

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Nuclear Waste
148th Meeting

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Friday, February 27, 2004

PROCESS USING ADAMS
TEMPLATE: ACRS/ACNW-005

Work Order No.: NRC-1331

Pages 1-90

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
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148TH MEETING
ADVISORY COMMITTEE ON NUCLEAR WASTE
(ACNW)
+ + + + +
FRIDAY, FEBRUARY 27, 2004
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ROCKVILLE, MARYLAND
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The Advisory Committee met at 8:30 a.m. at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, B. John Garrick, Chairman, presiding.

COMMITTEE MEMBERS:

B. JOHN GARRICK	Chairman
MICHAEL T. RYAN	Vice-Chairman
GEORGE M. HORNBERGER	Member
RUTH F. WEINER	Member
JAMES CLARKE	Consultant
JOHN T. LARKINS	Executive Director-ACRS/ACNW

- 1 NRC STAFF PRESENT:
- 2 TAE AHN
- 3 ANDY CAMPBELL
- 4 NEIL COLEMAN
- 5 GREGORY HATCHETT
- 6 BALER IBRAHIM
- 7 PHILIP JUSTUS
- 8 HOWARD LARSON
- 9 MICHAEL LEE
- 10 BRET LESLIE
- 11 RICHARD MAJOR
- 12 TIM McCARTIN
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I-N-D-E-X

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

(8:49 a.m.)

21) OPENING REMARKS BY THE ACNW CHAIRMAN

CHAIRMAN GARRICK: Good morning. The meeting will come to order. This is the fourth day of the 148th meeting of the Advisory Committee on Nuclear Waste. I am John Garrick, Chairman of the ACNW. Other members of the Committee present are: Michael Ryan, Ruth Weiner, George Hornberger. Also present today is our consultant, Jim Clarke.

The Committee will do three things. We will be briefed by representatives of the NRC staff on recent risk insight activities. We will be briefed by representatives of the NRC staff on the status of Yucca Mountain key technical issues and will continue our preparation of ACNW reports.

Neil Coleman is the designated federal official for today's session. The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act.

The Committee hasn't received any comments or requests for time to make oral statements from members of the public. If anyone wishes to do so, please make your wishes known to one of the Committee staff. As usual, it is requested that you use a

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1 microphone, identify yourself, and speak clearly.

2 We are running a little behind. So we
3 will move right into our first presentation. James
4 Danna of the NRC staff is going to handle that. You
5 will introduce yourself and the topic.

6 22) RISK INSIGHTS REPORT

7 MR. DANNA: Good morning. My name is Jim
8 Danna. I am a senior assistance performance analyst
9 with the NRC's Division of Waste Management. As Dr.
10 Garrick stated, today I am going to provide the
11 Committee with an update on the status of the staff's
12 high-level waste risk insights initiative.

13 Before I begin, I want to point out that
14 the risk insights initiative has been a team effort
15 among the staff at the NRC and the staff at the Center
16 for Nuclear Waste Regulatory Analysis in San Antonio.
17 To this, I would like to acknowledge the contribution
18 and the commitment of the staff of the NRC and the
19 center to developing the risk insights in the
20 initiative in the baseline; in particular, the
21 contribution of Tim McCartin to developing the risk
22 insights baseline report.

23 Next slide. In my presentation this
24 morning, I will start by providing a brief overview of
25 the risk insights initiative, the activities that led

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1 to the development of the risk insights baseline.

2 I will then discuss the risk insights
3 baseline report itself, describing its purpose,
4 content, format. I will also discuss the basis for
5 the staff's ranking of the insights. And I will
6 provide several examples of the risk insights from the
7 report.

8 I will then give a set of examples
9 followed by the staff has used in risk insights to
10 risk-inform its high-level waste program activities.
11 I will discuss how we may use the baseline in
12 reviewing a license application assuming one is
13 submitted by DOE.

14 Finally, I will discuss the current status
15 of the report. And the future activities for
16 maintaining the risk insights baseline; in other
17 words, keeping it up to date.

18 The term "risk insights initiative," it
19 has been used to characterize the staff's ongoing
20 effort to enhance the use of risk information and its
21 regulatory activities and high-level waste program.
22 In other words, it refers to our activities to
23 risk-inform our program.

24 As you know, the staff has been generating
25 risk information in the high-level waste program for

1 many years, the risk insights activities, risk
2 assessment activities.

3 Through the risk insights initiative, the
4 staff has attempted to pull together the risk
5 assessment results and to synthesize, to integrate the
6 knowledge and understanding gain through those risk
7 assessments to formulate an understanding of how the
8 components of the repository system at Yucca Mountain
9 might function together to isolate waste and, thus,
10 affect risk to public health and safety. It is this
11 synthesis and integration that are the focus of the
12 risk insights initiative.

13 We also aim to develop an understanding of
14 which components of this system are most important and
15 why. This understanding can then be used to
16 risk-inform staff's activities, both during
17 pre-licensing and following submittal of license
18 application.

19 Risk insights. Risk insights provides the
20 staff's perspective on the important parameters,
21 models, and assumptions, the importance here being
22 judged relative to risk to health and safety. Risk
23 insights also reflect uncertainties in the staff's
24 knowledge or understanding of the particular technical
25 issues. The risk insights provide a basis for

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1 focusing staff's attention and resources on more
2 important technical issues relative to risk. And the
3 risk insights indicate where the staff can benefit the
4 most from additional information.

5 I will briefly summarize how we got to
6 where we are today, primarily for the benefit of some
7 of the newer members of the Committee. The risk
8 insights initiative began in January of 2002. The
9 early efforts reflect that communicating among staff,
10 relative risk significance of technical issues, the
11 effort was focused squarely on risk ranking the 293
12 key technical issue agreements.

13 We used a facilitative approach to solicit
14 from staff members their perspective on the relative
15 importance of the agreements. Staff reported
16 preliminary results to ACNW in April 2002.

17 In its letter to the Commission, the
18 Committee noted that as a communication exercise, they
19 thought it was successful. However, they emphasized
20 they encouraged the exercise to be repeated, this time
21 with an emphasis on more traditional quantitative
22 health and safety risk metrics.

23 We began to develop the risk insights
24 baseline later in 2002. The idea here was to shift
25 staff efforts from risk ranking individual agreements

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1 to developing a fairly comprehensive and integrated
2 system level understanding the risk significance of
3 the technical issues associated with a repository
4 system based on our current knowledge.

5 This understanding would be supported by
6 quantitative risk information. This baseline of the
7 system-level understanding of risk information could
8 then be used to not only rank the risk significance of
9 the agreements but also risk-inform other activities
10 in a high-level waste program.

11 In March 2003, the Commission issued an
12 SRM requesting the staff's risk ranking of the 293
13 agreements. At that time, we had a draft baseline,
14 risk insight baseline, developed. We used that
15 baseline to provide an initial ranking of the
16 agreements, risk-significant ranking. We provided
17 that ranking and a draft insights baseline to the
18 Commission in June 2003.

19 In July of 2003, we updated the Committee
20 on the status of the risk insights initiative. And at
21 that time, we introduced the concept of the risk
22 insights baseline, stating that we were taking this
23 integrated system-level perspective. And then we
24 would use that. We have used that to rank the
25 agreements.

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1 In their letter to the Commission
2 following the presentation, the ACNW encouraged the
3 staff as it completed the risk insights baseline to
4 clearly identify the linkage between risk insights and
5 the supporting quantitative results of risk
6 assessments.

7 And also for both the NRC and DOE, ACNW
8 encouraged us to defer to the Commission's or the
9 agency's risk-informed performance-based white paper
10 for terminology related to risk.

11 Just quickly with respect to terminology,
12 we want to emphasize to the Committee at this time
13 that we are committed to the risk-related terminology
14 and concepts in the white paper. Particularly germane
15 to the risk insights baseline are these terms from the
16 white paper: risk, particularly not just looking at
17 consequence but also likelihood of those consequences
18 happening.

19 The concept of risk easement is a
20 systematic method focused on understanding likely
21 outcomes, sensitivities, areas of importance, system
22 interactions, and areas of uncertainty. Here we are
23 today: risk insights. The results of findings that
24 come from risk assessments.

25 The white paper also discusses other

1 concepts, particularly the distinction between
2 risk-informed or risk-based regulation. As you know,
3 we are focused on risk-informed, rather than solely
4 risk-based. And the white paper discusses the role of
5 risk insights in identifying and evaluating the
6 adequacy of the components of defense-in-depth in the
7 case of high-level waste program multiple barriers.
8 Again, we are committed to terminology in the white
9 paper.

10 At this point, I would like to point out
11 that the risk insights compiled by the staff and
12 presented in the report are intended to assist the
13 staff in our pre-licensing activities with DOE. At
14 this time, the staff has not made any determinations
15 regarding the type of conditions or adequacy of the
16 potential repository at Yucca Mountain.

17 If DOE submits a license application for
18 such a repository, the staff will review the
19 information provided by DOE, information available at
20 that time, on which to make its determinations.
21 Insights presented at the baseline are for our use
22 during pre-licensing and license application review.

23 Next slide, please. I would like to move
24 now to a discussion of the risk insights baseline
25 report itself. The report documents the results of

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1 the risk insights initiative. The report was
2 developed to provide a reference for the staff to use
3 in risk-informing its regulatory activities.

4 The objective of the report was to compile
5 the risk insights into a single baseline document to
6 promote consistency in the approach the staff uses in
7 risk-informing its activities, consistency among the
8 staff as well as consistency in its application to our
9 activities.

10 The development of the report enhances the
11 understanding and communication of the staff's
12 perspective on the relative importance of features,
13 events, and processes, allows us to communicate our
14 understanding of how these components might work
15 together to contribute to or detract from waste
16 isolation and, thus, risk.

17 The risk insights in the report are based
18 on performance assessment results, including subsystem
19 analyses and auxiliary calculations. The risk
20 insights and supporting information presented in the
21 report were developed by staff in all areas of the
22 high-level waste program, not just PA, both at the NRC
23 and at the center.

24 We didn't attempt to develop risk insights
25 for all aspects of the repository system but, instead,

1 tried to focus on the technical areas of greatest
2 importance or uncertainty.

3 As a starting point, we reviewed the KTI
4 agreements to ensure that the technical issues
5 addressed in the agreements would all be covered by
6 the risk insights.

7 Because of the ready availability of risk
8 information, the report kindly focuses on post-closure
9 repository system performance. The staff has begun,
10 however, to develop the risk insights for the
11 pre-closure system and when these are incorporated
12 will ask that risk insights are finalized to become
13 available.

14 The report includes both system-level
15 insights and detailed risk insights related to
16 specific features, events, and processes. Individual
17 risk insights are supported by quantitative risk
18 information as well as a discussion of uncertainties
19 in that information. And the report provides
20 references to the detailed risk analyses supporting
21 the insights. What the report does is summarize the
22 risk assessments and provides the references to the
23 detailed results.

24 The report also identifies areas for
25 additional analyses. These are primarily aimed at

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1 reducing the uncertainties that are discussed.

2 The risk insights in the report are
3 organized around the integrated sub-issue, structure
4 of the ISI, structure of the radionuclides. This is
5 the same organization used in the Yucca Mountain
6 review plan and the integrated issue resolution status
7 report. We adopted this structure to facilitate
8 application of the risk insights to these other
9 program areas. This is also the organization that DOE
10 is likely to use in the license application.

11 Finally, the report includes ratings of
12 risk significance of the insights; in other words,
13 significance to waste isolation. Why rate the
14 insights based on risk significance? Rating the
15 insights based on risk significance helps communicate
16 our understanding of what is more important and what
17 is less important relative to risk. It is to make
18 that link from performance assessments results and the
19 risk insights to program management and
20 decision-making. It helps to prioritize our
21 activities, focus staff resources, and support project
22 management and decision-making.

23 The ratings consider potential effect on
24 waste isolation capability. Specifically, we looked
25 at potential effect on waste package integrity,

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1 potential effect on the release of radionuclides from
2 the waste form, and effect on the transport of
3 radionuclides through the geosphere. These are the
4 three aspects of waste isolation that we looked at in
5 developing the risk rankings.

6 We didn't use a specific numeric threshold
7 for rating significance, but we did rate the
8 significance based on potential effect on the
9 quantitative risk estimates. In other words, we
10 didn't specify a particular threshold to say more than
11 this is high, less than this is medium.

12 Essentially the risk information we had,
13 our risk assessment techniques, doesn't lend itself to
14 this sort of strict quantitative approach
15 distinguishing high from medium and medium from low.
16 Again, it is, though, based on quantitative risk
17 results; in general, high significance in the case of
18 order of magnitude effect on risk estimates.

19 On the other hand, low significance
20 indicates a somewhat negligible effect on risk
21 estimates. And medium significance is in between. It
22 is not quite orders of magnitude, but it is not
23 negligible either.

24 These ratings do take into account
25 uncertainty. For example, if there is a potentially

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1 significant consequence; yet, there is significant
2 uncertainty in the likelihood, we tend to leave that
3 as a high until we can generate additional information
4 to reduce some of the uncertainty and the likelihood,
5 which then may bring that down to a medium or to a
6 low. That is how uncertainty is reflected. This is
7 discussed in the report for each insight.

8 I would like to now present several
9 examples of system-level insights and detailed risk
10 insights from the report. The first system-level risk
11 insight relates to radionuclide inventory. Stated
12 here, we specify the potential risk from repository
13 during post-closure -- and this is for the groundwater
14 pathway dominated by relative few radionuclides:
15 Americium-241, plutonium-240, 239, americium-243, less
16 the contribution to U-234, and neptunium-237. This is
17 show in the following slide.

