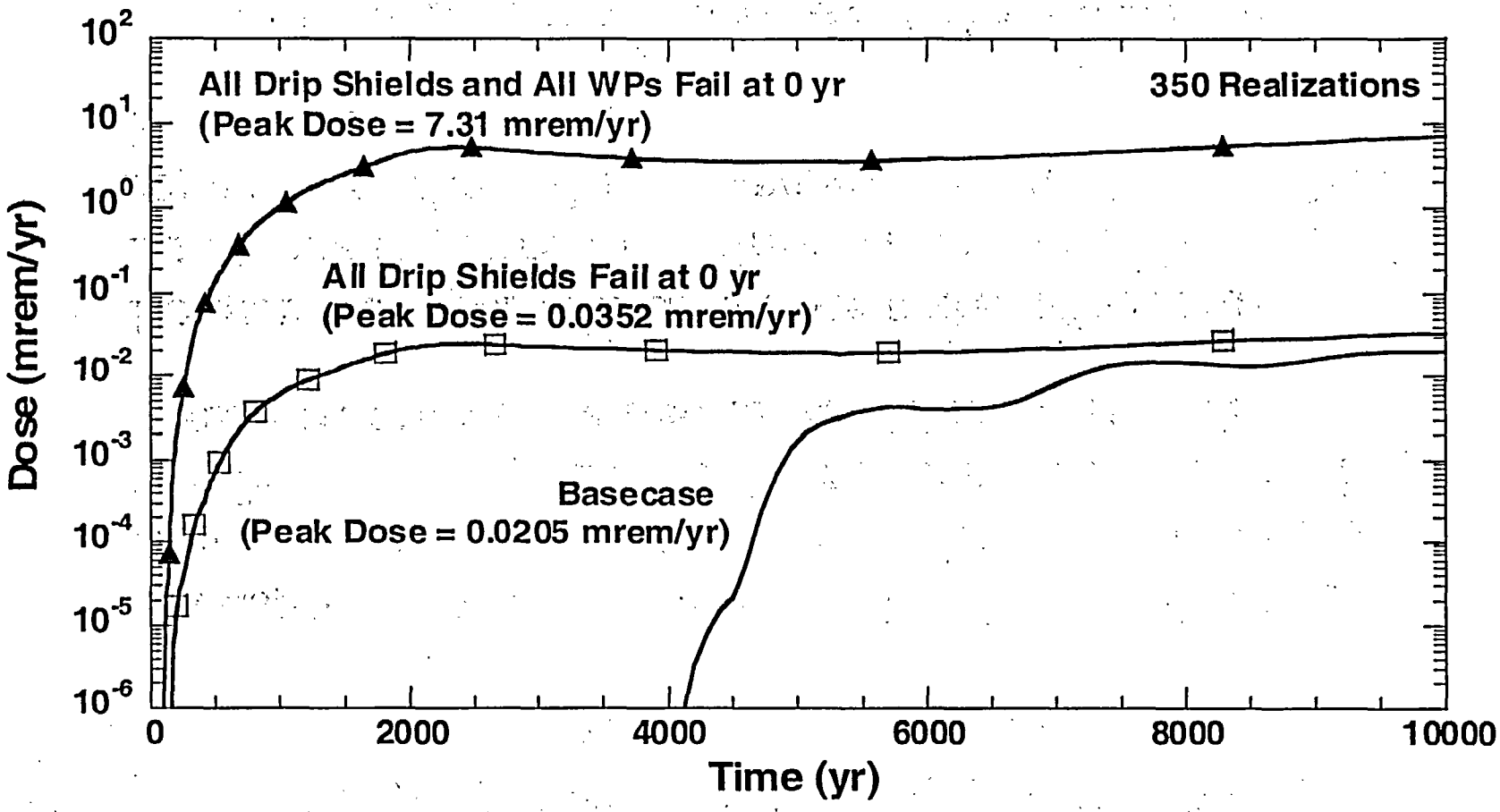
Risk Insight Example 1: Accumulated Rockfall on Engineered Barriers

- Mechanical loading from rockfall rubble accumulated from drift degradation over time may lead to failure of the drip shields and waste packages
- The failure of the drip shields and waste packages will depend on the rate of accumulation of rockfall rubble in the drift (building static load on the drip shield) and the threshold load-bearing capacity of the drip shields and the waste packages
- The accumulation of rock rubble in the drift outside the drip shield will also increase the waste package and drip shield temperatures

Risk Insight Example 1: Accumulated Rockfall on Engineered Barriers

- Change in rating reflects
  - Completion of preliminary consequence analysis
  - Incorporation of new drip shield design in projecting potential damage to the drip shield and waste package
- Uncertainties
  - Potential temperature effects on creep rate of drip shield
  - Potential mechanical interactions between drip shield and waste package
  - Effect of drift degradation on seepage
  - Impacts on low-probability intrusive igneous activity
- Insight supported by results from total system performance assessment calculations (conditional dose)
- Additional work to refine our understanding of the likelihood and extent of rockfall is ongoing

Risk Insight Example 1: Accumulated Rockfall on Engineered Barriers



Conditional* peak expected doses corresponding to: (i) the base case; (ii) a hypothetical case in which all drip shields have failed at post-closure; and (iii) a hypothetical case in which all drip shields and waste packages (WPs) have failed at the time of postclosure. (*Doses have not been weighted by the probability of scenario occurrence.)

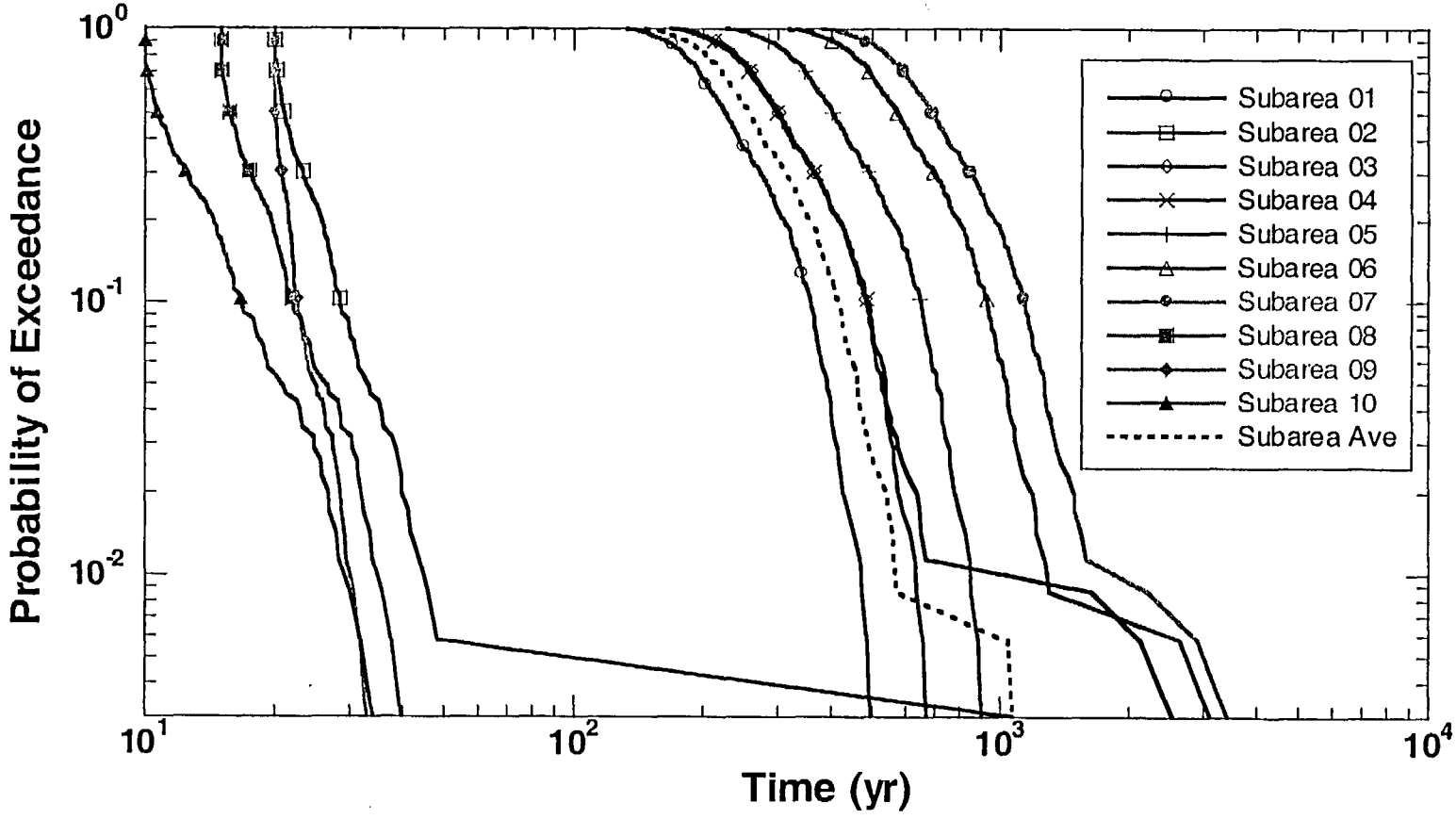
Risk Insight Example 2: Hydrologic Properties of the Unsaturated Zone

