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## NUCLEAR REGULATORY COMMISSION

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Nuclear Waste

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1 UNITED STATES OF AMERICA  
2 NUCLEAR REGULATORY COMMISSION

3 + + + + +

4 89th MEETING

5 ADVISORY COMMITTEE ON NUCLEAR WASTE

6 (ACNW)

7 + + + + +

8 WEDNESDAY

9 JANUARY 29, 1997

10 + + + + +

11 ROCKVILLE, MARYLAND

12  
13 The Advisory Committee met at the Nuclear  
14 Regulatory Commission, Two White Flint North, Room T2B3,  
15 11545 Rockville Pike, at 8:30 a.m., Paul W. Pomeroy,  
16 Chairman, presiding.

17  
18 COMMITTEE MEMBERS:

19	PAUL W. POMEROY	CHAIRMAN
20	B. JOHN GARRICK	VICE CHAIRMAN
21	WILLIAM J. HINZE	MEMBER
22	GEORGE M. HORNBERGER	MEMBER

23 ACNW STAFF PRESENT:

24	JOHN T. LARKINS	EXEC. DIRECTOR
25	MICHELE KELTON	TECH. SECRETARY

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1 RICHARD K. MAJOR  
2 HOWARD J. LARSON  
3 LYNN DEERING  
4 ANDREW C. CAMPBELL  
5 RICHARD P. SAVIO  
6 CAROL A. HARRIS  
7 SAM DURAISWAMY  
8 THERON BROWN

9 ALSO PRESENT:

10 TIM MCCARTIN  
11 MIKE BELL  
12 NEIL COLEMAN  
13 BRET LESLIE  
14 JEFF POHLE  
15 MARGARET FEDERLINE  
16 RICK WELLER  
17 JOHN GREEVES  
18 BUDHI SAGAR  
19 JOHN O. THOMA  
20 MIKE LEE  
21 HAROLD LeFEVRE  
22  
23  
24  
25

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P R O C E E D I N G S

8:34 a.m.

CHAIRMAN POMEROY: The meeting will now come to order. This is the second day of the 89th Meeting of the Advisory Committee on Nuclear Waste. Portions of today's meeting may be closed to discuss matters, the release of which would constitute a clearly unwarranted invasion of personal privacy.

Today the Committee will first of all, discuss the status of the key technical issues; secondly, meet with the Director of the NRC Division of Waste Management, Office of Nuclear Material, Safety, and Safeguards, to discuss current events; third, discuss defense-in-depth as it applies to nuclear wastes; fourth, prepare for the next open meeting with the Commission. We will continue the preparation of ACNW reports and hold a discussion of potential new ACNW members.

Mr. Richard Major, on my right, is the designated federal official for the initial portion of today's meeting. This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act.

We have received no written statements from members of the public regarding today's session. Should anyone wish to address the Committee, please make your

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1 wishes known to one of the Committee staff.

2 It is requested that each speaker use one of  
3 the microphones, identify himself or herself, and speak  
4 with sufficient clarity and volume so that he or she can  
5 be readily heard.

6 Do any of my colleagues have any comments  
7 they'd like to make before we go to the first agenda item?

8 Hearing none, the first agenda item this  
9 morning deals with the status of key technical issues.  
10 The purpose of today's meeting are: 1) to discuss and  
11 review the first KTI annual progress report which  
12 discusses NRC staff's progress for FY96 in developing KTIs  
13 for the high level waste repository free licensing  
14 program, and 2) to discuss the status and recommendations  
15 of the integration task force report on KTI activities.

16 I believe our leadoff speaker this morning is  
17 Margaret Federline, and I've seen Margaret Federline.  
18 Good morning, Margaret. And Margaret, you'll introduce  
19 the other speakers as appropriate?