18 The information in this table is drawn
19 from the NRC's TPA code. The table shows most of the
20 key radionuclides included in performance assessment
21 calculations and their half-lives in the first two
22 columns.

23 The third column shows the distribution of
24 the inventory at 1,000 years based on activity. The
25 third column here shows that most of the contribution

1 to activity after 1,000 years is dominated by
2 relatively few radionuclides, those generally at the
3 top.

4 The fourth column shows the distribution
5 of the inventory again, but this time it is weighted
6 by the dose conversion factors in the TPA code which
7 are based on the dose conversion factors in federal
8 guidance report 11. What this does is this, rather
9 than just basing it on activity, it takes into account
10 potential risk, relative risk, of these radionuclides.

11 As we see here, when we factor in this
12 potential risk, there is little change at the top.
13 The top four radionuclides stayed pretty much the
14 same. But as we move down, the potential risk
15 significance of the other radionuclides generally
16 decreases, the exceptions being to some extent U-234
17 and neptunium-237. What this tells us is that the
18 potential risk during post-closure period would be
19 dominated by this smaller subset of radionuclides.

20 When we look at total system performance
21 assessment results, we can use this table. And we can
22 ask ourselves, "Why don't we see a contribution to the
23 dose and to the risk from these radionuclides?" We
24 ask ourselves, "What is happening in the system that
25 is contributing to the waste isolation and reducing

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1 the risk from these radionuclides?"

2 Next slide, please. This leads to our
3 second system-level risk insight relating to potential
4 effectiveness of the repository system to isolate
5 waste and, thus, reduce the risks from these most
6 significant radionuclides.

7 Again, this is the staff's perspective
8 based on our perspective. We think that the features
9 of a repository system will significantly release and
10 transport of the radionuclides, both by delaying the
11 time to release from the system and also by limiting
12 the rate of release from the system.

13 This insight is shown quantitatively on
14 the next slide. This table again shows the
15 radionuclides that make up most of the inventory at
16 1,000 years across the top. This table also shows the
17 components of the system that may contribute to either
18 delaying the release of radionuclides from the system
19 or limiting the rate of radionuclide release from the
20 system.

21 The entries in this table, although they
22 are depicted here somewhat qualitatively, are based on
23 staff's performance assessment results. There is
24 quantitative information to back up what we see in
25 this table.

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1 In this table, the D's are used to
2 indicate a delay in the release. And the L's indicate
3 a limiting of the release. The number of the D's and
4 the L's from none to one, two, or three denote the
5 order of magnitude effectiveness of the delay or the
6 limit.

7 For example, the first row shows that for
8 all radionuclides, the engineered waste package is
9 expected to significantly delay the onset of release
10 of the radionuclides from the waste form into the
11 geosphere. Subsequently, the transport of those
12 radionuclides through the natural barriers. The delay
13 is expected to be significant, on the order of
14 magnitude of tens of thousands of years, for all
15 radionuclides.

16 The next several rows show that the
17 characters of the waste form, radionuclide solubility
18 limits, and the limited availability of water are
19 expected to limit the rate of release of radionuclides
20 from the engineered barriers to the geosphere.

21 In this case, the effectiveness is
22 radionuclide-specific and is greater, orders of
23 magnitude greater, for some radionuclides than for
24 others. That is shown by having no effect on limiting
25 for some radionuclides in some columns and orders of

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1 magnitude greater effect on limiting releases for
2 other radionuclides.

3 Finally, the last two rows describe the
4 effectiveness of the natural barriers in delaying the
5 transport of radionuclides through the geosphere to
6 the receptor location. Again, in this case, it is
7 radionuclide-specific.

8 What we can take away from this table is
9 looking down a column for any radionuclide, one can
10 see the expected effectiveness of the system
11 components from isolating that particular radionuclide
12 from the receptor. This goes back to our previous
13 table, where those radionuclides where we would expect
14 to see have a potentially significant contribution to
15 risk, how the system will effectively work to isolate
16 those radionuclides.

17 Again, the information in this table is
18 drawn from quantitative results from risk assessments.
19 In addition to these system-level risk insights, the
20 staff has developed a number of supporting detailed
21 risk insights related to specific features, events,
22 and processes of the post-closure system, essentially
23 to provide additional depth to what we just saw in the
24 system-level insights.

25 The staff has developed almost 40 of these

1 detailed risk insights. They are based on
2 quantitative risk assessments. And, as I stated, they
3 are organized around the ISI structure.

4 These risk insights are currently under
5 review. The entire report is currently under review.
6 However, I will provide a listing of those specific
7 insights as backup slides. And I will provide three
8 examples on the following slides.

9 The first example addresses effect of the
10 passive film of waste package performance. Stated
11 here, a passive film of waste package services is
12 expected to result in slow corrosion rates. It is a
13 favorable condition.

14 High temperatures and aggressive water
15 chemistries do have potentially detrimental effect on
16 the solubility to do passive film. And it could
17 result in lowering of the corrosion rate or increasing
18 the corrosion rate by orders of magnitude.

19 We have sensitivity analyses to indicate
20 that with assuming a loss of passive film on 25
21 percent of the waste packages, that calculated doses
22 could increase by several orders of magnitude,
23 approximately .01 millirem per year to almost 1
24 millirem per year. Again, this is assuming a loss of
25 passive film on 25 percent of the waste packages.

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1 However, that focuses on the consequence.
2 However, with respect to likelihood, there is
3 significant uncertainty regarding the likelihood of
4 whether or not such conditions could exist.

5 In this case, the scenario the staff has
6 identified warrants additional analyses to reduce that
7 uncertainty. However, given what our analysis
8 indicates, this is an example of something that the
9 staff would rate as having high significance.

10 I should note here that what you are
11 seeing in this slide is a very distilled version of
12 the risk insight. The report provides much greater
13 detail and, as I said, provides references to even
14 greater detail still. What we are seeing here is a
15 very succinct summary of the information supporting
16 our insight.

17 The second example addresses the
18 significance of waste form degradation rate. Waste
19 form dissolution is affected by temperature, presence
20 of oxygen, and in-package water chemistry modeled in
21 the TPA code by four different models: Model 1, Model
22 2, Model 3, and the show-pipe model.

23 Among the four alternative TPA models for
24 spent fuel dissolution, the analysis indicates a
25 correlation between a release rate from the waste form

1 and dose, as we would expect. TPA analysis depending
2 on the model selected, dose can vary over two orders
3 of magnitude from the low of .001 millirem per year to
4 one with .1 millirem per year depending on the model
5 selected. Again, these are orders of magnitude.

6 Base case model is model 2. Assuming a
7 TPA dissolution model 1, which results in a greater
8 use than the base case model, assuming TPA model 1,
9 this increases the waste form release rates by two
10 orders of magnitude. However, the peak dose is
11 expected to increase only by a factor of approximately
12 2.5 from roughly .02 millirem to .05 millirem.

13 So while there is a significant effect of
14 the dissolution rate on the potential dose, the change
15 from the base case to the higher release rate model is
16 only a factor of 2.5.

17 CHAIRMAN GARRICK: Jim, when you make
18 assumptions about these various models, do you attempt
19 to assign any kind of likelihood as to the different
20 models?

21 MR. DANNA: Well, what we like to see here
22 is that we have focused this analysis on consequence.
23 Given the consequence, we have a handle on the
24 consequence. That helps us gauge how much emphasis we
25 should focus on likelihood.

1 We could evaluate the likelihood of, let's
2 say, model 1 versus model 2. However, the consequence
3 would indicate that the impact on risk may not be that
4 significant, whether it is model 1 or model 2.

5 So there is some discussion of likelihood,
6 but we also factor in the focus on likelihood or our
7 resources expended on likelihood to the range and
8 potential consequences.

9 CHAIRMAN GARRICK: Okay. Thank you.

10 MR. DANNA: Along that line, this is an
11 example of something that we would rate as having
12 medium significance. It is not orders of magnitude
13 effect on a risk estimate, but there is some level of
14 effect. So it is an area we would be interested in
15 looking at further.

16 A third example is related to juvenile
17 failures of the waste package. Juvenile failures are
18 early failures, generally result from manufacturing
19 defects or other waste package flaws. Failures are
20 expected to occur early in the waste package lifetime.

21 While such failures are expected, we do
22 expect them to be limited to a small fraction of the
23 waste package. And our analysis indicates they are
24 not expected to have a significant effect on overall
25 repository performance or risk.

1 In addition, this is something that can be
2 somewhat controlled relative to other aspects of the
3 system. Quality assurance procedures, for instance,
4 or waste package fabrication characterization
5 handling, these types of procedures should reduce the
6 likelihood of significant defects and, therefore, the
7 likelihood for juvenile failures.

8 In respect to the consequence, our
9 analysis indicates that assuming a limited number of
10 juvenile failures, 44 on average, peak doses are on
11 the order of .021 millirem per year. So given that
12 the likelihood is low and somewhat controlled and the
13 consequence is low, this is something that we would
14 rate as low significance.

15 So what I have done here is I have
16 provided three examples. One example is an example of
17 something we would rate as high. The second example
18 is something we would rate as medium. This example is
19 something that we would rate at a low significance,
20 again all related to risk and all supported by
21 quantitative risk information.

22 I would like to move now to a discussion
23 of the application of the risk insight baseline,
24 basically questions of why do we do this. As I stated
25 earlier, the idea is to provide the staff with a

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1 reference base, a consistent approach to
2 risk-informing its activities, and a consistent tool
3 for the staff to use among the staff in risk-informing
4 those activities.

5 I will provide several examples here of
6 how we are currently using this risk information,
7 these risk insights, how we will likely use them, and
8 then I will move into a discussion of how we might
9 move the information during the review of a license
10 application.

11 The first example is application of the
12 risk insights to issue resolution. As you know, the
13 staff is currently reviewing DOE's technical basis
14 documents and agreement submittals. Reviewing
15 agreements was, as I said, the starting point for the
16 risk insights initiative. As you will see, we have
17 developed the risk insights baseline. Now we have
18 circled around, and we are applying what we will have
19 learned, what we have to review in those agreements.

20 In conducting its review of the technical
21 base documents and the agreements, the risk insights
22 are used by the staff to ask, again, "What is
23 important? Why do we need this information? How does
24 it affect risk?" It also allows us to ask, "How much
25 do we need to know?" We look at the uncertainties.

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1 We look at the potential effect, potential risk
2 significance and ask, "Do we know enough or do we need
3 more?"

4 Greg Hatchett, whose presentation follows
5 mine this morning, will discuss that process, the
6 process of using risk information in the review of
7 agreement submittals in additional detail.

8 Staff is also currently updating their
9 integrated resolution status report. And in that
10 report, there is a discussion of the relative
11 importance to risk for all the different key technical
12 issues. Staff is pulling that information from this
13 risk insights baseline. This risk insights baseline
14 document provides the basis for that perspective in
15 that report.

16 Risk insights are also being factored in
17 the development of the inspection program in two ways.
18 First, risk insights will help the staff focus on
19 particular areas of inspection that are most
20 risk-significant. In addition, the staff will use the
21 risk insights to help judge the significance of its
22 findings.

23 Finally, I think you have seen a
24 presentation on this before. The staff will
25 incorporate risk insights into the development of a

1 performance confirmation program. Again, focusing
2 performance confirmation on the more risk-significant
3 aspects of the system and the depth of the
4 confirmation were based on the relative risk
5 significance of those components.

6 As I mentioned, the staff expects to use
7 the risk insights baseline in its review of the
8 license application assuming one is submitted for
9 repository activity level by DOE.

10 Risk insights baseline report can be
11 considered part of a license application review tool
12 kit that the NRC has for its use. This includes the
13 Yucca Mountain plan and the integrated issue
14 resolution status report. These three documents
15 together will help the staff, assist the staff in its
16 review of the license application.

17 In reviewing the license application, the
18 staff expects to use risk information to focus its
19 review. While we will review all aspects of the
20 license application, risk insights will assist in
21 determining the depth of NRC's review in each
22 particular area. The depth of review will be key to
23 the risk significance of those particular areas, as
24 described in the risk insights.

25 Risk insights will also be used to assist

1 the development of the staff's request for additional
2 information from DOE. This approach supports our
3 basic review philosophy. We ask ourselves reviewing
4 the license application, "What is significant? Why is
5 it important? What is significant with respect to
6 risk?" We also ask, "What controls the significance?
7 How is that particular feature, event, or process
8 affected?" Then we ask, "What are the relevant
9 details that we need to know to judge that
10 significance?" Risk insights help support this
11 review.

12 As I stated earlier, our review will be
13 based on the information that DOE submits in a license
14 application and other available information that we
15 have at the time. What the risk insights based on the
16 report do is they provide the staff with an
17 independent look, an independent way of thinking at
18 what this DOE is providing to us. We use our own
19 insights to ask ourselves, "What DOE is submitting to
20 us, does it make sense? Is this what we expect to
21 see? Where do we agree, but also where do we
22 disagree? And if we disagree, why do we disagree?
23 What areas should we focus in on?" That is the
24 benefit of having this independent system-level
25 perspective on risk significance.

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1 Finally, the next steps, as I stated, risk
2 insights baseline report, final report, is currently
3 under review, final review. Staff expects that once
4 that review is completed, the risk insights baseline
5 report will be publicly available.

6 That is not the end, though. As you know,
7 risk information will continue to become available
8 throughout this process. For example, the staff, the
9 NRC, and the center are currently involved in
10 conducting additional focused risk assessment
11 activities to address particular uncertainties in our
12 understanding.