- Transport times for unretarded radionuclides from the repository horizon to the water table are on the order of a few tens of years for flow paths that occur mainly within fractured welded or zeolitized tuff units
- Longer transport times, on the order of several hundreds of years, are estimated for areas beneath the repository where the non-welded vitric Calico Hills unit is present
- The areal extent and thickness of the non-welded vitric Calico Hills unit are considered to be moderately important aspects of unsaturated zone flow and transport

Risk Insight Example 2: Hydrologic Properties of the Unsaturated Zone

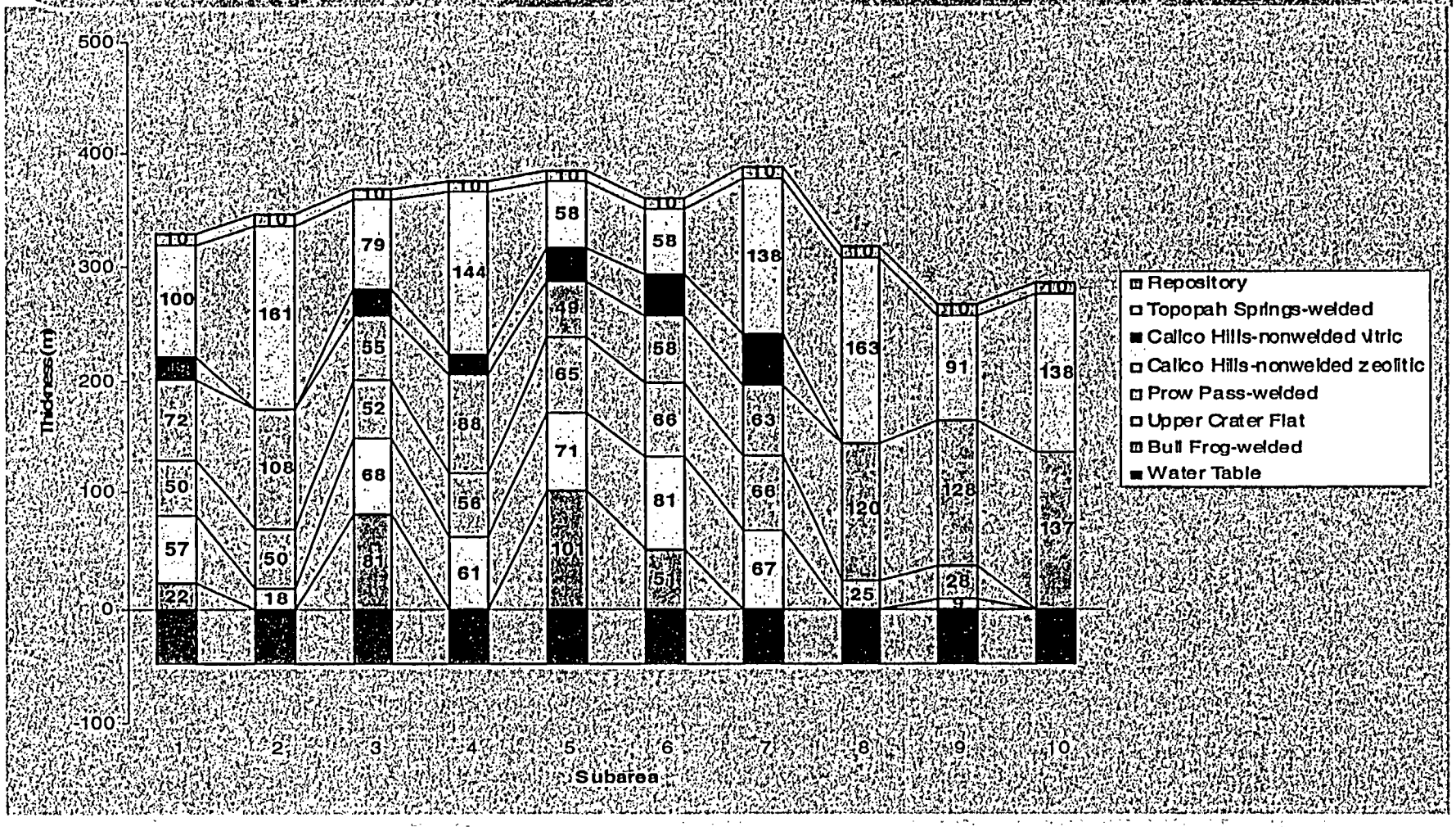
- Uncertainties
  - Thickness of non-welded vitric Calico Hills unit
  - Areal extent of non-welded vitric Calico Hills unit
- Insight supported by results from
  - Total system performance assessment results (dose)
  - Intermediate outputs from the total system performance assessment calculations
  - Comparison of intermediate results to total system performance assessment input parameters

Risk Insight Example 2: Hydrologic Properties of the Unsaturated Zone



Complementary cumulative distribution function of unretarded radionuclide transport time in the unsaturated zone for each of the 10 repository subareas and the average of all 10 areas (from Mohanty et al., 2002, Figure 3-30)

Risk Insight Example: Hydrologic Properties of the Unsaturated Zone



Depiction of the stratigraphic thickness below each of the 10 repository subareas (from Mohanty et al., 2002)

Application of Risk Insights: Pre-Licensing Issue Resolution

- Review of DOE's Technical Basis Documents and agreement submittals
- Incorporation into the Integrated Issue Resolution Status Report
- As appropriate, in the development of NRC's inspection program
- Development of the performance confirmation review capability

Next Steps

- **Risk information continues to become available:**
  - **Staff currently conducting focused set of risk analyses**
  - **New risk information becomes available from DOE through prelicensing interaction**
- **Staff plans to update the Risk Insights Baseline, as appropriate, before anticipated license application submittal**
- **Staff plans to expand the Risk Insights Baseline to include preclosure repository system**

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

www.ocrwm.doe.gov

Key Technical Issues Status

Presented to:
Advisory Committee on Nuclear Waste

Presented by:
Timothy C. Gunter
Office of Repository Development
U.S. Department of Energy