20 DR. FEDERLINE: Yes.

21 CHAIRMAN POMEROY: Thank you

22 DR. FEDERLINE: Good morning. I noticed that  
23 you have a very full agenda this morning. I just wanted  
24 to take a few minutes at the beginning to explain what  
25 John and I are trying to accomplish with the annual

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1 report: what it is and what it isn't; what you can expect  
2 to hear from us today.

3 In your letter of February 16th, you urged us  
4 to develop an annual report. We had had a discussion with  
5 you at the time on KTIs and we indicated that we were  
6 thinking about developing a summarization and you urged us  
7 to continue with that, and we took many suggestions into  
8 consideration and I think we feel that it was the right  
9 thing to do.

10 What we want to do today is provide a brief  
11 overview. As it notes on this slide, the annual report  
12 provides a status of NRC high level waste work conducted  
13 in FY96. It summarizes the work up until the end of July.

14 As with any report, there's a problem with  
15 getting all the last minute information, so we've  
16 attempted to define a cutoff point, and as you notice, the  
17 copy that you have is a pre-publication draft.

18 What we have done is send this draft to all  
19 the members of our mailing list. We wanted to make sure  
20 the information got out as soon as it was possible to get  
21 it out. And the report will be published later in  
22 February.

23 I wanted to discuss for just a minute, what  
24 the annual report is. We decided that we needed to  
25 explain to DOE, provide early feedback, of what we were

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1 thinking. So in other words, you won't find the annual  
2 report as being a definitive report on licensing. In  
3 other words, there are not specific findings about Yucca  
4 Mountain, there are not conclusions.

5 What the annual report is, is an attempt to  
6 make available to all the parties that are involved in  
7 this process, NRC's current thinking. And the real  
8 objective here is to promote a dialogue. We believe it's  
9 important as we move to the viability assessment, to bring  
10 all the information forward and to promote a dialogue,  
11 have a discussion so that nobody is surprised with new  
12 information as we approach viability assessment.

13 Another objective that we had for the annual  
14 report is to continue to focus NRC's program, and I'll  
15 touch on that briefly on the next slide. As always, DOE  
16 remains ultimately responsible for developing an  
17 integrated safety case, and they may in fact, choose to  
18 adopt different paths to resolution that we are outlining  
19 in our annual report.

20 But as you will see, as Mike and Budhi walk  
21 through the annual report, a very key aspect of our  
22 program is identifying a path to resolution. We feel that  
23 it's important to have an end objective that we can begin  
24 to bring closure at the staff level on some of the key  
25 issues that are affecting repository program.

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1           And so we feel even if we pursue a particular  
2 path to resolution and DOE chooses an alternative path to  
3 resolution, it will enhance confidence during the  
4 licensing proceeding and there won't be a concern.

5           So bottom line, our objective in publishing  
6 the annual report as I mentioned before, is to document  
7 our progress. Some issues you will see, as Mike and Budhi  
8 walk through, we have very preliminary information on.  
9 Other subjects we're quite far along, and we feel that the  
10 information in the annual report will form the basis for  
11 an issue resolution report in FY97.

12           As we discussed with you, it has been as we've  
13 reformulated our program and as our budget has been  
14 reduced, it's been very important to us to refocus and  
15 reorganize our program to make sure that we, as the  
16 regulator, are focused on what we believe to be the most  
17 significant vulnerabilities as we go along.

18           And the annual report is a tool that we're  
19 using to help us focus, and to help us better integrate  
20 the program. You will see, as Budhi and Mike walk through  
21 the various chapters, within each chapter we've defined  
22 paths to resolution, but we've also defined integration  
23 interfaces in the annual report.

24           And going through the discipline process of  
25 writing an annual report has helped us to focus to ensure

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1 that there are no loose ends. So that's been a key factor  
2 in preparing the annual report.

3 As we've described to you in the past, NRC's  
4 key technical issues are closely related to DOE's  
5 containment isolation strategy. We, as the regulator,  
6 have a role to look at the vulnerability, so you will see  
7 in our annual report an emphasis on what we believe the  
8 vulnerabilities are, and urging DOE to look at particular  
9 things, or bringing to DOE's attention, new information  
10 that we've collected in the area of vulnerability.