13 It is assumed that through these risk
14 activities, we will generate additional risk
15 information that will be used to address and hopefully
16 reduce some of these uncertainties. And then we will
17 have to go back and look at our risk insights to see
18 if they still make sense or if they need to be
19 changed. Those risk assessments are ongoing.

20 In addition, as you would expect, newer
21 information continues to become available from DOE as
22 it submits pre-licensing documents in response to
23 agreements, technical basis documents.

24 Based on this information, the staff plans
25 to update the risk insights baseline once more prior

1 to receiving a license application from DOE. What we
2 want to do is go into reviewing a license application
3 with an up-to-date perspective on our understanding of
4 the risk significance of the components of the system.
5 Additionally, as I mentioned, the staff plans to
6 expand the risk insights baseline to include the
7 pre-closure repository system.

8 That concludes my presentation this
9 morning on the status of the risk insights initiative.
10 And at this time, I would be happy to take questions.

11 CHAIRMAN GARRICK: Okay. Thank you very
12 much. An excellent presentation.

13 Yes, I am sure we have a few questions.

14 MEMBER HORNBERGER: Thanks, Jim.

15 Do you have any estimate on the timing for
16 the completion of the review of the report?

17 MR. DANNA: I am sure everyone would
18 caution me against estimating.

19 MEMBER HORNBERGER: I am sure they would.

20 MR. DANNA: Monday would be nice. Let's
21 say weeks. It is currently in the concurrence
22 process.

23 MEMBER HORNBERGER: Yes. My real question
24 was whether it was weeks or months or next year.

25 MR. DANNA: I would hope it is weeks.

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1 MEMBER HORNBERGER: Okay. Also, I think
2 your slide had July of 2003, when you briefed us on
3 your ranking of the agreements.

4 MR. DANNA: Right.

5 MEMBER HORNBERGER: Again, I know our next
6 presentation talks about the agreements. My question
7 to you is, as you went through completion of your
8 baseline report, did any of your assessments of the
9 rankings on those agreements change?

10 MR. DANNA: Well, I would say yes. In
11 fact, some of the insights changed. Based on the
12 additional we had and taking another look, we did
13 refine our insights. And some of the rankings did
14 change. Actually, there is still some discussion on
15 some of those particular risk insights.

16 Relative to the agreements, we didn't go
17 through the arduous task of risk ranking each and
18 every agreement, but what we are doing is in the
19 process of reviewing the agreement submittals, the
20 bundle agreements.

21 We look at those agreements. We are
22 ranking from last June, from the SRM. We look at our
23 current risk insights document. We ask ourselves, "Is
24 this still what we think? Does it still make sense?"

25 We are not bound to those ranking. We do

1 factor in additional information. So it is not a one
2 to one, but there are subtle changes. We evaluate
3 each on a case-by-case basis.

4 MEMBER HORNBERGER: My real question is,
5 the baseline report is actually already being used --

6 MR. DANNA: Yes, yes.

7 MEMBER HORNBERGER: -- in some of the ways
8 that you mentioned?

9 MR. DANNA: That is right. Well, we need
10 to use it. We couldn't wait until it was final. So
11 the staff, having developed it, is using it along the
12 way.

13 MEMBER HORNBERGER: Good. Thanks.

14 CHAIRMAN GARRICK: Ruth?

15 MEMBER WEINER: First, I would like to
16 commend you because you already answered the first
17 question I usually ask, which is "Why would you have
18 done things differently if you hadn't been
19 risk-informed?" You did an excellent job of that.

20 My question is very short. On your slide
21 14, you say you weighted the percent of inventory by
22 dose conversion factor. And I was just wondering
23 which dose conversion factor: ingestion, inhalation?

24 MR. DANNA: Ingestion. These are the dose
25 conversion factors in the TPA code.

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1 MEMBER WEINER: Right.

2 MR. DANNA: In fact, I think you --

3 MEMBER WEINER: They are the ingestion
4 dose?

5 MR. DANNA: That's right. And those are
6 based on ingestion dose --

7 MEMBER WEINER: Drinking water basically?

8 MR. DANNA: That's right.

9 MEMBER WEINER: Okay. Thanks.

10 The other question is on slide 16. Could
11 you explain to me how uranium-234 has different
12 solubility limits, very different solubility limits,
13 from uranium-238?

14 MR. DANNA: I could attempt to answer, but
15 I will defer to Tim. He could probably give you a
16 more definitive answer.

17 MR. McCARTIN: Yes. That's not saying
18 there were different solubility limits. It is saying
19 the effectiveness of the waste form release or the
20 solubility. And part of the effectiveness of
21 solubility is based on the extent of the inventory, et
22 cetera. So it is not just a --

23 MEMBER WEINER: So you're basically
24 talking about mass release, if you will, that you have
25 a whole lot more uranium. Am I understanding this

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1 correctly? Do you have a whole lot more U-238 than
2 you have U-234? So in any dissolution, there is going
3 to be relatively more U-238 dissolved? Am I
4 interpreting that correctly, Tim, or not?

5 MR. McCARTIN: No. there certainly is
6 more mass. There are a lot less curies. And so for
7 a given mass release, there are a lot less curies.
8 And so U-238 in terms of its solubility, will it be
9 effective in limiting the dose for U-238, yes. For
10 U-234, you get the same amount of mass.

11 Well, in terms of mass release, you are
12 correct. It is a very similar amount of mass, but the
13 curie amount is much higher. And so the solubility
14 isn't as effective. That is all that this is trying
15 to do.

16 MEMBER WEINER: So you have taken both the
17 mass percent and the activity percent and done --

18 VICE-CHAIRMAN RYAN: Among isotopes within
19 an element, it is specific activity that drives it.

20 MR. McCARTIN: Yes. But this is looking
21 at just on a radionuclide-specific basis.

22 MEMBER WEINER: Okay.

23 CHAIRMAN GARRICK: Jim Clarke?

24 DR. CLARKE: I would just like to
25 compliment you as well. I thought that was a terrific

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1 presentation. And it strikes me that you are
2 developing a tool that is going to be very useful, not
3 only here but I can think of a lot of other places
4 where I wish they were doing this.

5 If you could pull up slide 14, the table
6 "Radionuclide Inventory"? A couple of days ago or
7 maybe yesterday or maybe several days ago, we heard a
8 presentation on research. And I think we were struck
9 by the absence of a particular radionuclide. And
10 there it is right at the --

11 CHAIRMAN GARRICK: Yes. I was pleased to
12 see it.

13 DR. CLARKE: I just wanted to make that
14 observation.

15 CHAIRMAN GARRICK: Yes, yes.

16 DR. CLARKE: Thanks again.

17 CHAIRMAN GARRICK: I have a couple
18 questions. I wanted to know, are you interacting with
19 DOE in a way that they understand how you are going to
20 use the risk insights initiative in the review of
21 their license application? Do they kind of know what
22 is coming and how this tool is actually going to be
23 applied?

24 MR. DANNA: Yes. As a matter of fact,
25 several weeks ago, there was a technical exchange

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1 regarding the -- I think it was the focus from the
2 depths of the information submitted.

3 Tim McCartin gave a presentation some of
4 these slides were pulled from, mainly, for instance,
5 this slide. Tim explained our approach on how we
6 would use this type of information to, as I said in
7 some of the following slides, focus our review of
8 system developing request for additional information.
9 A lot of that information pulled into this
10 presentation. So many of the parts of this DOE heard
11 a technical exchange several weeks ago.

12 CHAIRMAN GARRICK: Is this having, to your
13 knowledge, any influence on how they are presenting
14 their analyses?

15 MR. DANNA: Well, I can't speak for DOE.
16 My impression from that technical exchange comments
17 received was that the presentation was well-received.
18 And it helped to enlighten DOE on NRC's approach of
19 what they might expect.

20 CHAIRMAN GARRICK: One of the things that
21 you kept referring to was, of course, the importance
22 of certainty being a fundamental part of your
23 analyses. We didn't see a great deal of specific
24 examples of how you are handling uncertainty and how
25 you are handling the different components of the

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1 uncertainties, such as the information, uncertainty
2 versus modeling uncertainty, or if you would refer
3 aleatory uncertainty versus epistemic uncertainty.
4 Would you care to comment about how you are doing
5 that?

6 MR. DANNA: Sure. An example of model
7 uncertainty would be that in the TPA code, we have
8 several alternative models for waste form dissolution.
9 Given that model uncertainty, we look at the potential
10 effect of that uncertainty by looking at what the
11 range of the effect on dose could be. That helps us
12 to evaluate, given the small uncertainty, how much of
13 a difference does it really make?

14 Additionally, the first example I provided
15 discussed the consequence. It was mainly focused on
16 the consequence of the passive film if it were to
17 fail. It acknowledged, however, that it was great
18 uncertainty with respect to the likelihood.

19 Now, the likelihood of evaluating the
20 potential failures is difficult, that uncertainty.
21 But we have additional analyses that we are conducting
22 that will focus in on refining or reducing that
23 uncertainty. We will then factor that back into this
24 estimate.

25 There are other examples in the report

1 regarding some of the areas we once considered to be
2 of high significance for reducing uncertainties. So
3 they might have moved on to the either medium or low
4 significance.

5 CHAIRMAN GARRICK: One of the things we
6 talked a good deal about in our working group session
7 was the difference between what one might call
8 compliance risk assessment and what one might call
9 safety risk assessment, compliance taking into account
10 that some of the safety analysis requirements are
11 highly prescribed, particularly the biosphere.

12 Are you looking at this somewhat from both
13 perspectives? That is to say, are you looking at the
14 analysis from the standpoint of what the evidence can
15 support versus what the evidence can support plus the
16 constraints that are inherent in the regulations?

17 Is some circles, some people make the
18 distinction between compliance risk assessment and
19 safety risk assessment. The question is partly why
20 you are doing this in the context of the regulations.
21 Are you also doing it somewhat in the context of the
22 boundary conditions that are not a part of the
23 regulations but more based on the fundamental
24 information?

25 MR. DANNA: I will try to answer to see if

1 I understand the question. Our goal through our
2 analysis, through developing the risk insights
3 baseline was to develop an understanding of the
4 repository system, how it works, somewhat independent
5 of compliance.

6 Now, given that, as we move into the
7 question of what is important, I think that actually
8 gets more to the compliance issue.

9 CHAIRMAN GARRICK: Right.

10 MR. DANNA: The level of understanding
11 that we would have if compliance were an issue,
12 obviously we would like to continue toward
13 understanding the way the system works to a greater
14 and greater extent.

15 However, when we step back from a
16 regulatory perspective, how much do we need to know
17 with respect to compliance? That is why when we are
18 saying, "Let's focus on what is important, what's not
19 important," part of that is what is important to risk
20 and ultimately a compliance demonstration.

21 Does that speak to your --

22 CHAIRMAN GARRICK: That is helpful. I
23 think that what we are really talking about is
24 sometimes the compliance requirements mask reality.
25 And the essence of the question is, what are you doing

1 to unmask the impact of the assumptions that are
2 inherent in the regulatory process?

3 Now, this is not so much in what you
4 presented here because you sort of stopped at the
5 geosphere and didn't talk much about that part of the
6 performance assessment that is much more prescribed
7 than other parts, namely the biosphere, but it is
8 something of an issue in the risk community of drawing
9 a distinction between what the risk is based on what
10 can be supported by the state of the knowledge versus
11 the risk that is tampered with, so to speak, by
12 assumptions that are a direct result of the
13 regulations.

14 I was just trying to get an idea if you
15 were aware of that and if there was any kind of side
16 calculation activity going on that would look at those
17 issues, either separate or at least to give you some
18 additional insight on the answer to the question of,
19 what do you really expect to happen?

20 MR. DANNA: I think Tim looks at --

21 MR. McCARTIN: Yes. Tim McCartin, NRC
22 staff.

23 Let me give you an example I think related
24 to the biosphere. All of our calculations are
25 typically done within the regulations. And along the

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1 biosphere, as an example, the reasonably maximally
2 exposed individual is specified to have mean
3 characteristics for lifestyle, diet, et cetera.

4 For, let's say, the volcanism scenario,
5 where inhalation of dust is a significant aspect of
6 the risk calculation, what we do look at is in
7 determining that mean behavior, what is the important
8 aspect of determining the mean behavior is that the
9 time spent outdoors, highly disruptive activities,
10 inside, et cetera.

11 And so we are looking at variation of that
12 across the U.S. in addition to relative to the surveys
13 DOE has conducted as we are trying to understand, "How
14 important is it to get the time sleeping versus the
15 time outdoors?"; et cetera.

16 So it is all within the confines of
17 determining the mean lifestyle but trying to
18 understand what part of that mean lifestyle is more
19 pertinent. We are doing those kinds of evaluations to
20 determine what part is most significant for the
21 calculation.

22 CHAIRMAN GARRICK: Well, the thought here
23 is not to get nitpicky and worry about whether it is
24 one and a half liters per day that the person drinks
25 or two liters. But whether or not there are some

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1 major effects, -- and they could go either way -- that
2 should be looked at.

3 Maybe my final question, this is a very
4 valuable effort in our judgment, I think. One of the
5 issues that is always before us is, how do we package
6 this in such a way that the public knows how you are
7 doing it, what you are doing, and that you can get
8 some benefit from it? Is there any effort being made
9 to cast the risk insights, products if you wish, in a
10 form that maybe is more reader-friendly, more suitable
11 for public consumption than often risk results are?

12 MR. DANNA: When the initiative began, the
13 idea was to have a concise prescriptive. And, as you
14 can imagine, over the past few years, it has grown.
15 Now it is no longer concise.