Donald Beckman
KTI Completion Manager
Bechtel SAIC Company, LLC

April 21, 2004
Rockville, Maryland

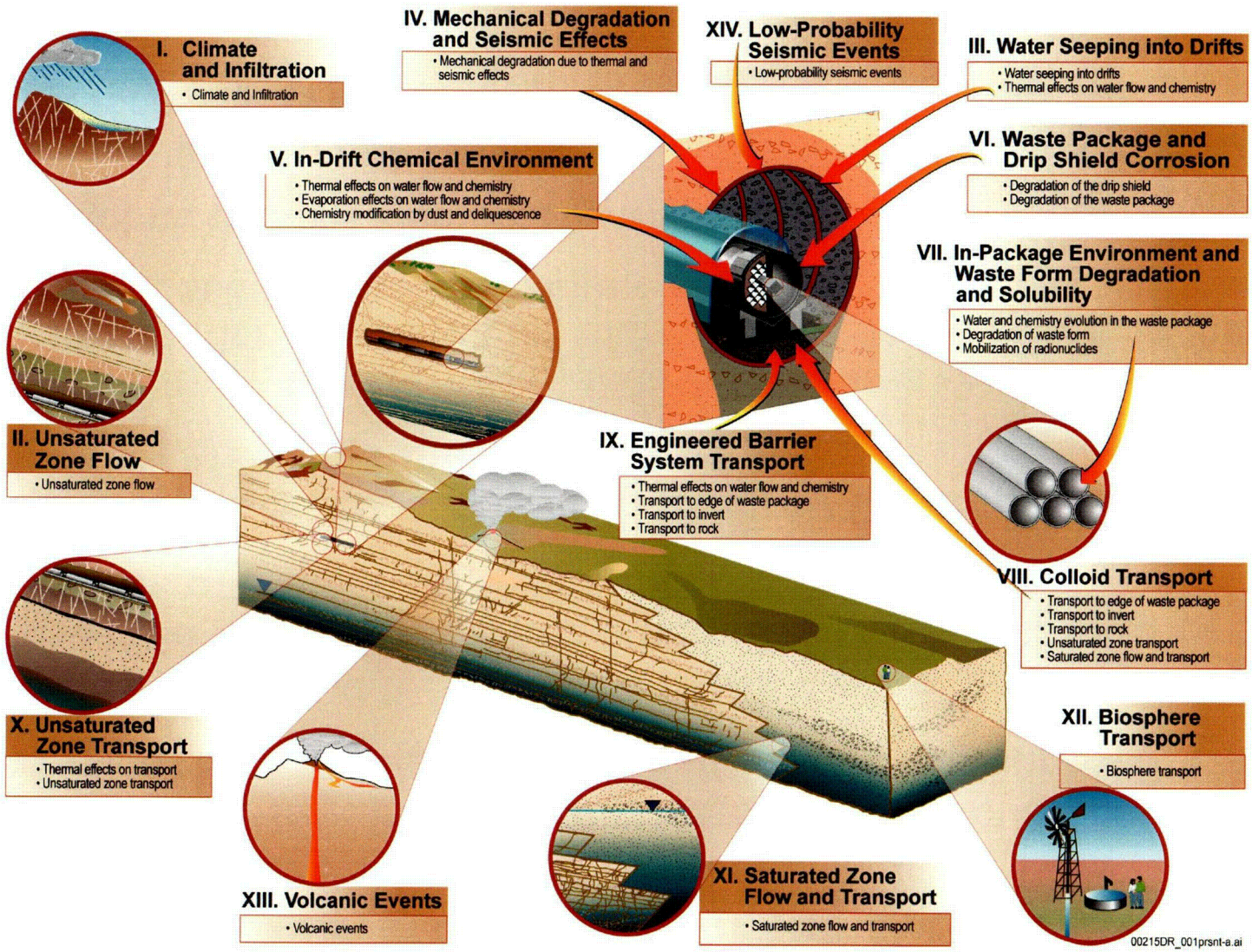
Overview

- Background
- Strategy Update
- Status
- Summary

Background

- U.S. Nuclear Regulatory Commission (NRC) developed Key Technical Issues related to repository performance
- 293 Key Technical Issue Agreements were established and will be addressed by the U. S. Department of Energy (DOE) prior to submittal of a License Application
- Approach as discussed at the Advisory Committee on Nuclear Waste meeting in June 2003
  - Majority of Key Technical Issue Agreements and Additional Information Needs will be addressed in groups based on their relationship to the postclosure technical basis
  - Technical Basis Documents will be prepared for most groups
  - Some Key Technical Issue Agreements and Additional Information Needs will be addressed singularly or in smaller groups

DOE's Key Technical Issue Resolution Strategy: An Integrated Approach



C01

Strategy Update

- Proceeding to address Key Technical Issue Agreements and Additional Information Needs within a framework of technical basis documents that reflect a total system postclosure view
- Most Key Technical Issue Agreement and Additional Information Needs responses grouped in a framework of 14 technical basis documents, with Key Technical Issue Agreement and Additional Information Needs responses specifically addressed in appendices to these technical basis documents
- Remaining "ungrouped" Key Technical Issue Agreements and Additional Information Needs are being addressed individually
- Schedule adjusted for changes in performance assessment models that impact technical basis documents, Key Technical Issue Agreement and Additional Information Needs responses
- Meetings are being considered to support NRC need for information on Key Technical Issue Agreement and Additional Information Needs where technical input is still being developed
- Key Technical Issue Agreements and Additional Information Needs will be addressed in submittals by August 2004

Status

- DOE has fully responded to 168 Key Technical Issue Agreements (including associated Additional Information Needs) out of a total of 293
- Submitted 7 of the 14 Technical Basis Documents (September – December 2003)
- Of the 125 remaining Key Technical Issue Agreements and Additional Information Needs, approximately half have been rescheduled primarily due to continuing work on models and reports
  - New Regulatory Integration Team effort may impact completion of some Key Technical Issue Agreements and Additional Information Needs
  - Updated schedule to incorporate lessons learned from internal assessments and NRC evaluations
- Key Technical Issue Agreements and Additional Information Needs associated with Total System Performance Assessment and Integration and Criticality may be addressed in meetings with the NRC pending completion of additional technical work

Status
(Continued)

Technical Basis Document/Group		Remaining KTI Agreement Responses or AINs
I.	Climate and Infiltration	5
II.	Unsaturated Zone Flow	11
III.	Water Seeping into Drifts* (October 2003)	9
IV.	Mechanical Degradation and Seismic	14
V.	In-Drift Chemical Environment* (November 2003)	2
VI.	Waste Package and Drip Shield* (December 2003)	21
VII.	In-package Environment	12
VIII.	Colloids* (October 2003)	0
IX.	Engineered Barrier System Transport	0
X.	Unsaturated Zone Transport	6
XI.	Saturated Zone Flow and Transport* (October 2003)	0
XII.	Biosphere Transport* (September 2003)	0
XIII.	Volcanic Events* (November 2003)	1
XIV.	Low Probability Seismic Events	8
	Barrier Capability/TSPAI	9
	Criticality	6
	Features, Events, and Processes	5
	Ungrouped	16

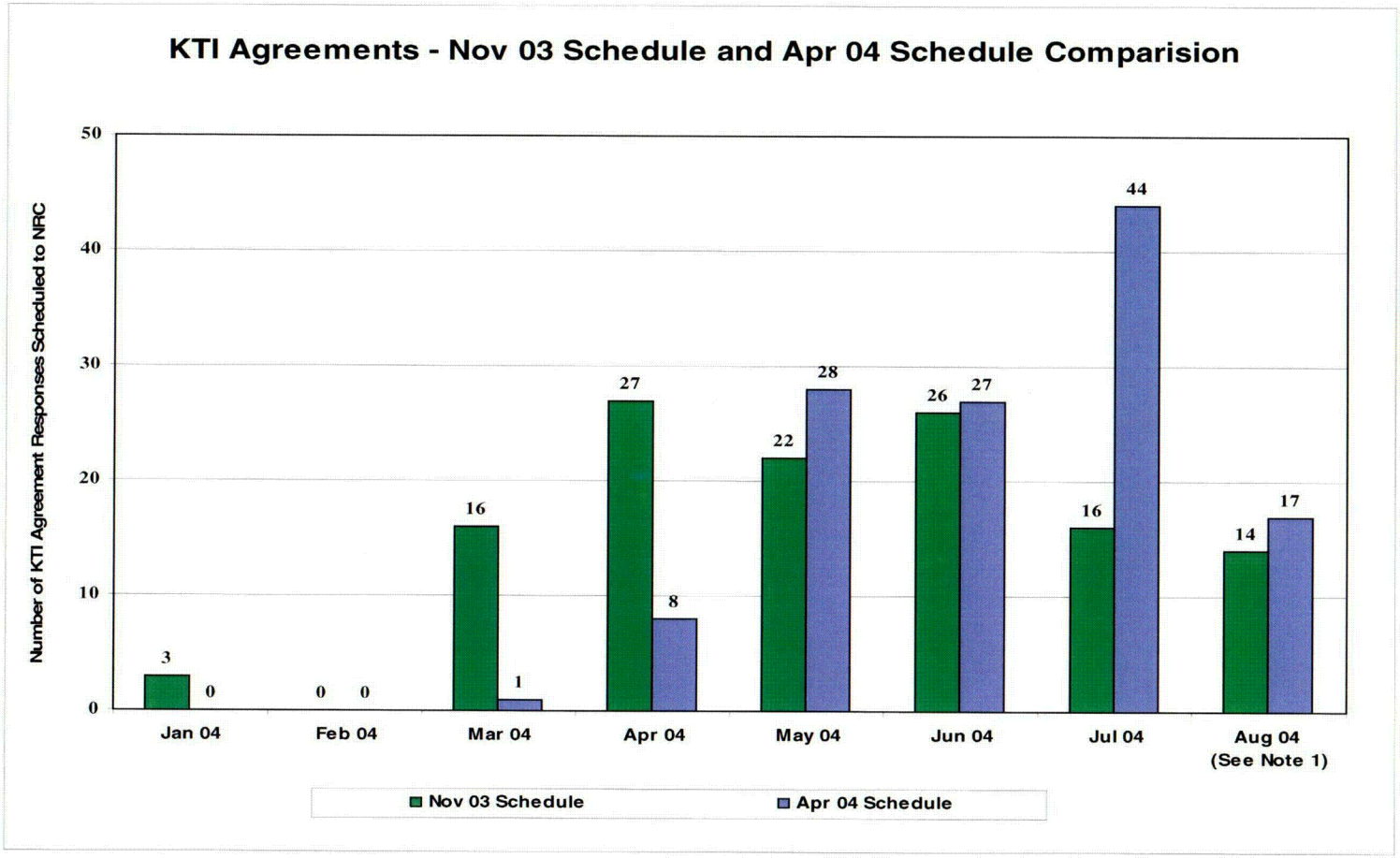
*Identifies Technical Basis Document already submitted

Status

(Continued)

- Key Technical Issue Agreements and Additional Information Needs rescheduled due to updates in technical models
  - 14 Key Technical Issue Agreements and Additional Information Needs grouped under *Technical Basis Document 4 - Mechanical Degradation and Seismic Effects* - delayed to incorporate updated ground motion analysis and updated rock fracture model into drift degradation analysis
  - 12 Key Technical Issue Agreements and Additional Information Needs grouped under *Technical Basis Document 7 - In-Package Environment, Waste Form Degradation and Solubility* - delayed by updates to chemistry abstraction model that increase confidence in pH ranges, and transuranic waste form solubility values
  - 8 Key Technical Issue Agreements and Additional Information Needs grouped under *Technical Basis Document 14 - Low Probability Seismic Events* - delayed to incorporate model updates to better characterize damage to waste packages in terms of stress corrosion cracks