11 We're still working with our vertical slice  
12 approach and as you recognized in your letter following  
13 our briefing to you, we recognized that there are some  
14 shortcomings in pursuing this more focused approach.

15 There's a chance that we might miss something,  
16 but we believe overall, as we have an iterative program  
17 between our disciplinary focus in the KTI and our total  
18 systems approach in the last KTI, that there's an  
19 iterative approach and that we will be able to recognize  
20 elements that are perhaps outside our existing KTIs.

21 So overall, the objective of our program  
22 remains to define a path to resolution. It's very  
23 important that we define acceptance criteria as we go  
24 along. One of our key roles is to ensure ourselves that  
25 we're going to have the criteria against which to review

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1 DOE submittals when the time comes.

2 And so you will see as we describe our issue  
3 resolution process, part of that will be developing the  
4 acceptance criteria and advising people of those  
5 acceptance criteria, at least in a general sense as we  
6 develop our status reports.

7 MEMBER HINZE: Excuse me, Margaret. Is there  
8 a generic acceptance criteria and then specific criteria  
9 for each of the slices?

10 DR. FEDERLINE: No. What we are planning to  
11 do is, for each issue resolution status report there will  
12 be acceptance criteria. It may be an acceptable  
13 methodology. We may, in all cases, not -- and I'll use an  
14 example -- what is the acceptable amount of infiltration  
15 at Yucca Mountain? We believe that's an integrated  
16 systems question. In other words, you have to look.

17 So maybe for infiltration the best you can do  
18 is define an acceptable methodology at that point in time.  
19 And as you pull it all together in the total systems  
20 analysis, then you'll be able to get to more definitive  
21 acceptance criteria as we get closer to licensing.

22 So you know, our goal is to pursue as precise  
23 an acceptance criteria as we can at this point in time,  
24 without limiting DOE's flexibility for the interfaces of  
25 processes.

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1 Does that --

2 MEMBER HINZE: Yes.

3 DR. FEDERLINE: It's a fine line we have to  
4 walk defining acceptance criteria early in the process.

5 MEMBER HINZE: Well, let me ask the question  
6 then, when you have reached -- if you reach -- issue  
7 resolution on any of these topics with DOE, does that mean  
8 that that terminates your work on this topic? Or do you  
9 just agree to disagree?

10 DR. FEDERLINE: There will be facets of work.  
11 In other words, if we're working towards defining an  
12 acceptable methodology at the process level, we may come  
13 to agreement on that, but that work will still continue at  
14 the systems level ensuring that the abstraction is  
15 appropriate and that it's appropriately represented.

16 But to the best we can, and this is -- I know  
17 there was some sensitivity in your letters to defining  
18 subissues -- we want to get to the point where we are  
19 resolving all the KTIs. And we see that that will come as  
20 we move closer to licensing. But we believe that we're  
21 going to be able to resolve a number of subissues prior to  
22 that time.

23 MEMBER HINZE: In our letter about this time  
24 last year, we wrote: "In the interest of achieving the  
25 efficiency that is central to the vertical slice approach,

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1 criteria should be developed to determine when activities  
2 should be terminated within a specific vertical slice".