16 The report does include an executive
17 summary. We attempted to write in plain English. It
18 takes the 100 pages of the report and presents it in
19 a way of saying, "These are the high areas. These are
20 the medium, and these are the low."

21 I think that communicating the technical
22 details; for instance, persistence of the passive
23 film, in order to communicate a greater understanding
24 requires some depth of technical knowledge.

25 As I said, I think the executive summary

1 of the report gets a part of that. It may be that as
2 we apply it as questions are raised, we address those
3 comments.

4 I am not sure what the vehicle would be,
5 though, to distill it.

6 CHAIRMAN GARRICK: It is something you
7 might want to think about because one of the biggest
8 issues facing these kinds of projects is the context
9 and perspective. The one tool that you have that is
10 attempting to provide perspective and context and some
11 sort of road map of importance ranking and what have
12 you is the risk insights effort.

13 It just seems to me that from the
14 standpoint of providing assurance that issues are
15 being addressed, number one; and, number two, here is
16 how that issue enters into the grand scheme of things,
17 that the opportunity exists here to make a very
18 valuable contribution for outreaching to the public as
19 to what this is all about.

20 MR. DANNA: In fact, I will make a point
21 of that to think about how we roll out this plan, not
22 just among our staff and the DOE but also the public.

23 CHAIRMAN GARRICK: Very good.

24 MR. LESLIE: Jim, this is Bret Leslie from
25 the NRC staff. I want to add a little something on

1 that. After, in fact, Tim's presentation to DOE was
2 so well-received, they requested us to put it onto the
3 Web site.

4 In addition, when Tim came back, he came
5 to the team and said, "Here is our initial attempt,
6 this table with the D's and L's. What other ways can
7 we better explain to the people around us?"

8 And so the outreach team has taken the
9 challenge from Tim and the risk insights initiative to
10 try to come up with ways of better explaining. So we
11 are aware that we need to do it. This is a valuable
12 set of information for technically skilled people, but
13 how do we translate that again to the broader public?
14 At least we are going to try to start to work on that
15 and provide that in our publicly available Web site.

16 Maybe Tim wants to add something.

17 CHAIRMAN GARRICK: Well, the thought here
18 is not to get nitpicky and worry about whether it is
19 one and a half liters per day that the person drinks
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7 set of information for the technically skilled people,
8 but how do we translate that again to the broader
9 public? At least we are going to try to start to work
10 on that and provide that in our publicly available Web
11 site.

12 Maybe Tim wants to add something.

13 MR. McCARTIN: Yes. Thanks, Bret. That
14 is very nice.

15 CHAIRMAN GARRICK: Shall we have a medals
16 ceremony now or later?

17 MR. McCARTIN: I need to buy some lunches
18 for some people here.

19 Along those lines, that table with the D's
20 and the L's was a way to in a quick snapshot give
21 people a sense of what is working. The next step is
22 certainly why. We have had suggestions to that.
23 Certainly that doesn't factor in uncertainty. We need
24 to do a way to have uncertainty in that table. We are
25 working on that.

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1 Also, there are possible scenarios that
2 you could look at to add to that scenario. Okay. If
3 this occurs, how does this table change? There are a
4 variety of things that we think we can make easier to
5 understand by a broad range of people, including the
6 staff. No one wants to read through a 100-page
7 report. There should be an easier way to get the big
8 picture.

9 And so we are working on that. As Bret
10 said, the outreach team is looking at it. And we
11 certainly hope to in future meetings be able to
12 present more of these ideas. And we welcome any
13 comments the Committee may have.

14 One thing, Mike has his hand raised.
15 Absolutely we do want to add something with respect to
16 the dosimetry and health effects onto that table to
17 give people also an understanding. And that is
18 certainly radionuclide-specific. Like I said, it
19 continues to evolve. I would like to think we
20 continue to get better.

21 VICE-CHAIRMAN RYAN: Tim, you read my mind
22 in part but only in part. Could you put up 16? Maybe
23 we could have the table while we talk about it a bit.

24 And, Jim, let me endorse the comment on
25 your presentation. It really is very thorough and

1 informative and well-done. It is a pleasure to see
2 it.

3 It strikes me on the left side where you
4 have the safety functions and important features, that
5 those are global and top-level. Are you drilling down
6 to get something to build up to this thing with?

7 And I think it speaks to the communication
8 issue that you raised, John, that it is probably five
9 or six or two or three. There is some number of
10 things under each one of these two columns, really,
11 where the extraction is to create the influence of
12 this table.

13 So if that road map can be organized and
14 described, I think you are doing two things. One is
15 you are making it transparent from how you are
16 thinking and what you did to what might help in the
17 communication part.

18 We didn't see all of the tables that built
19 this up, but how does it work?

20 MR. McCARTIN: Well, there weren't any
21 other tables that built it up. There were analyses
22 that built it up.

23 VICE-CHAIRMAN RYAN: Well, analyses. Yes.
24 I understand. Sorry for the wrong term.

25 MR. McCARTIN: Well, no. That is a very

1 good suggestion in terms of you are right. This is
2 very high-level. And that is exactly what we are
3 looking at now: ways to sort of peel back the onion
4 and look at the inside parts of this and give a better
5 sense.

6 VICE-CHAIRMAN RYAN: I would say release
7 just to pick on one.

8 MR. McCARTIN: Sure.

9 VICE-CHAIRMAN RYAN: I mean, there is a
10 whole bunch of stuff that goes into the onset of
11 release. So maybe there are a whole bunch of tables
12 like this that actually get the titles --

13 MR. McCARTIN: Right. In possibly
14 different conditions, if this condition occurs, what
15 happens? Once again, to me I think we get most
16 benefit from the Committee when we come early on.
17 This was done with mean values. Mean values are
18 helpful. Clearly there is a lot more to the story
19 than mean values.

20 I think that is a very useful suggestion.
21 We do want to build this up to give the sense of, like
22 we said, the range of uncertainties, the different
23 processes, different assumptions. And we will
24 continue to strive.

25 You are right. Maybe we will see a

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1 presentation where we have a series of tables. At the
2 end, you have this that you will understand how that
3 was derived.

4 VICE-CHAIRMAN RYAN: Thank you.

5 CHAIRMAN GARRICK: All right. Any other
6 questions from the staff?

7 MR. CAMPBELL: I was going to add
8 something here, John.

9 CHAIRMAN GARRICK: Yes?

10 MR. CAMPBELL: Yes. I am Andy Campbell.
11 I am Chief of the Performance Assessment Section for
12 the NRC. Thank you.

13 In addition to the activities in terms of
14 the analyses and the supporting information, Jim has
15 talked about some of how we are integrating
16 performance assessment into essentially the entire
17 high-level waste program, inspections, review of
18 agreements, and the KTI resolution process, which Greg
19 Hatchett is going to talk about into the area of
20 reviewing DOE's performance confirmation program.

21 All of those I think also contribute to
22 our ability to communicate among ourselves, with the
23 Department of Energy, with a wide variety of
24 stakeholders. And I think that integration component
25 is really also an important aspect of being able to

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1 communicate risk insights, not just that we have done
2 this and it sits on a shelf, but it really becomes an
3 integral part of our whole approach.

4 As we review the license application, risk
5 insights will be used in conjunction with YMRP. Our
6 understanding is in the integrated resolution status
7 report to help the staff performance review.

8 CHAIRMAN GARRICK: Okay. Mike? Mike Lee?

9 MR. LEE: While we have slide 16 up there,
10 it strikes me that DOE takes a lot of credit for the
11 unsaturated sound. And if you are using this tool to,
12 in effect, review their compliance demonstrations,
13 shouldn't you have a line above "onset of release" to
14 evaluate the performance of the vetas? I mean, if you
15 don't get water contact in the waste packages, which
16 is I think part of DOE's argument, you don't get a
17 release. How would you address something like that?

18 MR. DANNA: That is probably true. I am
19 thinking we do take into account limiting the water,
20 but --

21 MR. LEE: I mean, this represents your
22 interpretation of the system, but you are going to use
23 this interpretation to review what DOE is doing. And
24 DOE takes credit.

25 MR. DANNA: Looking at the contribution of

1 the saturated zone part to release from the engineered
2 barriers, we have that covered with respect to the
3 waste package. I think what Dr. Ryan was saying, that
4 is factored in in that it would show up in that
5 additional detail.

6 How would the conditions of the
7 unsaturated zone above the waste package affect it?
8 It would be expanded if we expanded on those deeds.

9 MR. McCARTIN: But also the release rate,
10 that is where you would see it at a third, where
11 limited water, solubilities limits coupled with the
12 fact that you have limited water. That is basically
13 the vetas still involved is part of that. Once again,
14 this is one way to look at it.

15 We certainly are also in our effort, what
16 I said at the DEC exchange. It is going to get more
17 and more true. I am a big supporter of our PA
18 results, but it is the Department of Energy's
19 performance assessment that we are more interested in.

20 And we are transitioned to doing more with
21 respect to their results. We will do these same kinds
22 of tables to help us understand what DOE's TSPA is
23 doing. And so it may have a slightly different table.

24 MR. LEE: Right.

25 MR. McCARTIN: Our only desire is to make

1 this as flexible and as understandable as we can to
2 various audiences.

3 MR. LEE: Well, that's why Dr. Ryan's
4 comment might be pretty important to consider, that
5 there is additional detail in there that is not
6 readily apparent if observers look at this table based
7 on their understanding of what the department is
8 doing.

9 MR. DANNA: Right. And I think this gets
10 to Tim's comment in his presentation, the technical
11 exchange, the questions of not just what is
12 significant but also why is it significant, what
13 drives that significance and delving deeper into the
14 significance of the waste package. We just have to
15 pull out the significance of the contribution of the
16 effect on unsaturated zones.

17 MR. LEE: Last question real quickly is
18 slide 27, you spoke to doing additional analyses. I
19 presume these are like other auxiliary performance
20 assessment analyses that you have underway. Is there
21 any way you can describe that in ten words or less?

22 MR. DANNA: Sure. Rather than doing a
23 full-blown repeat of IPAA, integrated performance
24 assessment analyses, what we chose to do at this time
25 was a series of very focused analyses. I think there

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1 are 20 or 24 in total. Many of these are focused
2 specifically on reducing uncertainties with respect to
3 these risk insights.

4 When those are completed, in fact, there
5 is a correlation between those risk analyses,
6 individual risk analyses, and the risk insights. And
7 they will be folded in there. I think the schedule
8 for that is July time frame. And they will be folded
9 into the revisions.

10 MR. LEE: It is something that the
11 Committee may want to consider being brought up to
12 speed on at some later date. Particularly you are
13 presuming it is going to have an impact or either
14 positive or negative on the things you have concluded
15 in your report.

16 MR. DANNA: It should. It should. In
17 fact, that is part of the reason for doing that, to
18 refine our understanding, our knowledge as it
19 currently exists.

20 MR. LEE: Okay. Thanks.

21 CHAIRMAN GARRICK: Okay. I think we want
22 to end this. Jim, we want to thank you for an
23 excellent presentation. We especially want to thank
24 you for complying with the rule of allowing us some
25 time for questions.

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1 MR. DANNA: Again, I want to emphasize
2 that the risk insights initiative has been a team
3 effort, NRC staff and the center, the last couple of
4 years and acknowledge the contributions to all of the
5 staff. Thank you.

6 CHAIRMAN GARRICK: We are going to take a
7 15-minute break. Thank you.

8 (Whereupon, the foregoing matter went off
9 the record at 9:58 a.m. and went back on
10 the record at 10:18 a.m.)

11 CHAIRMAN GARRICK: If we can come to order
12 now? We are going to now hear from Greg Hatchett on
13 the issue resolution issue. I think we will jump
14 right into it. We have a couple of committee members
15 who will be leaving about 11:15. So we would like to
16 get the presentation and questions in as much as
17 possible by then.

18 Go ahead, Greg.

19 23) REPORT ON KTI STATUS AND DWM EVALUATION OF
20 DOE'S BUNDLING APPROACH

21 MR. HATCHETT: As Dr. Garrick said, I am
22 Greg Hatchett. I am a senior project manager in the
23 high-level waste program for issue resolution. I am
24 just going to sort of give you an update of where we
25 are with this resolution in the current staff's

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1 activities.

2 I know you just heard from Jim Danna
3 talking about the baseline of risk insights. The
4 story I will tell is the baseline report was actually
5 published out in a June memo back in 2003. We get a
6 letter in June, about the 23rd, from DOE about how
7 they were changing their schedule to address key
8 technical issue agreements.

9 This concept of bundling came up. Jim
10 Danna and I flew out to Las Vegas to get a look at
11 what they were doing early on before the staff would
12 actually get its first technical bases documents, what
13 they called him. Jim and I took a late flight back.
14 I think we landed around 2:00 a.m. in the morning.
15 But during the whole flight back, Jim and I talked
16 about how we were going to review these technical
17 bases documents.

18 Jim looked over at me, and he said, "Well,
19 you know, here is my input. Here are my thoughts."
20 And then he kind of winked his eye at me. And then he
21 says, "But it is your job to figure out the process."
22 He sort of just left me there. So it is one of those
23 things that he developed the risk insights, but then
24 he said, "Greg, you figure out the process for
25 reviewing the agreements and these bundles."

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1 CHAIRMAN GARRICK: Sounds fair.

2 MR. HATCHETT: I want to review the status
3 of the key technical issues, agreements, and the
4 current activities, and, in particular, again, discuss
5 the technical bases documents that DOE submitted to
6 the staff, and little bit about the process for the
7 review. And I will say something about the integrated
8 issue resolution status report.