Schedule Status

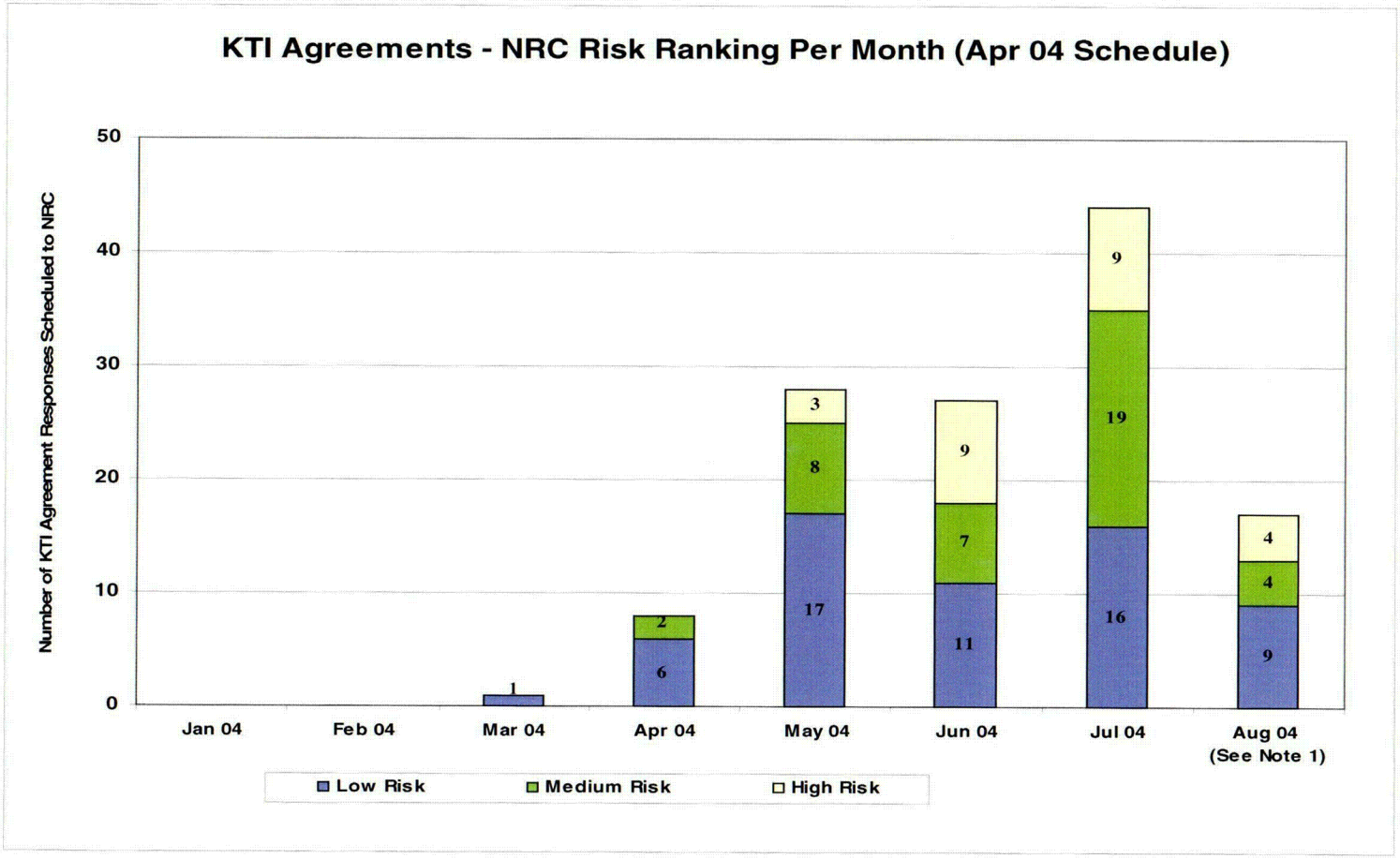


Note: Although delay to completion of the Total System Performance Assessment will affect some Key Technical Issue Agreement responses in the Barrier Capability/Total System Performance Assessment Group, our written response by August 2004 will address the status of these Key Technical Issue Agreements and the plans for completion of any remaining work.

C02

Schedule Status

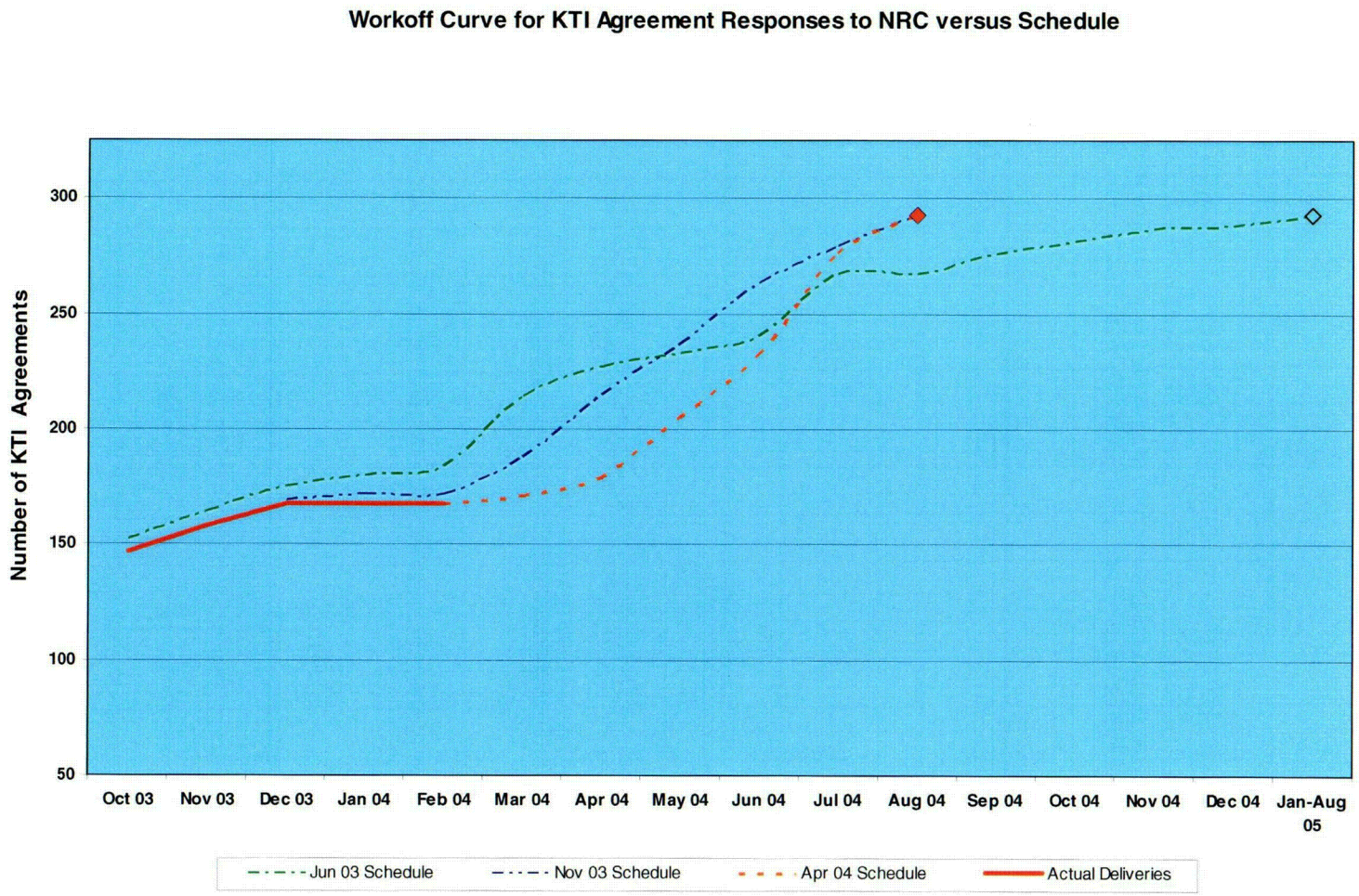
(Continued)



Note: Although delay to completion of the Total System Performance Assessment will affect some Key Technical Issue Agreement responses in the Barrier Capability/Total System Performance Assessment Group, our written response by August 2004 will address the status of these Key Technical Issue Agreements and the plans for completion of any remaining work.