3 DR. FEDERLINE: Right.

4 MEMBER HINZE: Are we talking about the same  
5 thing here --

6 DR. FEDERLINE: Yes.

7 MEMBER HINZE: -- when we're talking about  
8 acceptance criteria and so forth?

9 DR. FEDERLINE: Correct.

10 MEMBER HINZE: All right. So then you are  
11 approaching that problem?

12 DR. FEDERLINE: Yes.

13 MEMBER HINZE: Thank you.

14 CHAIRMAN POMEROY: Margaret, let me just ask  
15 one other question. When you talk about defining  
16 methodologies in process, for instance, I think of our  
17 discussions over the years about expert judgment and our  
18 thoughts on trying to define a methodology and in fact,  
19 incorporate it somehow even in a rulemaking, prior to the  
20 time we get into the licensing situation, where I think  
21 that in that particular -- using that use of methodologies  
22 there may affect more than DOE because there may be  
23 independent evaluations using expert judgment --

24 DR. FEDERLINE: That's correct.

25 CHAIRMAN POMEROY: -- of the repository by

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1 other parties. When you say define then, an acceptable  
2 methodology, you're saying this is what would be  
3 acceptable to --

4 DR. FEDERLINE: Yes, at the staff level.

5 CHAIRMAN POMEROY: At the staff level.

6 DR. FEDERLINE: And realizing we're now  
7 currently working on developing a strategy for revising  
8 or, you know, supplementing Part 60 which will go to the  
9 Commission. And until we get a sense of, you know, what  
10 the Commission sense is, we don't know how much we'll be  
11 resolving through rulemaking. But our goal in this  
12 process is to resolve as much at the staff level or to  
13 obtain agreement.

14 Just to give you a couple of examples that, it  
15 may help a little bit, and others will walk through these  
16 and can explain these examples. I think in the area of  
17 volcanism we feel that we've laid a solid groundwork in  
18 the probability area, and that there may be enough  
19 information to come to agreement on the range of  
20 probability. That's in one sense.

21 In the sense of climate, we feel that we have  
22 defined a methodology that may be able to bound the  
23 climate number, but we're going to be, in our next issue  
24 resolution status report we're going to be putting forward  
25 the methodology itself.

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1 MEMBER HINZE: Those are great examples. One  
2 of my concerns here is -- and help me please -- is that  
3 issue resolution is not equivalent to agreement.

4 DR. FEDERLINE: That's correct.

5 MEMBER HINZE: That's my reading of your  
6 material, right? And I think those words get confused  
7 occasionally. It isn't agreement at all; it can be agree  
8 to disagree.

9 DR. FEDERLINE: Yes.

10 MEMBER HINZE: Okay.

11 DR. FEDERLINE: And I think we have an  
12 acknowledgement that there may be areas of difference with  
13 DOE as we approach viability assessment. On both sides,  
14 we can do our best job, but you know, if there are  
15 differences of interpretation of scientific information,  
16 that may continue to exist. So I think the most important  
17 thing at viability assessment is to be able to define what  
18 those areas of agreement and disagreement are.

19 I don't think we would ever say that an issue  
20 has been resolved if we've not achieved agreement with  
21 DOE, but there may be some areas where we're not able to  
22 achieve issue resolution at this point in time. But  
23 hopefully, we'll be able to understand why we're not  
24 achieving issue resolution.

25 VICE CHAIRMAN GARRICK: Margaret, I just want

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1 to say that I think you gave a very good answer to Bill's  
2 question when you referred to the fact that some of these  
3 issues are systems questions.

4 DR. FEDERLINE: Correct.

5 VICE CHAIRMAN GARRICK: And I think that's  
6 something that has concerned us a little bit is any  
7 attempt to allocate acceptance --

8 DR. FEDERLINE: Right.

9 VICE CHAIRMAN GARRICK: -- to lower levels out  
10 of context with the total system impact.

11 DR. FEDERLINE: Right.

12 VICE CHAIRMAN GARRICK: So I think -- I was  
13 encouraged to hear that, as a matter of fact.

14 DR. FEDERLINE: As I go through this, you'll  
15 see that our FY97 work is focused on sensitivity and  
16 importance analysis at the system level. We've done a lot  
17 of work in FY96 on completing sensitivity analysis at the  
18 process level, and you could sort of jump to say, well  
19 based on the process level we achieve agreement. But  
20 really, until you factor that into the system and see what  
21 the tradeoffs are, you know, you may have to make some  
22 adjustments.