9 To date, the staff has concluded review on
10 90 agreements. There are 75 that have been currently
11 received in review, and there are 78 that are in
12 process. What I will say about this in-process thing
13 is, as you have heard before, we have these different
14 categories of completed; needing additional
15 information; partly received; and, of course, did not
16 receive, as shown here at 80.

17 The 48 here just reflects the ones that we
18 need additional information on or the ones that were
19 partly received. By the way, anything that is
20 received and then reviewed on its in-process line
21 here, really, all of these are in some stage of
22 processing. Ninety have been completed. And 80 we
23 haven't received any response from DOE to date.

24 Next slide. This slide represents a
25 breakdown according to the breakdown of risk insights

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1 on the June memo back in 2003, the memo to the
2 Commission.

3 So what I have here is those that have
4 been completed that reflect high, medium, and low
5 significance to performance, those that are of high
6 significance that are currently under review, medium,
7 and low, in process, and not received in the totals
8 all give you the 293.

9 This slide is a DOE presentation,
10 actually, that was given last week at the QA
11 management meeting. This is DOE's memo to us, really,
12 back in November 2003, where they changed the schedule
13 yet again from the June memo of 2003.

14 I started to show you what it looked like
15 from our database, but I felt like that might be too
16 confusing because I am trying to look at when they
17 told us they were going to give it to us and when we
18 actually got it. It wouldn't make much sense.

19 What is interesting to note here is that
20 this is January. And they were scheduled to submit
21 three agreements to us in January. We haven't
22 received them yet.

23 In conversations, doing biweekly telephone
24 calls with DOE, the 16 that are supposed to be coming
25 in March, it looks like they may not be coming at all

1 either. So DOE continues to have schedule challenges,
2 and we continue to try to basically get access to
3 information so we can continue this licensing process
4 and get information as early as possible, despite the
5 delays that may be occurring.

6 Even the three that were supposed to be
7 submitted in January, we haven't received. Here we
8 are in February. And we are talking March next week.
9 So, again, the only thing I will point out is we
10 haven't received the January submittals. They weren't
11 submitted in February, and it looks like March is in
12 jeopardy as well.

13 If you go back and look at past
14 performance here, while they didn't achieve what they
15 expected at one point, they overachieved at another.
16 They are still having schedule challenges. Again, our
17 only interest is to make sure that we get access to
18 information. And some of that comes in the form of us
19 going out to the OR's office and looking at work in
20 process prior to their sending it to us.

21 The staff is currently reviewing the
22 integrated or bundled KTI agreement responses. And,
23 again, this is part of the DOE's schedule change for
24 June 2003.

25 One of the things this does is the

1 technical bases documents cover the 14 post-closure
2 component processes. It is kind of a good thing for
3 both the staff and for DOE in that it begins to
4 integrate these KTI agreements in the sense that in
5 the past, we were reviewing these things individually.

6 It doesn't really give you a very broad
7 perspective of what is going on. And so getting these
8 technical bases documents allows us to work together
9 in a more integrated fashion than we had before, but
10 it also gives us an early look at what DOE's safety
11 analysis might include because they have always stated
12 that these technical bases documents are first in a
13 evolution of what the safety analysis report may look
14 like regarding post-closure performance.

15 Here listed are just the technical bases
16 documents that we have received to date, ones like
17 water seeping in the drift, waste package and
18 dripature corrosion, and a bacillar transport in
19 volcanic events.

20 Just listed here for your information are
21 a number of agreements that were responded to in these
22 documents. What the star indicates is we have this
23 one agreement called GEN, or general.

24 GEN basically is a number of comments
25 associated with many or different KTI agreements. And

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1 in this process, when I first got here, sometimes we
2 would double-count this thing. So when a GEN comment
3 comes in, it is really 17 agreements that were in TBD
4 number 5, TB doc number 5. But I take the 17 off
5 because, really, it shows up in 3 and 5, et cetera, et
6 cetera. I don't want to double-count that thing. It
7 is just that the GEN item, KTI agreement will always
8 be partially received until we receive all responses
9 and close them all. So that is the reason for that
10 footnote there.

11 I want to talk now about the review
12 process that we use to review the technical bases
13 documents. One fundamental issue up here is that we
14 had a program. At one point we were receiving
15 information from DOE directly. And then we were
16 handling information two or three times, trying to get
17 things interested in document control desk
18 appropriately.

19 Now we have everything going to the
20 document control desk. Instead of tracking
21 information according to agreements, it is now tracked
22 according to responses because we have already had the
23 agreements. We know what they are. We have 293 of
24 them.

25 So now we are waiting for DOE to provide

1 a response to any one or several of different
2 agreements. And so now it is tracked by a session
3 number and a response.

4 So there is a response that comes in to
5 us. And we receive it. And there is a response that
6 goes out from us and status and the responses
7 associated with agreements that were included in that
8 response.

9 So what we do is we distribute those
10 documents to the various staff, both here at the NRC
11 and the Center for Nuclear Waste Regulatory Analyses.
12 And we make preparation for the actual review of the
13 document.

14 Down here, again, we make assignments,
15 both internally here at NRC and down at the center as
16 a joint review. One of the things we do in this
17 process is since the YMRP is a relatively untested
18 document and the agreements were developed before the
19 completion of the YMRP, one of the things we go
20 through is we say, "Listen, here is what the agreement
21 says. If we go into the YMRP, look at the review
22 methods, can we align our agreement with a particular
23 review method within the YMRP?" It gives the staff an
24 opportunity now to start using the YMRP before we
25 receive a license application.

1 The other thing that we do is we look at
2 the responses in this initial review period and say,
3 "Well, gee, did they actually meet the mark?" It is
4 a cursory review to prepare the staff for the next
5 part of the process, where we get together and talk
6 about it.

7 The other thing that occurs down here that
8 isn't necessarily listed down here is that the
9 performance assessment staff in preparation for this
10 meeting prepares its understanding of those agreements
11 for the staff consideration during its review.

12 So, again, we are integrating across the
13 disciplines. And we are also integrating the
14 performance assessment review in a way that we have
15 never done before. It is not to say that the
16 integration wasn't occurring before, but because of
17 the technical bases documents, we are actually
18 planning for the integration, making sure the
19 integration occurs using the YMRP and also using the
20 performance assessment insights, which are derived
21 from the baseline of risk insights.

22 Let me go to the next slide. Again, after
23 all of that up-front work is done, the review team
24 gets together. One of the things we do is we first
25 discuss the technical bases documents in the context

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1 of the post-closure performance. So back on one of
2 the other slides you saw, you saw the technical basis
3 document on water seeping in the drift.

4 We want to first look at what DOE is
5 saying about water seeping in the drift more broadly.
6 It gives us a wide view of what is going on with water
7 seeping in the drift, instead of looking at the
8 agreements first and foremost, because at some point,
9 this is what we may see in the license application.

10 And to the extent that our agreements are
11 relevant to that area, we want to understand that and
12 get responses to that from DOE and see if they can
13 satisfy those agreements.

14 We also want to know, what is DOE doing?
15 How has the program evolved from the static
16 development of these agreements back in '99, 2000,
17 2001? I mean, we are talking 2004 now. Has anything
18 changed? Do we still believe our agreement is
19 relevant based on what we see the direction is in this
20 thing? And then we apply the risk insights to that as
21 well.

22 We want to do that. Then we basically put
23 together some meeting minutes, assessment summary, and
24 some action items. The team goes out and does its
25 detailed review. What is interesting here is because

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1 there are multiple agreements, before we were just
2 getting a response that might have one or two
3 agreements in it. We would just take those agreements
4 and say, "Well, you are the KTI lead for this area.
5 You are the KTI lead for that area. You go decide
6 whether or not that is acceptable or not."

7 With these technical bases documents, we
8 are looking at things more broadly. We are looking at
9 the risk insights. We are looking at performance.
10 And we are saying to ourselves, "In the context using
11 a technical basis document as a backdrop, how have
12 they answered and responded to these agreements? How
13 does risk information get incorporated into our
14 thinking in terms of what is adequate at this
15 particular stage in the process?"

16 What we find is that, hey, some of these
17 agreements we believe adequately address. So we end
18 up doing partial responses, if you will: one where we
19 have additional information on some agreements and
20 others where we believe they satisfied it.

21 And so then we communicate with DOE either
22 asking for additional information or we forward the
23 response back in. We have completed it. So it starts
24 that whole loop again. And that is where it gets a
25 different status or it stays at the same status

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1 depending on where the agreement is in the process.

2 But, again, we are integrating risk
3 insights. And we are using the YMRP. And we are
4 asking ourselves, "What is the relevance of the
5 agreement based on when it was constructed and how the
6 program has evolved to date?"

7 Next slide. On December 23rd, we
8 forwarded a letter to DOE regarding the first set of
9 technical bases documents that we had received. The
10 technical bases documents provide -- and everyone on
11 the staff agrees with this -- a very good overview in
12 some sense of that technical area, that component of
13 the post-closure performance.

14 Again, it is a road map. And we always
15 want to see the underlying justification or bases for
16 their conclusions, which aren't always apparent in
17 these technical bases documents. So we looked at the
18 areas that they had referenced in the technical bases
19 documents. In our letter of December 23rd, we simply
20 asked for those references, believing that those
21 references provided the underlying bases for their
22 positions or for their conclusions.

23 Unknown to us, they were preparing to send
24 us a letter on the same date, saying, "Here is how we
25 are going to give you access to these references." We

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1 took a look at that letter, and we had a conversation
2 with DOE. They subsequently sent another letter back
3 out on January 30th, saying, "Okay. By the way, here
4 are the 50 or so odd references you asked for. Here
5 is a schedule we are going to give you for when you
6 can get those references. And they are still coming
7 in to date."

8 To date, we have complete references for
9 the biosphere documents on their Web site. And we are
10 still waiting for the references on the other
11 technical bases documents that we have, some of them
12 for the technical basis document number 8, which is on
13 colloids.

14 With respect to that, I will say something
15 specifically about technical basis document number 12,
16 which is the bacillar transport. Of the seven
17 agreements that were bundled or integrated together,
18 we sent out a response closing five of those seven.
19 The other two were on igneous activity. And we are
20 currently putting a schedule together to review that.
21 Then we have all of the references.

22 One of the things that we are doing is we
23 are revising NUREG-1762, which is the integrated issue
24 resolution status report. And it is being revised to
25 reflect the status of the program since F.Y. 2001. So

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1 the information in the existing report is old
2 information.

3 Of course, this predates also the baseline
4 of risk insights. So we want to to the extent we can
5 risk-inform the IIRSR. We will also document the
6 status of issue resolution agreements and where we
7 stand with that in the document. We anticipate
8 completing this action in September of this calendar
9 year.

10 In summary, the staff is risk-informing
11 the issue resolution process. We also use it to
12 further refine the nature of the information gaps as
13 we understand them in the update to the integrated
14 issue resolution status report.

15 We are monitoring the agreements. And, as
16 I said before, back on the other slide, it shows the
17 DOE schedule. One of the things we are doing is we
18 are trying to get early exposure, despite the schedule
19 challenges that DOE faces, by going out to the OR's
20 office and trying to look at these documents, the work
21 in process, and get a feel for what is covered and try
22 to get an understanding of what is going on in the
23 program.

24 More recently, DOE is creating a satellite
25 office up Rockville Pike, at the Twinbrook location,

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1 that would serve the same purpose as the OR's office.
2 We can go in and review work in process. What that
3 does is as we deal with getting prepared to review a
4 license application and still have the need to do
5 pre-licensing, we are operating in parallel universes
6 here.

7 We are trying to get ourselves ready to do
8 a license application review. We are trying to
9 continue on with pre-licensing interaction. Schedules
10 are getting tight. And we are reviewing a massive
11 number of agreement submittals. And flying back to
12 forth to Las Vegas becomes time and
13 resource-intensive.

14 So the idea of the satellite office will
15 help to alleviate some of those pressures by providing
16 a brisk walk up the street and a review of those
17 documents. And then the staff can determine the
18 nature and extent of their interactions based on being
19 able to get information early. And I would say it is
20 somewhat collocated in a way in terms of being on
21 Rockville Pike. So it is close to get to. And,
22 again, it prevents that resource and time-intensive
23 process that we recently have been engaged in.

24 Again, DOE stated that it did intend to
25 meet its schedule for submission of the agreements.

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1 But, as I indicated before on an earlier slide, they
2 continue to have schedule challenges. All it does is
3 builds up the number of agreements that the staff will
4 have under its review, again, as we move to get ready
5 for a license review and move into a licensing
6 framework and DOE freezes its LA for management review
7 in June.

8 If you go back and look at the schedule
9 slide and you can just tell, get a feel for the nature
10 of interactions. While we are going to be continuing
11 to engage in pre-licensing, they are going to be more
12 focused on preparing that license application and
13 getting it submitted.

14 So, again, we are operating in parallel
15 universes the need to continue pre-licensing and the
16 need to move to a licensing mind-set framework looking
17 at the YMRP and using it in our review and
18 incorporating the baseline of risk insights into what
19 we do. It is just going to be an interesting time.

20 I am trying to be sensitive to other
21 people needing to leave. Hopefully I left enough time
22 for it.

23 CHAIRMAN GARRICK: Thank you. Thank you
24 very much. You certainly did.

25 George, any questions?

1 MEMBER HORNBERGER: Greg, thanks. That
2 was pretty clear.

3 I just have a couple of things that you
4 can probably clarify for me pretty easily. When I
5 look at your agreement status and you have 90
6 completed, does complete mean that all of the issues
7 are closed?

8 MR. HATCHETT: Well, as we stated,
9 complete means the staff has no further questions at
10 this time.

11 MEMBER HORNBERGER: I understand the
12 nuances of closed, but no further questions at this
13 time. They're not open anymore, right?