C03

Schedule Status
(Continued)



C04

Key Technical Issue Agreements Status Summary

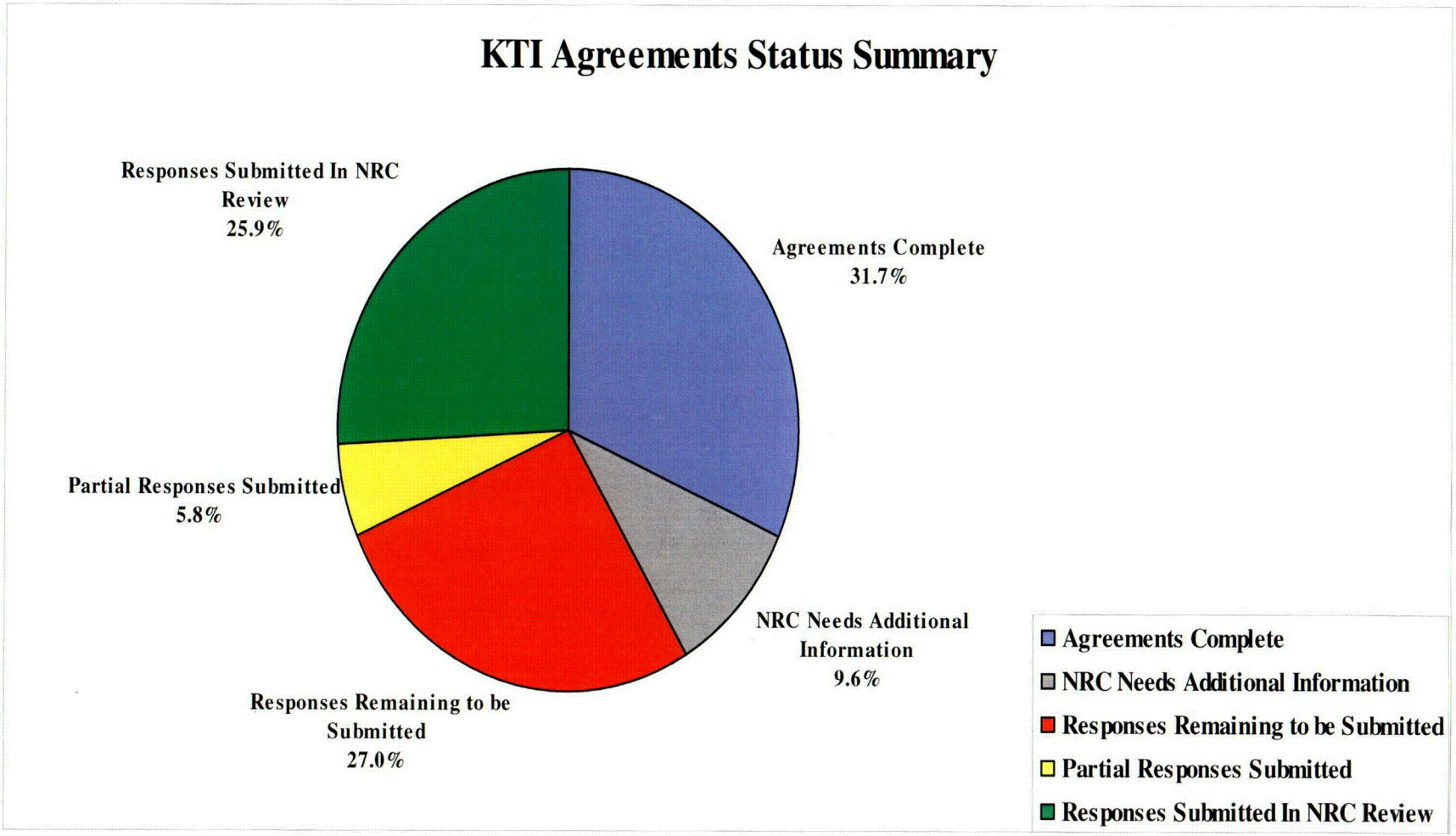
Reflects activity through April 15, 2004

KTI ID	Agreements Reached	Agreements Submitted to NRC	Responses Submitted In NRC Review	Partial Responses Submitted	NRC Needs Additional Information	Responses Remaining to be Submitted	Agreements Complete
CLST	58	41	10	3	8	17	20
ENFE	41	37	18	5	1	4	13
GEN	1	1	0	1	0	0	0
IA	22	20	7	0	0	2	13
PRE	9	6	1	0	3	3	2
RDTME	23	3	2	1	0	19	1
RT	29	22	15	1	0	7	6
SDS	10	10	0	3	2	0	5
TEF	15	13	3	1	2	2	7
TSPAI	58	35	11	2	9	23	13
USFIC	27	25	9	0	3	2	13
Totals	293	213	76	17	28	79	93

Legend

CLST - Container Life and Source Term
GEN - General
PRE - Preclosure
RT - Radionuclide Transport
TEF - Thermal Effects on Flow
USFIC - Unsaturated and Saturated Flow under Isothermal Conditions
ENFE - Evolution of the Near Field Environment
IA - Igneous Activity
RDTME - Repository Design and Thermal Mechanical Effects
SDS - Structural Deformation and Seismicity
TSPAI - Total System Performance Assessment and Integration

Status Summary



C05

Summary

- 57 percent of 293 Key Technical Issue Agreement responses submitted
- NRC indicates 93 Key Technical Issue Agreements are complete
- Remaining 125 Key Technical Issue Agreements and Additional Information Needs will be addressed by August 2004
- 13 Key Technical Issue Agreements and Additional Information Needs associated with criticality and Total System Performance Assessment results may be addressed in meetings with the NRC pending completion of technical work
- In August 2004, DOE will provide submittal with current status and plans for completion of any remaining work associated with Criticality and Total System Performance Assessment

Scientific and Technical Priorities at Yucca Mountain – EPRI's Risk Prioritization Effort

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EPRI

Outline

- Quick overview of EPRI's 2003 TSPA and results
- EPRI view of risk prioritization
  - EPRI measure of risk "importance"
  - Main findings
  - Brief comments on DOE Risk Prioritization report [BSC, 2002]
  - Comments on NRC Risk Prioritization work as documented in:
    - January 27, 2003 letter (Schleuter to Ziegler (DOE))
    - June 25, 2003 presentation by Esh to ACNW
    - Attachment 2 to June 5, 2003 memorandum (Travers to NRC Commissioners)

EPRI

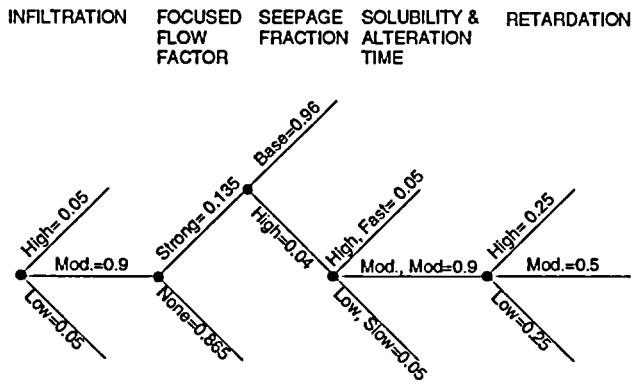
EPRI Considers Only "Normal" Release Mode (at present)

- Container and cladding must fail for diffusive release to begin
- Drip shield failure allows advective release (where local flow is high enough)
- Advection/diffusion through UZ and SZ to 18km "fencepost"

- The following are not in the EPRI model:
  - Igneous activity (almost done, report release in June)
  - Human intrusion
  - Colloid-aided transport

EPRI Uses a Simplified Logic Tree Approach to Probabilistic TSPA (i.e., not Monte Carlo)

- Limited number of branches with discrete probability and parameter value for each branch



Future Climate and Net Infiltration [mm/yr] Assumptions

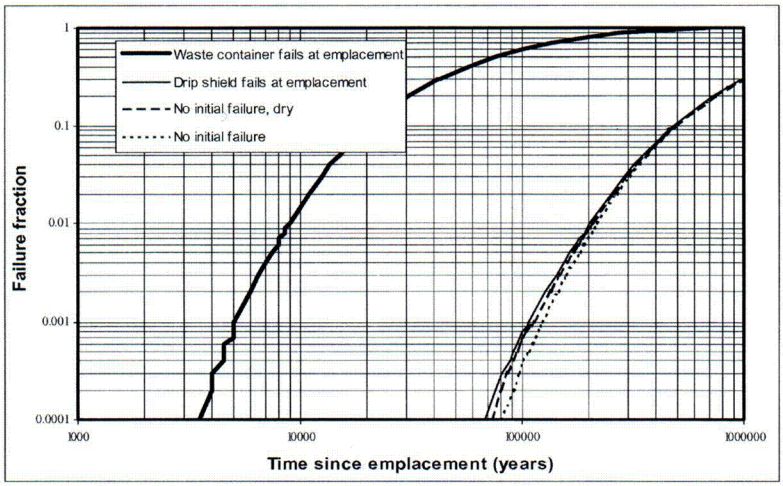
Climate (time beyond closure)	Low	Moderate	High
"Greenhouse" (0-1000 years)	1.1	11.3	19.2
Interglacial (1000-2000 years)	1.1	7.2	9.6
Full Glacial Maximum (Beyond 2000 years)	6.8	19.6	35.4