23 So the focus of -- we've taken our own  
24 guidance, you know, we've been very definitive with DOE  
25 saying that you should document your decision process, you

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1 should lay out clearly what your thinking is. We took  
2 that to heart, and we believe that the annual report is a  
3 place for us to really lay out our thinking and document  
4 our thought process.

5 And that will be culminated in Issue  
6 Resolution Status Report. So these are going to be the  
7 two key documents and we would hope, as we get closer to  
8 licensing, that we will document all of this in a PSER  
9 which will enable us to sort of formalize it for the  
10 licensing process.

11 But right now, these two documents are our key  
12 documentation of our current thinking, and they're also  
13 our vehicles for discussion and integration. We feel it  
14 extremely important to bring the information to the table,  
15 make sure DOE and other parties know what we're thinking  
16 at this point in time.

17 So we have already met with DOE and the other  
18 parties and provided an overview of the annual report.  
19 And what we're planning to do in the next management  
20 meeting with DOE is, sort of walk through the report and  
21 understand what the best means are to dialogue.

22 Some of these issues you'll see are very early  
23 in the process. It may be wise to continue with some  
24 Appendix 7s. There may be others, you know, that have  
25 matured to the point where we could actually achieve some

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1 agreements and move to higher level meetings. So that's  
2 one thing that we need to decide.

3 As I mentioned, our FY97 and FY98 work is  
4 going to be focused on importance and sensitivity analysis  
5 at the systems level. It's a very ambitious goal that we  
6 have; we're hopeful we're going to be able to achieve it.

7 But our key here is to look at, if we proceed  
8 with some of the issue resolution strategies that we're  
9 looking at at the process level, what will that mean at  
10 the systems level?

11 You're also aware of our reduced budget in  
12 FY97 in three KTIs. That's been very hard for us because  
13 we really need the Center's support in those key areas and  
14 we're certainly hopeful that, you know, we can reverse  
15 that thinking and bring our budget back to full strength.

16 Are there any questions? This was just  
17 intended to be sort of a brief management overview to let  
18 me know at least what John and I are trying to accomplish  
19 with the annual report and where it fits into the big  
20 picture.

21 CHAIRMAN POMEROY: Apparently not Margaret, so  
22 --

23 DR. FEDERLINE: Okay. Let me turn it over to  
24 Mike Bell who is the Branch Chief who's responsible for  
25 the majority of the KTIs. John Austin is not able to be

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1 with us today; he's at a TRB meeting on performance  
2 assessment, and Budhi Sagar will be doing the presentation  
3 on the last two KTIs.

4 CHAIRMAN POMEROY: Thank you, Margaret.

5 DR. BELL: Good morning. I'm Michael Bell;  
6 I'm Chief of the Engineering and Geosciences Branch within  
7 the Division of Waste Management at NRC, and as Margaret  
8 mentioned, the technical staff supporting the high-level  
9 program primarily worked for me. Eight of the ten KTIs  
10 that we worked on in fiscal '96 are under my area of  
11 responsibility.

12 VICE CHAIRMAN GARRICK: That sounds a little  
13 unfair.

14 (Laughter.)

15 DR. BELL: Or challenging. The outline today  
16 follows pretty closely the outline in the annual report,  
17 and I'm sure everybody's had a chance to read the draft  
18 we've provided you thoroughly. But we will talk about  
19 each of the KTIs and how it relates to the waste isolation  
20 -- DOE's waste containment and isolation strategy.

21 That was a step on our part to try to  
22 communicate better with DOE, that we thought if we focused  
23 the program in our comments to them on, you know, their  
24 own strategy for running their program, it would  
25 facilitate communication and have more impact than what we

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1 had done in the past, in many cases, you know, relating  
2 some concern to some provision in Part 60 which is likely  
3 to change over the next few years as a result of the  
4 legislation, the Academy report, and what EPA is doing.