14 MR. HATCHETT: They're not open anymore.

15 MEMBER HORNBERGER: Okay. You have, then,
16 75 received and in review. I will tie this with a
17 question related to the DOE schedule you showed. So
18 you have 75 reviewed and received and in review. Can
19 you give me sort of a gut level feeling on your part
20 as to your timing for moving them to the end of your
21 flow charts?

22 MR. HATCHETT: Well, I mean, I can tell
23 you that part of the problem we are dealing with has
24 to do with two issues. It deals with adequate
25 justification for satisfying the agreement where the

1 staff has no more concerns and would like to close
2 them and the issue of quality.

3 I break quality into three categories.
4 There is this transparency. There is traceability.
5 And there is completeness. My observation in working
6 with the staff has been the issue of quality and
7 adequate justification, there is a fine line between
8 them.

9 And so we are dealing a lot with trying to
10 clarify whether it is adequate or not or it is just a
11 fact that it is just not complete and it is not
12 traceable. We don't understand how they got to their
13 conclusion.

14 So it is really one of those things where
15 it is a wait and see game. I mean, I believe that DOE
16 may have done the work, but it is clear to me that
17 they have not explained to us in some of these
18 documents how their conclusions are adequately
19 supported. So it is a wait and see game.

20 I can't give you any definite time. All
21 I can tell you is this. Our only interest right now
22 is to see where they are going to with the program,
23 what they are doing getting early exposure to that
24 information so the staff can have a better
25 understanding of what we may get in a potential

1 license application.

2 So to the extent that we close agreements,
3 we are going to continue to engage in that process,
4 but we are not going to obsess over it, if you
5 understand what I mean.

6 MEMBER HORNBERGER: Yes. Actually, I
7 wasn't even questioning getting to closing the issues,
8 but getting these things at least out of your pipeline
9 and the portions that have to go back to DOE back to
10 DOE and the portions that get closed closed. I am
11 just trying to get a sense of the pressures on your
12 staff.

13 MR. HATCHETT: We are still waiting for
14 additional information on those other documents. So,
15 again, they have a schedule for taking this out to
16 March, when all of those references would be in. So
17 if you go back and look at the DOE schedule, which is
18 on slide number 5, we have got 75 under review, which
19 stem from the October through December submittal.

20 And we are still waiting for documentation
21 on five of those TBDs, which are in our December 23rd
22 letter. This is the number here. And we are still
23 waiting to get information to complete our review back
24 here.

25 So no. The mountain is building. And if

1 they freeze their LA, they review in June. So you can
2 draw your own conclusion. Again, we engage in
3 pre-licensing. We still need to understand and then
4 get ourselves ready for a licensing review.

5 MEMBER HORNBERGER: I think I do
6 appreciate the difficulty you are facing. I am just
7 trying to, again, as you say, get a bit of a grasp on
8 the problems you face.

9 So let me make now a rash assumption. The
10 rash assumption is that, regardless of the timing
11 across this coming summer, let's say that by
12 September, you actually do get all of those technical
13 basis documents in. What does your time frame look
14 like to have your staff review them?

15 MR. HATCHETT: King, would you like to?

16 MR. STABLEIN: This is King Stablein with
17 the NRC. I work with Greg on this issue resolution
18 area.

19 Clearly, as we get closer to license
20 application time, it becomes more and more difficult
21 to do a complete review in terms of closure of the
22 agreements. To the extent that we can, we will. We
23 have a number of other initiatives ongoing ready for
24 the license application review also.

25 If the agreements cannot be closed by the

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1 staff prior to license application, we will be looking
2 at that material in the license application, where
3 possibly DOE will have provided all of the information
4 needed.

5 I don't know if that helps, but I think
6 what you are getting to is the point that we are just
7 not going to have time to completely address all of
8 these agreements and certify them closed prior to
9 license application.

10 MEMBER HORNBERGER: Carol has a comment.

11 MS. HAMMOND: Carol Hammond, Department of
12 Energy. I just want to add a little bit to what Greg
13 is saying.

14 Some of the references he is talking about
15 for the first set of documents that were submitted
16 this fall, I think there were seven of them. I know
17 Greg is referring to references that we are making
18 available. He is referring to final references
19 because the references that Greg is referring to were
20 submitted in draft as we were finalizing them.

21 The letter of the 23rd of December that
22 Greg is referring to asked us to submit final
23 references because the NRC was unable to make
24 conclusions based on the draft references. And so we
25 have submitted in some cases the finals for those, but

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1 all of the final documents, the final references are
2 basically available. That was the follow-on letter
3 that Greg referred to that we submitted the schedule
4 for, those final references, most of which are
5 available.

6 So that is for the schedule that Greg
7 referred to. But the staff I do think has the draft
8 references that will allow them to do a lot of their
9 work. So I just wanted to clarify that.

10 MR. HATCHETT: DOE gives us access to the
11 draft references. In sticking to our policy of
12 openness and trying to have the public have confidence
13 in what we do, we can't make conclusions on those
14 documents because they are not publicly available.

15 So let me clarify that. Until they become
16 publicly available, while we may have reviewed some of
17 that documentation at the OR's office and believe that
18 the documentation satisfies agreement even, we can't
19 close it because the document is not complete. It is
20 not available to the public. Therefore, we don't
21 close the agreement, despite what we think about that
22 after having reviewed it.

23 MEMBER HORNBERGER: Ruth? Mike

24 VICE-CHAIRMAN RYAN: If you could just
25 back up to the previous slide? I had the same

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1 questions George has asked, but I did them a little
2 bit more numerically.

3 If I just take the high-risk category,
4 you're a little less than ten percent complete. I
5 know that is not a fair assessment. I want to ask my
6 question in a second. And then, of course, overall
7 half of the high-risk you haven't received yet. That
8 is maybe not fair. And I want you to maybe help me
9 understand exactly how much is not fair.

10 By not having roughly half of it, does
11 that mean you have half the work to do? The hard one
12 is the ones you haven't received or just some sense of
13 --

14 MR. HATCHETT: I mean, if I go back to Jim
15 Danna's earlier presentation, these risk insights are
16 how the staff sees the repository, the staff's
17 understanding of the repository.

18 DOE while they are aware of our ranking of
19 certain agreements are doing their work despite NRC's
20 ranking or significant specification of those
21 individual agreements.

22 Last week in our QA management meeting,
23 Joe Ziegler with the Office of Repository Development
24 presented a slide that says, "Here is how we are
25 different from the NRC."

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1 What is interesting about that is he made
2 a comment. He said, "Well, the reason why, for
3 instance, the saturated zone is of high significance
4 to NRC but not of significance to us or not as high a
5 significance to us is because we don't believe we have
6 enough data to support that conclusion for us.
7 Therefore, we rely more on the unsaturated zone."

8 So he made it very clear. He talked about
9 differences. But, again, those differences may not be
10 that fundamental in terms of when they deliver their
11 safety case.

12 VICE-CHAIRMAN RYAN: I bring this up
13 because I want to caution myself and others to think
14 about this in terms of the detail you are providing,
15 rather than just playing with this numerically and
16 thinking about percent complete.

17 What you are saying is that is really not
18 a fair assessment. I think that is helpful that
19 people realize that so they don't misjudge them. You
20 said the mountain was building. We don't want to
21 misjudge.

22 MR. HATCHETT: Yes. I think what we can
23 take away from this is just what King said. I mean,
24 while DOE may submit responses on all agreements prior
25 to the license application being submitted, it doesn't

1 mean that this staff here will have reviewed it in
2 disposition.

3 VICE-CHAIRMAN RYAN: Right. As I
4 understand it -- correct me if I am wrong or expand it
5 if you need to -- the first step is the completeness
6 of the application decision. That will kind of factor
7 into where you are in closing these things out or
8 reviewing the application itself or both or how does
9 that work exactly?

10 Again, what I am trying to think about is
11 you don't want people to say, "Well, if these aren't
12 all closed, that means the application is incomplete."
13 I mean, that doesn't make sense to me, but I just want
14 you to maybe expand on that notion a bit.

15 MR. STABLEIN: We will be doing, of
16 course, an acceptance review.

17 VICE-CHAIRMAN RYAN: Yes.

18 MR. STABLEIN: And that acceptance review
19 will be based on what is required in part 63. And we
20 have some guidance in the Yucca Mountain plan. These
21 agreements will factor into how we look at the
22 information provided. These are not our criteria for
23 determining whether it is acceptable or not.

24 VICE-CHAIRMAN RYAN: Thanks. Again, I
25 just want to at least clarify in my own mind that

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1 point, make sure others don't misjudge this as a
2 completeness kind of thing standing alone by itself.

3 CHAIRMAN GARRICK: Okay. Go to slide 9,
4 unpaginated slide 9. At the bottom there, you say you
5 align the agreements with the review areas of the
6 Yucca Mountain review plan, et cetera, et cetera. Is
7 that alignment or aggregation in accordance with the
8 abstractions of the Yucca Mountain review plan?

9 MR. HATCHETT: To the extent they apply,
10 yes. Sometimes it is even in scenario analysis as
11 well. One of the things we talked to the staff about
12 is, "If I am reviewing this agreement and I am using
13 YMRP, which review method would the agreement be
14 reviewed under?" Sometimes it falls under multiple
15 review method areas. And then we go back and ask the
16 staff. If you had to review it primarily for one,
17 which one would it be? That is kind of how we do it.

18 CHAIRMAN GARRICK: So DOE has their
19 bundling approach, and you have your bundling
20 approach. Was there any thought given to requesting
21 DOE to bundle theirs on the same basis?

22 MR. HATCHETT: What we talked about when
23 we went out there in September to look at these
24 documents was DOE sort of felt like the nature of the
25 KTIAs, key technical issue agreements, could fall

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1 under any number of the 14 components of the
2 repository.

3 CHAIRMAN GARRICK: Right.

4 MR. HATCHETT: So they made a judgment
5 call to say this group of agreements we are going to
6 address in this technical basis document, and this
7 group of agreements we are going to address in that
8 one. But it could have gone either way. And so they
9 made a choice to decide where they would try to
10 respond to that.

11 CHAIRMAN GARRICK: I see. But I think it
12 is a good idea to do it by the extraction models if
13 you can do it as they are defined in the Yucca
14 Mountain review plan.

15 Can you give us a sense of the magnitude
16 of these responses? And do they vary much between
17 your categorization of high, medium, and low? In
18 other words, if you get a response of a risk item, how
19 does that documentation compare with the low or does
20 it depend so much on what the nature of the agreement
21 is that it doesn't --

22 MR. HATCHETT: I will give the response in
23 this sense.

24 CHAIRMAN GARRICK: Are we getting --

25 MR. HATCHETT: Let me explain it this way.

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1 With respect to how the repository is supposed to
2 perform in DOE's eyes, he simply says -- colloids, for
3 instance. That is technical basis document number 8
4 that is listed there in the slides. We believe it may
5 not be a significant contributor to performance.

6 And so they make conclusionary statements
7 or the document is thematic in the sense that they
8 also believe it may not be a significant contributor
9 to performance. What is lacking is the baseline of
10 information necessary to support that thematic
11 argument.

12 And the document is very small. But when
13 will receive technical basis document number 5, which
14 is in the empirical environment, it was two and a half
15 sizes at the time. So if that is any indication of
16 how they are giving us technical information to
17 support an area that is significant in terms of
18 performance versus one that they believe is not that
19 significant in terms of performance, the level of
20 detail in the documentation in an area that they
21 believe is significant increases to about two times.

22 CHAIRMAN GARRICK: Yes. What I was trying
23 to get a handle on is whether the importance of the
24 issue based on a risk insights perspective was lining
25 up in any way with the amount of documentation that

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1 you are getting.

2 MR. HATCHETT: To the extent that they
3 agree with us, yes, it does. They give us more
4 information for high-risk ones, higher significant
5 ones, than they do for ones that they believe --

6 CHAIRMAN GARRICK: Which brings us back to
7 the fact that the 18 remaining high-risk ones could
8 really introduce quite a bit of uncertainty about your
9 schedule.

10 MR. HATCHETT: I will take that as a fair
11 assumption.

12 CHAIRMAN GARRICK: All right. Very good.
13 Jim?

14 DR. CLARKE: Just one question to clarify.
15 If I understand what you said, you are ranking them
16 and they are ranking them. So both of you have a
17 high, medium, and low significance on these
18 agreements?

19 MR. HATCHETT: No. We definitely want to
20 speak to this, but they had a risk prioritization
21 report they submitted back to us back in -- I don't
22 know. I forget the actual date of the report. That
23 is the report that they are using to do their sort of
24 risk significance, which is not the same way we are
25 doing ours.

1 DR. CLARKE: Okay. I was wondering if you
2 were running into significant differences.

3 MR. HATCHETT: Again, at the QA management
4 meeting, Joe Ziegler gave a brief explanation of some
5 of the areas in terms of how they are different from
6 us in terms of our level of significance in terms of
7 performance.

8 DR. CLARKE: For example, if they thought
9 something was of low significance and you didn't
10 necessarily agree, then there would be reason for you
11 to want more documentation when it is low
12 significance.

13 MR. HATCHETT: Or had they adequately
14 justified why it is of lower significance. Then the
15 staff would have to make that judgment in its review.

16 MEMBER HORNBERGER: Yes, Mike Lee?

17 MR. LEE: One thing this Committee has
18 been asked with some regularity by the Commission is
19 "How is KTI issue resolution proceeding?" In your
20 discussion of slide 3, you noted that the devil is in
21 the details. The transparency, the traceability, and
22 the completeness issues really have to be evaluated on
23 an individual basis of the staff to reach a judgment
24 as to how well DOE has complied with the information
25 request.