Distributions of Seepage Fraction and Seep Flow Rate versus *q* (Local Percolation Rate)

	"Base"-Seepage Case		"High"-Seepage Case	
q (mm/yr)	Fraction	Flow Rate (m^3/yr)	Fraction	Flow Rate (m^3/yr)
2.4	0	0	0	0
5	0	0	.083	.086
14.6	0	0	.083	.401
60	0	0	.310	.701
73.2	.054	.365	.376	.788
213	.054	4.24	.452	4.24
500	.129	6.20	.512	12.1
1000	.303	30.9	.609	35.6
3000	1	129	1	129

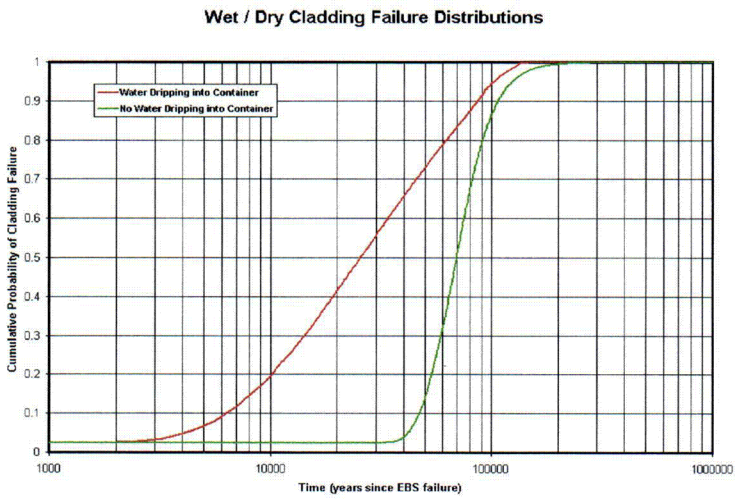
Maximum value of *q* in IMARC-7: 142 mm/yr

Drip Shield and Container Failure Distributions

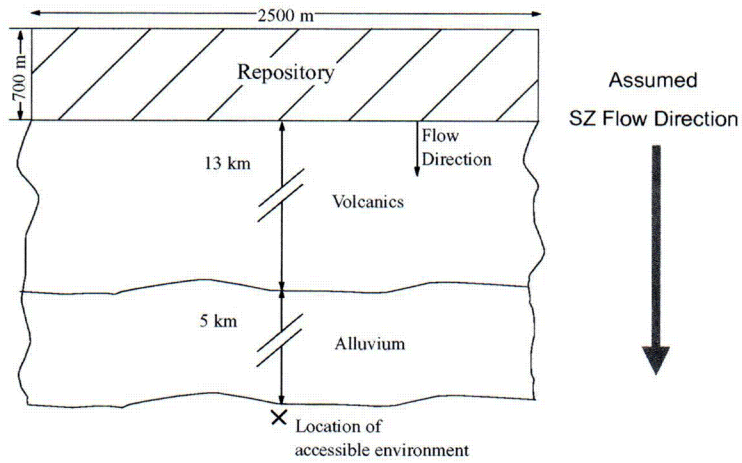


One drip shield and one container assumed failed at emplacement (not co-located)

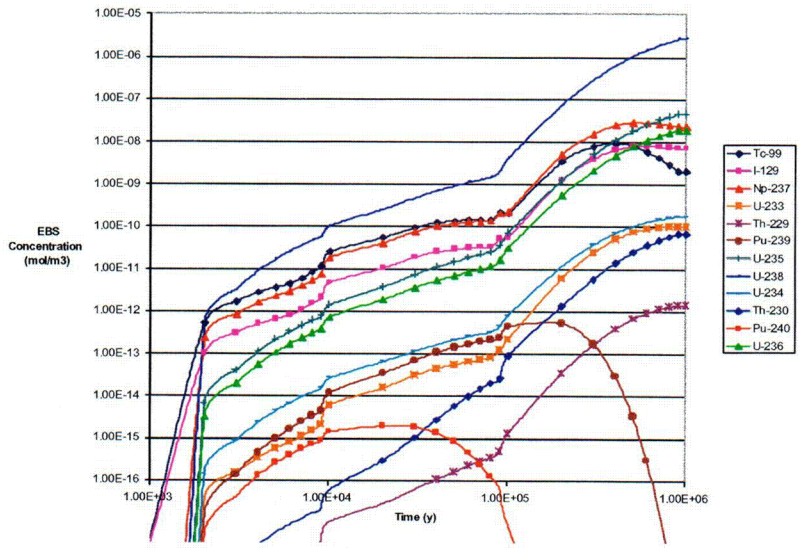
"Wet" and "Dry" Cladding Failure Rates



Saturated Zone Model (plan view)

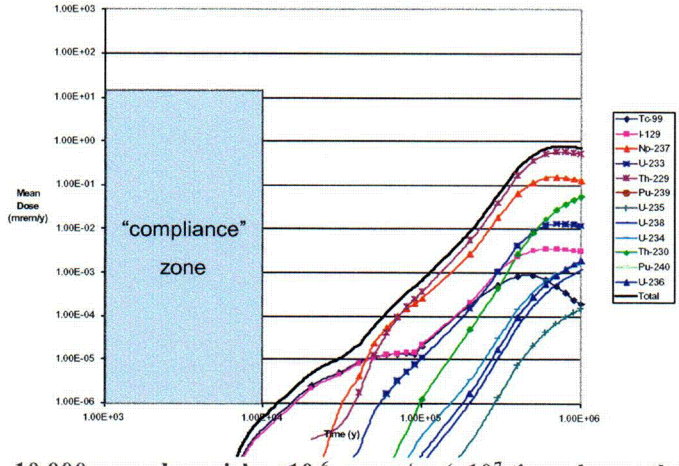


Intermediate Result: Radionuclide Mean Concentrations Exiting the EBS



EPRI Base Case Dose Risk Result

(ICRP 72 Dosimetry)

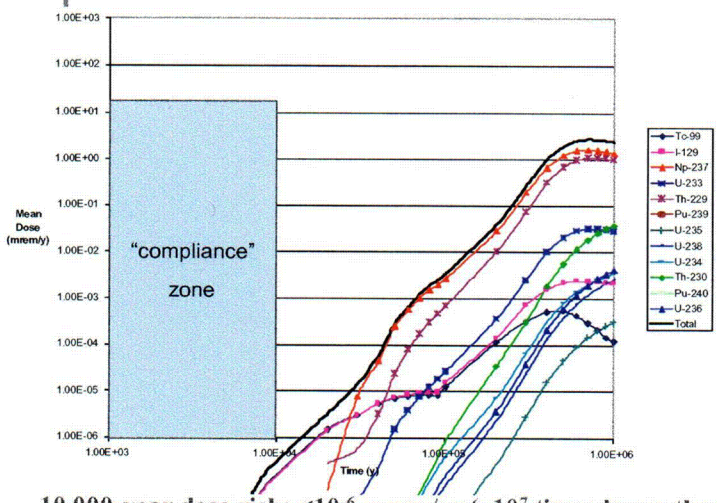


Note: Complete "function" failure of any **two** barriers will not cause 10,000-year dose to increase above Part 63 limit (examples to follow)

10,000-year dose risk: <10^{-6} mrem/yr (~10^{7} times lower than Part 63 limit)
Peak 1,000,000-year dose risk: ~1 mrem/yr (<1% of natural background dose)

EPRI Base Case Dose Risk Result

(FGR 11 Dosimetry)



Note: Complete "function" failure of any **two** barriers will not cause 10,000-year dose to increase above Part 63 limit (examples to follow)

10,000-year dose risk: <10^{-6} mrem/yr (~10^{7} times lower than Part 63 limit)
Peak 1,000,000-year dose risk: ~3 mrem/yr (~1% of natural background dose)

Examples of Contributors to Low Dose Risk Estimates

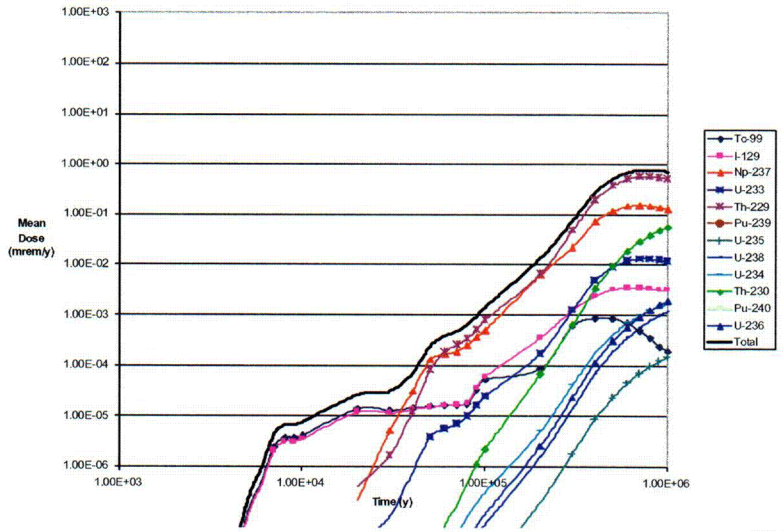
- Slow container and drip shield degradation rates
- Repository in the unsaturated zone
  - Small fraction of repository contacted by flowing groundwater
  - Limited diffusive release from failed containers via tortuous pathways
- Solubility limitations
- Travel time in the unsaturated and saturated zones
  - Sorption delays most actinides and Cs/Sr
    - (short-lived Cs-137/Sr-90 not even modeled)

Sensitivity Studies

- Used to test robustness of the system if some system components don't perform as anticipated
- Results dependent on other system components functioning "as advertised"
- Examples (ICRP 72 dosimetry):
  - Drip shield does not function
  - Waste packages do not function (immediate groundwater contact with waste package internals)
  - Neither drip shied nor waste packages function

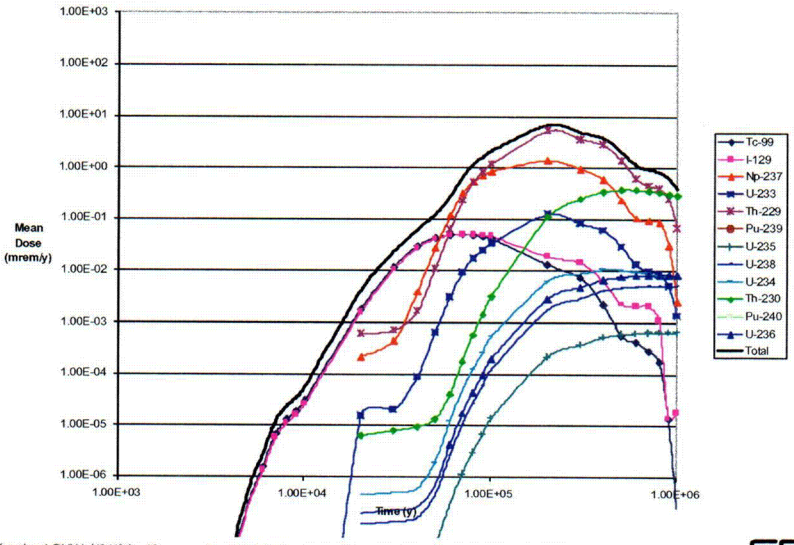
Drip Shields Fail to Function

(All other barriers function "as advertised")

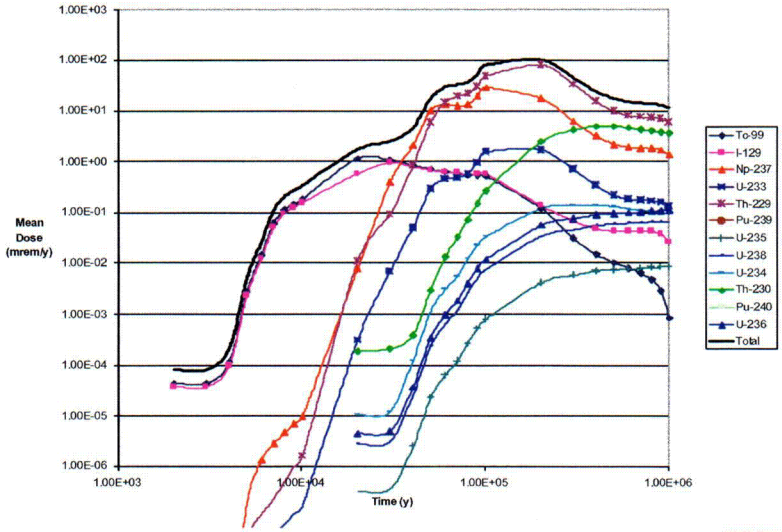


Waste Packages Fail to Function

(All other barriers function "as advertised")



Drip Shield AND Waste Packages Fail to Function (All other barriers function "as advertised")



Preliminary Conclusions

- EPRI probabilistic analyses result in very low doses
  - Many "natural" and "engineered" features contribute
- Complete failure to function of any two (or more) system components ("barriers") will still not cause regulations to be exceeded
- Both of the above contribute to confidence while some processes and parameters remain uncertain

EPRI Independent "Risk Prioritization" Work

- Motivation:
  - KTI Agreement Item completion process
  - Three-year regulatory review period *for construction authorization*
- Purpose:
  - Develop independent understanding of the "risk-important" system FEPs
  - Identify a potential approach to completing "risk-important" work *at the appropriate time during repository development or operation*
- Approach:
  - Develop working definition of "risk-important"
  - TSPA sensitivity studies
    - One-offs
    - "One-ons" (EPRI's "Hazard Index" work (reported elsewhere))
  - Evaluation of DOE and NRC work

EPRI Working Definition of "High" Risk-Importance

- FEPs or barriers whose uncertainty "range" causes the current estimate of "dose risk" to vary by one millirem per year or more
  - Uncertainty "range" includes conceptual model or parameter uncertainty and variability
  - "Dose risk": mean of the output distribution treated probabilistically
  - Dose risk in first 10,000 years considered
- Rationale:
  - Part 63 and Yucca Mountain Review Plan require a risk-informed approach

EPRI Conclusion: No SINGLE barrier or FEP is of "High" Risk-Importance

- Examples of FEPs/barriers EPRI considered (Slide 1 of 2)
  - Net infiltration rate, degree of flow focusing, and seepage fraction/flow rate
    - Advective release at early times is relatively unimportant
    - Engineered barriers still provide protection
    - UZ/SZ travel times not shortened to the point of ineffectiveness even for high values of infiltration/focusing
  - Solubility and waste form alteration time
    - Tc/I already essentially solubility unlimited
    - Actinide solubilities would have to be MUCH higher to even begin to approach being risk-important on their own
      - Pu colloid uncertainty also not sufficiently large
    - Waste form alteration time already assumed to be ~10^3 years

EPRI Conclusion: No SINGLE barrier or FEP is of "High" Risk-Importance (continued)

- Examples of FEPs/barriers EPRI considered (Slide 2 of 2)
  - UZ/SZ retardation: Kd's of zero shift actinide arrival times, but no "significant" dose increase results
  - Drip shield, waste package (Alloy 22), cladding
    - If one completely fails to function (even if two fail), other(s) back them up

Only "Common Mode Failures" May be Risk-Significant

- "Common mode failure": FEPs that, if they occurred, could cause multiple barriers to fail to function "as advertised"
- Examples:
  - Unexpectedly corrosive local environmental conditions
    - Could cause early failure of drip shield, waste package and cladding
    - Could also cause local solubility limit increases
  - Disruptive events (potential "short-circuiting" of multiple barriers)
    - Igneous activity
    - Major rockfall (maybe)
      - Thermally- or seismically-induced
    - NOT human intrusion (single waste package penetration not enough)
  - Dramatically higher repository temperatures (maybe)

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
- Preliminary DOE estimates of risk importance as a basis to prioritize work for the license application should be accepted by NRC at this time
  - Is DOE's risk to accept in the pre-licensing phase
  - NRC review of license application will be independent

EPRI Recognizes Some Information is Required in All Areas

- EPRI is not saying *no* information is required
- Degree of information should be relative to risk-importance
- EPRI does feel, however, that the current amount of information in areas of lesser importance to risk is probably adequate
- EPRI understands that determinations of what is "important" are based on assuming current TSPA submodels are correct
- Decision to proceed with prioritization of KTI Agreements should be solely at DOE's risk
  - NRC should not require DOE to perform all Agreements

When Should "Risk-Important" Work be Completed?

- Step-wise licensing issue
- Analogy to Part 50 reactor licensing
  - Level of detail in construction PSAR lower than in operation FSAR
- Level of detail needs to be associated with the need for a particular barrier
  - Little to no public risk associated with construction
    - No need for post-closure natural barriers, so less information about them required at the time of construction
    - More information required about surface facilities and subsurface handling

Degree of Information Required at Each Licensing Stage

SSC/barrier	Site Recom-mendation	Con-struction Permit	Receive and Possess	Em-place-ment	Clo-sure
Transportation system	I	II	III	III	N/A
Surface handling facility	I	II	III	III	N/A
Repository EBS[a] (except drip shield and/or backfill SSC's)	I	I	II	III	III
Drip shield and/or backfill SSC's/barriers	I	I	II	II	III
Unsaturated zone rock affecting repository temperatures, rock stability, and other environmental conditions during loading prior to closure	I	I (II: rock stabilit y)	II	III	III
UZ affecting repository environmental conditions and radionuclide transport after closure	I	I	I	II	III
Saturated Zone properties	I	I	I	II	III

I: Preliminary Information

II: Reason-ably com-plete info

III: Complete information for full barrier reliance

EPRI Evaluation of DOE and NRC Risk Prioritization Activities

- DOE:
  - BSC 2002: "Risk Information to Support Prioritization of Performance Assessment Models", TDR-WIS-PA-000009 Rev.1 ICN 1, August 2002.
- NRC:
  - Esh, 2003: "Status of the HLW Risk Insights Initiative", presentation by Dr. David Esh to the ACNW, 6/25/03.
  - NRC memorandum M030303A: "Final Staff Response to March 19, 2003, Staff Requirements Memorandum on Waste Arena Briefing", 6/5/03, Attachment 2 (Baseline of Risk Insights).