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1 I guess in some respects, you could argue
2 from the staff's perspective that by laying out the
3 questions for DOE in the context of these 293
4 agreements, you are on record as to the information
5 that you need. DOE is on record that they are going
6 to address each of them by the time of license
7 application submittal.

8 Is it fair to say that you are really not
9 going to have a sense for the type of information you
10 are going to have until all of the agreements are
11 satisfied? I mean, is this a question where the sum
12 is rated in the whole?

13 MR. HATCHETT: I guess what I would say to
14 that -- and this may or may not address the question
15 that you are raising -- is that from my perspective
16 only -- and I don't know how many people on the staff
17 share this with me, but DOE is doing something.

18 First of all, this is a one-of-a-kind
19 project We early on were proceeding along the lines
20 of KTI agreements in what I will call semi-silo, each
21 KTI lead looking at their individual area. But at the
22 end of the day, it is a system that performs as a
23 unit.

24 As you begin to look at it performing as
25 a unit, the department now has to try to integrate its

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1 look and pour on the various disciplines to make all
2 of that work and at the same time as they integrate
3 it, create a regulatory document, which I think is a
4 very different thing than sitting there and trying to
5 integrate your work to meet or to demonstrate
6 compliance. And so, again, I think the quality issue
7 that breaks down into traceability, transparency, and
8 completeness is somewhat plaguing them as they try to
9 do both activities and meet their 12/04 proposed
10 deadline.

11 So, I mean, again, the devil is in the
12 details. I think it is an overwhelming task that they
13 are trying to undertake. My hat is off to them. But,
14 again, they are the ones that have to do the
15 compliance demonstration at the end of the day.

16 CHAIRMAN GARRICK: Any other questions?

17 MR. COLEMAN: Yes. Neil Coleman, ACNW
18 staff.

19 Greg, about the low significance
20 agreements, there are 160 altogether. Thirty-four
21 haven't been received. I just wondered if the staff
22 have looked at the risk insights to determine if
23 responses from DOE would be needed for all of those
24 34.

25 MR. HATCHETT: Giving the party line, we

1 are waiting for responses on all of the agreements,
2 despite their risk significance. I mean, we are
3 engaged in this process to the end. Now, we just have
4 determined that one has more significance than the
5 other. I mean, the only answer I can give to you is
6 that we are still waiting to receive all of them.

7 Tim?

8 MR. MCCARTIN: I guess there was never an
9 implication when we ranked these that low meant zero.
10 We felt all of the agreements were information that we
11 needed. Certainly the level of detail is impacted,
12 but we felt that information was needed.

13 We did not put forward agreements for
14 information we felt we did not need, but it is fair to
15 say not all of the information has the same impact.
16 That is why it was ranked.

17 MR. HATCHETT: Every licensing activity
18 has a baseline of information that is fundamentally
19 needed to make a decision, despite the degree of
20 significance. I mean, absent that, the staff has a
21 hard time making a decision. It is just that
22 underlying information that girds that safety argument
23 that a potential applicant could make.

24 CHAIRMAN GARRICK: All right. Any other
25 questions?

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(No response.)

CHAIRMAN GARRICK: Thank you very much, Greg. We will look forward to a report later on.

Okay. This ends the formal briefing session of our Committee meeting. From this point on, we will not need to have a record. So we will take just a two or three-minute break while that transition takes place and come back. And the Committee will consider its reports.

(Whereupon, at 11:00 a.m., the foregoing matter was adjourned.)

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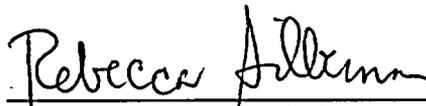
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148th Meeting

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Status of the HLW Risk Insights Initiative

**148th Meeting of the
Advisory Committee on Nuclear Waste
February 27, 2004**

**James Danna
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1



Outline

- **Risk Insights Initiative**
- **Risk Insights Baseline Report**
- **Application of the Risk Insights Baseline**
- **Next Steps**

2



Risk Insights Initiative

- **Ongoing effort to increase the use of risk information in the NRC HLW regulatory program**
- **Compilation and synthesis of risk information to better support risk-informed prelicensing activities, LA review, and other regulatory activities and decision-making**

3



Risk Insights Initiative

- **Risk insights**
 - **Identify important parameters, models, and assumptions**
 - **Consider uncertainties**
 - **Provide an “informed” and focused approach for NRC’s review**
 - **Indicate areas where more information is needed**

4



Risk Insights Initiative

- Began in early 2002
- Preliminary results reported to ACNW in April 2002
- Began to develop Risk Insights Baseline in late 2002
- Response to Commission SRM in June 2003
- Reported status to ACNW in July 2003

5



Risk Insights Initiative

- **Terminology adopted from White Paper on Risk-Informed, Performance Based Regulation**
 - **Risk Triplet:** What could happen, how likely is it, and what are the consequences?
 - **Risk Assessment:** Systematic method for addressing the risk triplet as it relates to the performance of a particular system, to understand likely outcomes, sensitivities, areas of importance, system interactions and areas of uncertainty
 - **Risk Insights:** The results and findings that come from risk assessments

6



Risk Insights Initiative

- **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**

7



Risk Insights Baseline Report

- **Documents the results of the Risk Insights Initiative**
- **Provides integrated, system-level basis for supporting risk-informed HLW activities**
- **Promotes consistency in risk-informed activities and decision-making among staff**
- **Enhances understanding of risk significance of system features, events, and processes**

8



Risk Insights Baseline Report

- Risk insights based on performance assessment results, subsystem analyses, and auxiliary calculations
- Report currently focused on postclosure repository system performance
- Staff has begun to develop the risk insights for the preclosure system

9



Risk Insights Baseline Report

- System-level insights and detailed risk insights
- Supported by quantitative risk information, uncertainties, and areas for additional analysis
- References provided to detailed risk analyses
- Organized around Integrated Sub-Issue (ISI) structure
- Baseline includes rating of significance of the insights (i.e., significance to waste isolation)

10



Rating Risk Significance

- **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**

11



Rating Risk Significance

- **High Significance**
 - **Potential for significant effect on risk estimate**
- **Medium significance**
 - **Some effect on the risk estimate**
- **Low significance**
 - **Little effect on the risk estimate**

12



System-Level Risk Insights

- **Radionuclide Inventory:** Potential risk from repository during postclosure is dominated by relatively few radionuclides
 - Mostly from Am-241, Pu-240, Pu-239 and Am-243
 - Lesser contribution from U-234 and Np-237

13



Radionuclide Inventory

Nuclide	Half-Life (yrs)	Percent of Inventory at 1,000 yrs (by activity)	Percent of Inventory at 1,000 yrs (by activity - weighted by DCF)
Am 241	430	54%	56%
Pu 240	6,500	25%	25%
Pu 239	24,000	18%	18%
Am 243	7,400	1.2%	1.2%
Tc 99	210,000	0.7%	0.0003%
U 234	240,000	0.1%	0.01%
C 14	5,700	0.07%	0.00005%
Np 237	2,100,000	0.06%	0.08%
Cs 135	2,300,000	0.03%	0.00007%
U 238	4,500,000,000	0.02%	0.001%
I 129	16,000,000	0.002%	0.0002%
Th 230	77,000	0.001%	0.0002%

14



System-Level Risk Insights

- **Effectiveness of Waste Isolation Functions:**
Features of the repository system are expected to limit release and transport of radionuclides by
 - Delaying the time to release from the system
 - Limiting the rate of release from the system

15



Effectiveness of Waste Isolation Functions

[D=delay time; L=lowering of release rate; More letters denotes increased effectiveness]

Safety Functions	Important Features	Radionuclides in the Ground-Water Pathway											
		Am 241	Pu 240	Pu 239	Am 243	Tc 99	U 234	C 14	Np 237	Cs 135	U 238	I 129	Th 230
Onset of Release	Waste Package	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD
Release Rate From Engineered Barriers	Waste Form					LL		LLL		LL	L	L	LL
	Solubility Limits									LLL			L
	Solubility Limits; Limited Water		L	L	L		L		L		LLL		LL
Transport in Geosphere	Transport in Fractures	DDD	DD	DD	DD	D	D	D	D	DDD	D	D	DD
	Transport in Porous Media	DDD	DDD	DDD	DDD	D	DDD	D	DDD	DDD	DDD	D	DDD

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Detailed Risk Insights

- System-level risk insights supported by almost 40 detailed risk insights
- Based on quantitative risk assessments
- Organized by ISIs
- Currently under review
- Listing provided as backup slides
- 3 examples follow

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Risk Insight Example: Passive film on waste packages

- A passive film on waste package surfaces is expected to result in slow corrosion rates. High temperatures and aggressive water chemistry have a potentially detrimental effect on the stability of the passive film and could accelerated corrosion.
- TPA sensitivity analyses indicate that assuming loss of passive film on 25% of waste packages increases the calculated dose by several orders of magnitude, from approximately 0.01 mrem/yr to almost 1 mrem/yr.
- The likelihood of conditions that could result in widespread loss of passive film is uncertain, and warrants further investigation

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Risk Insight Example: Waste form degradation rate

- Waste form dissolution rate is affected by temperature, presence of oxygen, and in-package water chemistry. The time required to release radionuclides from the waste form could range from hundreds to hundreds of thousands of years.
- Among the 4 alternative TPA models for spent-fuel dissolution, analyses indicate a correlation between release rate and dose. TPA analyses indicate that dose varies over 2 orders of magnitude, from 0.001 mrem/yr to almost 0.1 mrem/yr, depending on the dissolution model assumed.
- Assuming TPA dissolution Model 1, instead of the TPA base case Model 2, increases waste form release rates by 2 orders of magnitude. However, peak expected dose only increases by a factor of approximately 2.5, from approximately 0.02 mrem/yr to 0.05 mrem/yr.

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Risk Insight Example: Juvenile failure of waste packages

- Manufacturing defects and other waste package flaws are expected to result in early waste package failures.
- Such failures are expected to be limited to a small fraction of the waste packages, and are not expected to have a significant effect on overall repository performance.
- Quality assurance procedures for waste-package fabrication, characterization, handling and emplacement should reduce the likelihood of significant defects and, therefore, juvenile failures.
- TPA analysis assuming limited juvenile failures (44 failures on average) results in a peak dose of 0.021 mrem/yr.

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Application of the Risk Insights Baseline

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Risk Insights Baseline: Application during Pre-licensing

- **Issue Resolution - Review of DOE's Technical Basis Documents and agreement submittals**
- **Incorporation into the Integrated Issue Resolution Status Report**
- **Development of NRC's inspection program**
- **Development of the performance confirmation program**

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Risk Insights Baseline: Application in LA Review

- **Risk Insights Baseline Report is part of NRC's license application "toolkit" to support staff's review of potential license application:**
 - **Yucca Mountain Review Plan**
 - **Integrated Issue Resolution Status Report**
 - **Risk Insights Baseline Report**

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Risk Insights Baseline: Application in LA Review

- **Risk information will be used to:**
 - **Focus review**
 - **Assist determination of depth of NRC review**
 - **Assist development of requests for additional information**
- **Supports basic review philosophy:**
 - **What is significant?**
 - **What controls the significance?**
 - **What are the relevant details?**
- **Risk Insights Baseline Report will contribute to staff's independent thinking, regarding the risk significance of technical issues**

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Next Steps

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Next Steps

- **Risk Insights Baseline Report currently under review**
- **Staff expects that the Risk Insights Baseline Report will be publicly available**

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Next Steps

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

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Backup: Detailed Risk Insights

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Detailed Risk Insights

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

- **ENG2 - Mechanical Disruption of Engineered Barriers**
 - Effects of accumulated rockfall on engineered barriers
 - Dynamic effects of rockfall on engineered barriers
 - Effects of seismic loading on engineered barriers
 - Effects of faulting on engineered barriers

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Detailed Risk Insights

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

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

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Detailed Risk Insights

- **UZ1 - Climate and Infiltration**
 - Present-day net infiltration rate
 - Long-term climatic change

- **UZ2 - Flow Paths in the Unsaturated Zone**
 - Seepage
 - Hydrologic properties of the unsaturated zone
 - Transient percolation

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

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Detailed Risk Insights

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

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

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Detailed Risk Insights

- **DIRECT1 - Volcanic Disruption of Waste Packages**
 - Probability of igneous activity
 - Number of waste packages affected by eruption
 - Number of waste packages damaged by intrusion
- **DIRECT2 - Airborne Transport of Radionuclides**
 - Volume of ash produced by an eruption
 - Remobilization of ash deposits
 - Inhalation of resuspended volcanic ash
 - Wind vectors during an eruption

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Detailed Risk Insights

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

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Issue Resolution

148th Meeting of Advisory Committee on Nuclear Waste February 24-27, 2004

Gregory Hatchett 301-415-3315
gxh@nrc.gov

Division of Waste Management
U.S. Nuclear Regulatory Commission

OBJECTIVES



- **Status and schedule of Key Technical Issue (KTI) Agreements**
- **Current NRC Staff activities related to issue resolution**
 - **Department of Energy's Technical Basis Documents (TBDocs)**
 - **NRC Staff review process for TBDocs**
 - **Status of TBDoc reviews**
 - **Integrated Issue Resolution Status Report**
- **Summary**



Current Agreement Status

KTI Agreement Status Report	
Completed	90
Received & in Review	75
In Process	48
Not Received	80
Total	293