EPRI Evaluation of DOE Approach

- EPRI measure of "risk-importance" fundamentally the same as DOE's
  - Effect on probability-weighted dose of the order of 0.1 to 1 millirem per year
- DOE considered alternatives, but rejected them (EPRI agrees):
  - Importance based on conditional probabilities
  - Focus on most likely consequence rather than mean of distribution
  - "...neither of these approaches provides a means for assessing the role of TSPA model components in meeting the requirements ... that have been established by the NRC."
- DOE found only waste package degradation was of high risk significance
  - EPRI disagrees. WP degradation uncertainty is only of high risk significance coupled with other failures.

EPRI Evaluation of NRC Approach

- NRC (Schleuter letter to Ziegler, 1/27/03): "The 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."
  - EPRI agrees
- Esh (NRC staff) remarks to ACNW: "[The a]mount of technical basis for the analysis should be commensurate with the uncertainty, risk-significance, and pessimism introduced into the analysis."
  - EPRI partially agrees:
    - Risk-significance: yes
    - Uncertainty: ONLY if risk-significant
    - Pessimism: only in those cases where it may cause something else to appear risk-significant

NRC Approach to Determining What is Risk Significant is Somewhat Unclear

- Esh (same presentation to ACNW): "NRC agrees that the margin between the analysis results and the performance objective can be considered when risk-informing."
  - Seems clear enough and fundamentally consistent with DOE and EPRI approach
- NRC concerns about "combined effects" is less clear
  - NRC example of several unrelated parameters that, together, contribute to the highest risk (next slide)
  - Artificial equation: Outcome = $(A \times B)^C$
    - More on this equation later

Esh (NRC) Example of Combined Effects
(6/25/03 presentation to ACNW)

Parameter Name	Highest Realization	2nd Realization	3rd Realization	4th Realization	5th Realization	Mean
WPFlowMF	84	82	91	86	90	87
SbArWt%	70	92	79	32	85	72
WP-Def%	91	64	88	74	32	70
PSFDM1	81	67	87	94	98	85
InitRSFP	63	56	50	98	70	67
DSFailTi	53	64	27	55	37	47

- In the highest realization, three parameters are near the edge of their uncertainty range, others elsewhere
  - Not surprising
  - NRC seems concerned that additional information collected on all three parameters will result in "worse" ranges
    - Does not seem likely, hence not risk-informed

NRC Artificial Equation Example of Combined Effects

- Artificial equation: Outcome = $(A \times B)^C$
- NRC selects "Base Case" and "New" uncertainty ranges for A, B, and C
  - NRC shows, for selected "Base" and "New" ranges, that *if all three parameters* shifted to "new" ranges, the probability-weighted "outcome" is much larger than if each parameter range is shifted to its "new" range *one at a time*
    - This is NRC's argument against using just one-off sensitivity studies to identify items of risk significance
  - What is the likelihood that new information would cause *all three* parameter ranges to shift to the "new" values?
  - Such an approach may make it impossible to prioritize work
    - Won't know which uncertainties will be shifted until all the work is completed
    - Requires speculation on "new" uncertainty distributions

Summary of Concerns about NRC's "Combined Effects" Thoughts

- Well understood that particular "combined effects" cause the highest dose realizations
  - Example: "high" net infiltration; "high" corrosion; "high" solubilities; UZ/SZ fast(er) transport (potential combination of van Genuchten/Kd/fracture-matrix interaction parameters)
- Above effects are largely independent
  - So what is 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* additional work), if "risk-informed", should not be based on the concern that new information will cause *several* FEPs/barriers to all change in the "wrong" direction.

EPRI Review of Attachment 2 of NRC 6/5/03 Memo: "Baseline of Risk Insights"

"The staff judged risk significance by evaluating the impact 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-in-depth)."

- Suggests NRC's is considering more than a traditional uncertainty assessment approach
- Added item: need for multiple barriers
  - (OK, but let's not mix this up with "risk-significance")

Attachment 2 "Philosophy"

- "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."
  - EPRI agrees this is a good approach
  - NRC provides a clear example of what they mean by this approach:
    - "High" risk importance: uncertainty in rockfall initiators (although EPRI believes NRC's rockfall model is quite conservative)
    - Lower risk importance: uncertainty in waste package mechanical integrity

Attachment 2 "Philosophy" (continued)

- "[E]valuating the agreements is not as simple as the above example because many of the agreements are complex and interrelated...". "Thus, staff judgment has been used, as needed, when combining information from different analyses."
  - Indeed many of the Agreements are interrelated
    - Would have been nice to have simplified the final set of Agreements rather than leaving the current hodgepodge
  - Hence, it *is* necessary to use judgment in determining risk-importance

Attachment 2 "Philosophy" (continued)

- NRC states its risk insights are based on TSPA calculations that include all of the supporting evidence:
  - Laboratory and field experiments;
  - Analogs;
  - Sensitivity analyses;
  - Based on current understanding
- All appropriate. However, DOE should have already considered all the above when developing its conceptual models and parameter ranges.
  - If NRC feels DOE did not do that properly, then that is a largely *separate* issue from the need to do more research

Attachment 2 "Philosophy" (continued)

- NRC subjectively modified its quantitative risk assessments to determine risk-importance to somehow include the concept of multiple barriers.
  - Words about the "safety significance" of individual barriers
  - Effect is to raise some issues higher in risk-importance than traditional risk assessment approaches support
- NRC introduces the concept of risk "potential"
  - Seems to have to do with radiotoxicity of specific radionuclides, but unclear
    - If so, this is not necessarily supportable based on current levels of understanding of the more radiotoxic radionuclides. [I.e., some are well understood.]
  - Does the mere existence of a postulated risk "potential" imply "risk-significance"???

NRC's Attachment 2 Risk Insights are in Seven Areas

- Water infiltration, percolation, and seepage
- Degradation of the engineered barrier system (EBS)
- Radionuclide release from the EBS
- Flow and transport of radionuclides in the unsaturated zone (UZ)
- Flow and transport of radionuclides in the saturated zone (SZ)
- Biosphere and reasonably maximally exposed individual (RMEI)
- Igneous activity

NRC Finds No "High" Risk-Important Issues in the Following

- Water infiltration, percolation, and seepage
  - EPRI agrees.
  - NRC finds shallow infiltration of "moderate" importance due to potential effects on Np-237 transport.
    - EPRI disagrees. Infiltration uncertainties won't cause even close to a "significant" (~1 mrem/yr) change in overall dose. EPRI is concerned this is one of those risk "potential" items simply because it involves Np-237.
- Flow and transport in the UZ
  - EPRI agrees
- Biosphere and RMEI
  - EPRI agrees, but for slightly different reasons

NRC's High Risk-Important EBS Degradation Items

- Some chemistry issues governing nature of salts that could develop on the drip shield
  - EPRI agrees in principle as local chemical conditions could, in some models, cause a "common mode failure"
  - However, recent EPRI work (not presented here) concludes that aggressive local chemical conditions are unlikely
- Existence of a passive film on the waste packages
  - EPRI disagrees: 100% of packages can fail and dose risk won't rise by 1 mrem/yr
- Rockfall
  - EPRI disagrees. NRC rockfall model is conservative, so has biased their risk assessment.

NRC's High Risk-Important SZ Flow and Transport Items

- Retardation in the alluvium
  - EPRI disagrees.
    - Even no alluvium retardation does not cause dose risk to rise by anywhere near 1 mrem/yr.
    - Many other engineered AND NATURAL barriers exist.
- "Medium" risk-important items about the amount of transport in fractures versus porous media
  - EPRI agrees that these are of some importance, although still not "high"

NRC's High Risk-Important Igneous Activity Items

- Several items
  - EPRI agrees that, in principle, igneous activity is of higher risk-importance due to the possibility of "common mode failures"
  - Since EPRI's December 2003 report, EPRI has developed new insights on igneous eruption risks
    - Neglected mitigating factors will dramatically (orders of magnitude) lower igneous eruption dose risks
    - Results to be published later this Spring

Conclusion

- EPRI normal release scenario dose risks are VERY low
- EPRI and DOE approaches to determining FEPs and/or barriers of "high" risk significance are fundamentally the same
  - Essentially, "standard" probabilistic sensitivity analyses only
  - Additional combined effects considerations do not seem to be risk-informed
- EPRI partially agrees and partially disagrees with NRC's approach to determining risk significance
  - Disagreement in areas related to combined effects and risk "potential"
  - NRC may have good reason to require work to support multiple barriers
    - But let's not confuse those regulatory requirements with risk-significance