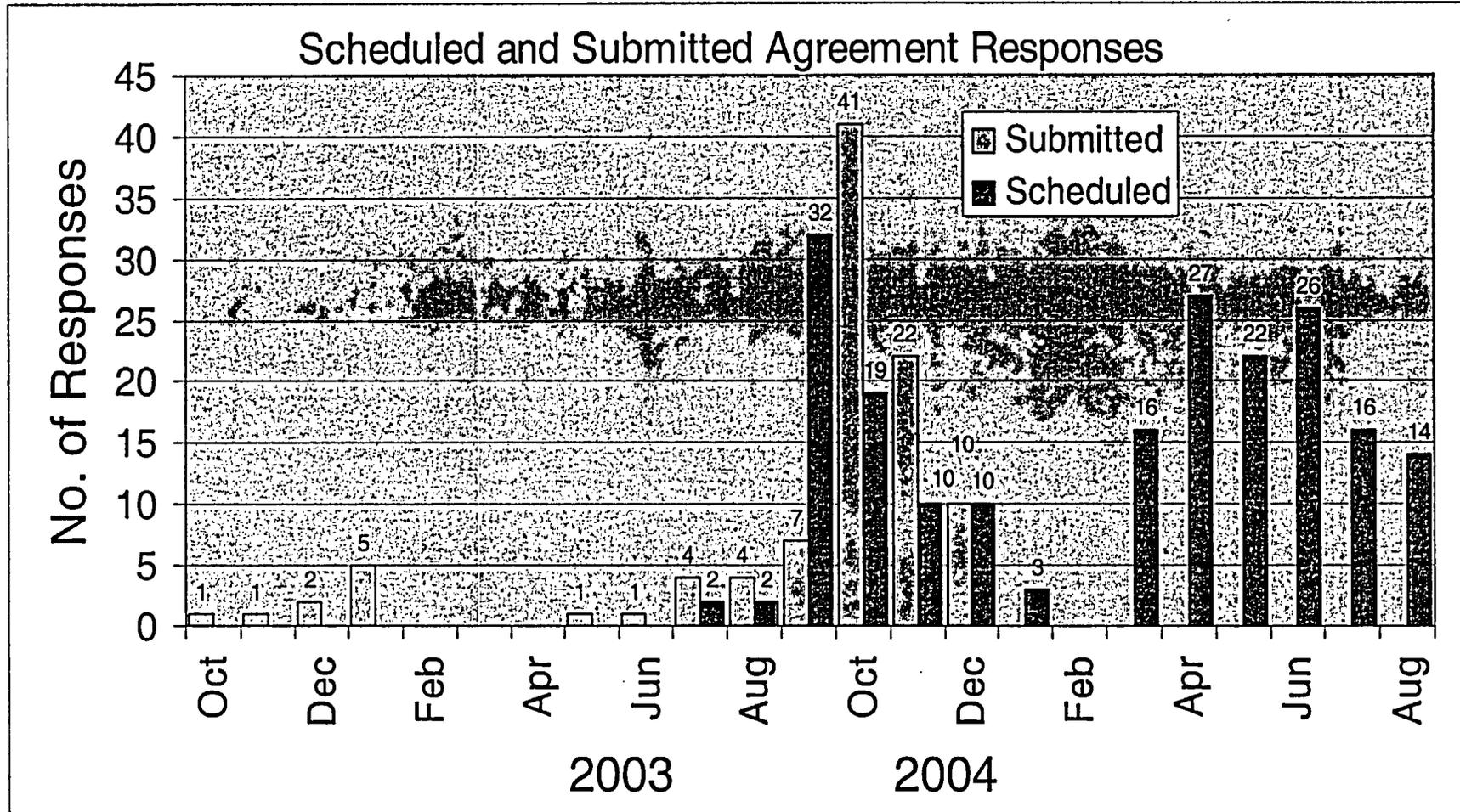
Agreements Significance Ranking

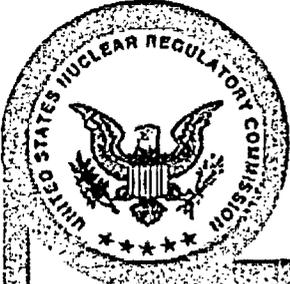
Agreement Status	H	M	L	Totals
Completed	3	22	65	90
Received & in Review	13	29	33	75
In Process	7	13	28	48
Not Received	18	28	34	80
Totals	41	92	160	293

➤ Significance Ranking based on June 5, 2003 memo to Commission



Agreement Response Schedule





Current NRC Staff Activities

- **NRC staff currently reviewing “integrated or bundled” KTI agreement responses**
 - **Bundled responses are part of DOE’s Technical Basis Documents (DOE schedule change-June 23, 2003)**
 - **Technical Basis Documents (TBDocs) summarize key processes and, as appropriate, relevant features and events for the 14 components of the postclosure performance**
 - **NRC staff has received seven TBDocs from DOE**



Current NRC Staff Activities – Cont.

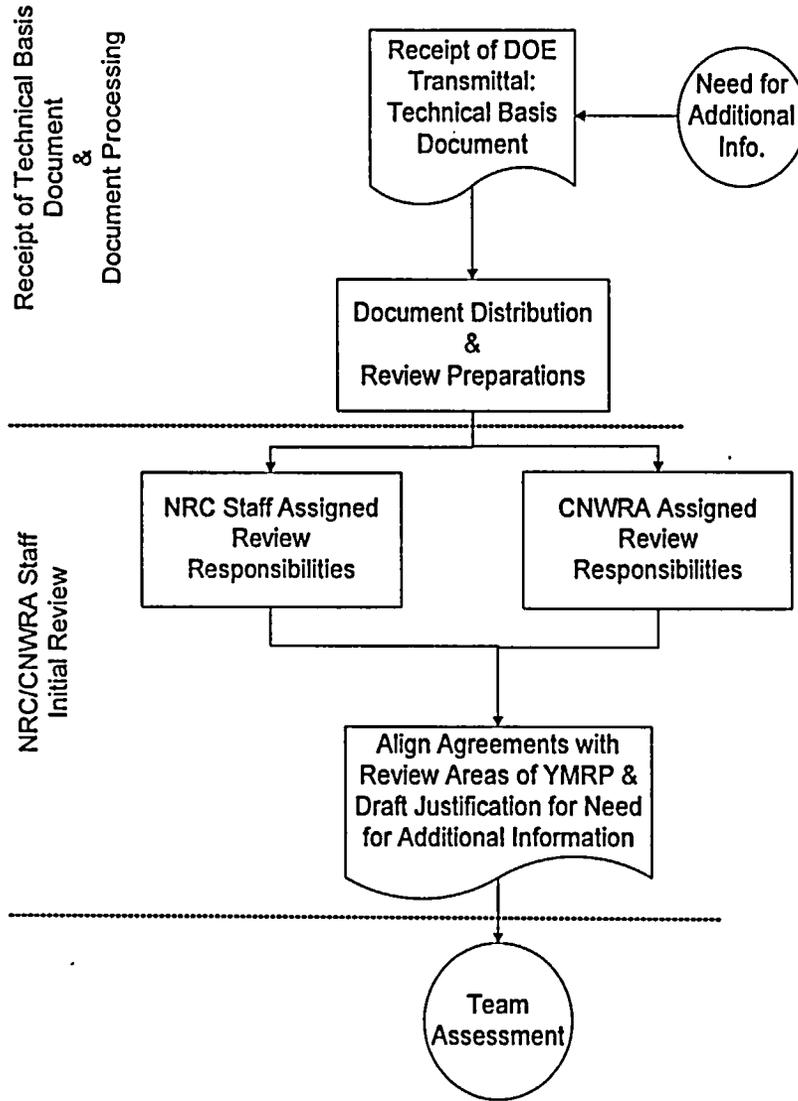
- **Technical Basis Document (TBDoc) No. 3: Water Seeping Into Drifts (6* KTI Agreement Items)**
- **TBDoc No. 5: In-Drift Chemical Environment (16* KTI Agreement Items)**
- **TBDoc No. 6: Waste Package and Drip Shield Corrosion (9* KTI Agreement Items)**
- **TBDoc No. 8: Colloids (11* KTI Agreement Items)**
- **TBDoc No. 11: Saturated Zone Flow and Transport (24* KTI Agreement Items)**
- **TBDoc No. 12: Biosphere Transport (7 KTI Agreement Items)**
- **TBDoc No. 13: Volcanic Events (4 KTI Agreement Items)**

- *** These numbers exclude responses to GEN 1.01 responses**

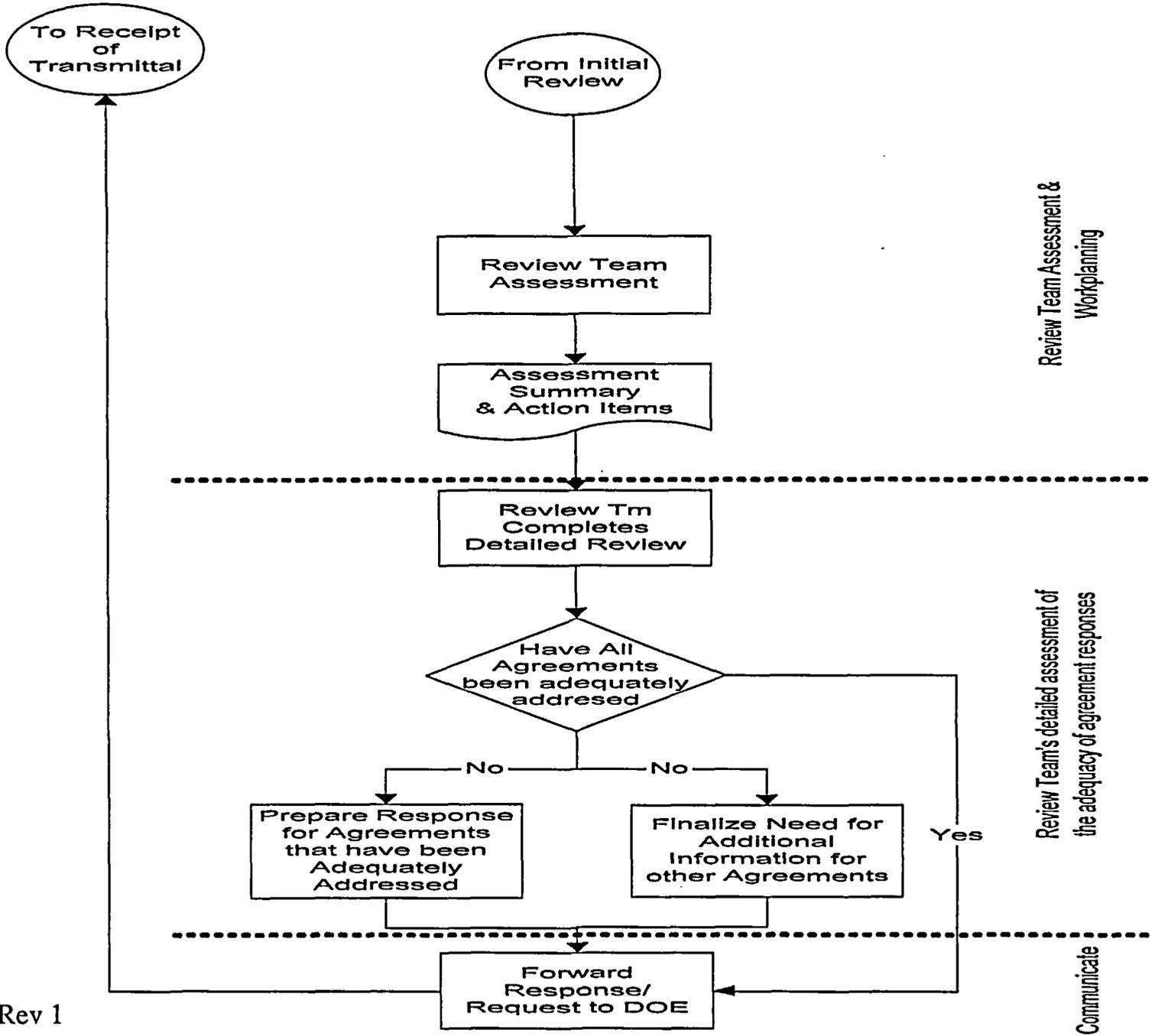


Current NRC Staff Activities – Cont.

Technical Basis Document Review Process



4/2003 Rev 1





Current NRC Staff Activities – Cont.

- **Status of Technical Basis Documents (TBDocs) reviews**
 - **On December 23, 2003, NRC forwarded letter to DOE requesting additional references to complete detailed reviews of TBDocs**
 - **DOE forwarded letters to the NRC regarding the availability of references on December 23, 2003 and January 30, 2004**
 - **TBDoc No. 12: Biosphere Transport – NRC staff completed its review on 5 out of the 7 “bundled” KTI agreements and provided a response to DOE closing those five agreements (NRC letter dated February 4, 2004 –ADAMS Accession No. ML040360425)**



Current NRC Staff Activities – Cont.

- **NUREG-1762, Integrated Issue Resolution Status Report (July 02)**
 - **Being revised to reflect status of program since FY 2001**
 - **NRC staff is risk-informing NUREG-1762**
 - **NUREG-1762 will continue to follow the Yucca Mountain Review Plan format**
 - **Will document the status of issue resolution**
 - **The revision is expected to be completed by Sep 04**



Summary

- **The staff is risk-informing the issue resolution process**
- **Revision to NUREG-1762 will further refine the nature and extent of information gaps as we understand them (this process is also being risk-informed)**
- **NRC staff is actively monitoring the agreements**
- **DOE has stated it intends to meet its schedule for submission of the agreements prior to submission of any license application**