5 I will talk about our path to resolution and  
6 in particular, what we're doing on each of the sub-issues,  
7 focusing on '97 and '98. We see, basically, these two  
8 years as being a key time for making some progress on  
9 raising issues and resolving some of them with DOE,  
10 because at the end of '98 they'll be doing their viability  
11 assessment.

12 And if we have some reason, or something that  
13 needs to be taken into consideration in that, we want to  
14 have the opportunity to make it known to DOE.

15 The last bullet on integration -- each chapter  
16 talks about the linkages between the various KTIs. I  
17 won't have charts on that today, but John Thoma will be  
18 talking about integration afterwards, and it is discussed  
19 in the annual report.

20 And it will be unavoidable actually, to talk  
21 about not -- let's see, I'm going to use a double negative  
22 here -- I won't be able to avoid talking about linkages  
23 and interfaces even though I don't have a specific chart  
24 on it.

25 Now, one of the things I'm going to do to

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1 confuse those of you who have read the report from cover  
2 to cover, is change the order. The order things appear in  
3 the annual report is the way they appear in the contract  
4 for the Center in the operating plan. It makes no  
5 technical sense whatsoever.

6           Hopefully, this sequence does. Basically,  
7 we'll talk first about the KTI on unsaturated flow, where  
8 we look at things like: what's the climate over the next  
9 10,000 years if that's the period of performance;  
10 infiltration into the mountain.

11           How much of that percolates down to the  
12 repository level where it then gets impacted by the heat  
13 from the emplaced waste and so it provides the input to  
14 the thermal effects on flow KTI; where now we look at  
15 things like: is their focus recharged, what's the impact  
16 of the heat on perched water at the repositories, issues  
17 like DOE's thermal testing program and will it get the  
18 information we need to model the transport?

19           Now when this heated water gets close to the  
20 waste packages, the next technical issue I'm going to talk  
21 about in this sequence is the near-field environment of  
22 the waste package where we then get into the thermal  
23 hydrochemical coupling and the chemical environment that  
24 the waste packages are exposed to.

25           That's one of the inputs to the waste package

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1 and the source term considerations. The other is the  
2 design of the repository itself; whether or not there's  
3 backfill, what the thermal-mechanical response of the rock  
4 is and whether that influences the waste package, or how  
5 it's taken into account in the waste package design.

6 And then with these two sets of inputs we look  
7 at the container life and source term. How long does it  
8 take for containers to begin failing? As containers fail,  
9 what's the release rate from the waste packages?

10 Next in turn is radionuclide transport. How  
11 does the contaminated water flow out of the repository  
12 down to the underlying aquifer and to the acceptable  
13 environment, the critical group? Whatever the measure is  
14 we'll be using.

15 And basically, that would be the package if  
16 all you looked at was undisturbed performance, but we  
17 realize there are things that could disrupt the  
18 repository. So there are two KTIs: the one on igneous  
19 activity and the one on structural deformation.  
20 Seismicity, then look at geological phenomena that could  
21 disrupt the isolation systems, and that's impact on  
22 performance.

23 Then when you've done all that you need some  
24 standard to compare it against, and so at that point John  
25 Austin would have taken over if we weren't in Nevada with

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1 the TRB today. But Budhi Sagar, the Technical Director at  
2 the Center, will talk about the work in the KTI on the EPA  
3 standards, and then finally, the KTI and total system  
4 performance and how we integrate the program.

5 I know integration is always a problem that --  
6 a question that comes up, a concern on people's minds --  
7 and we think we've structured our work to try to  
8 accomplish that. Each of these KTIs is worked on by  
9 teams, and the teams are all interlocking.

10 There is an individual, for example, on the  
11 container license source term team who is a representative  
12 of, or may even be the team lead, from the repository  
13 design team and the near-field environment team. So that  
14 the people who have to provide the inputs are actually  
15 represented on the team.

16 And in the same way, there's also somebody on  
17 that team from the transport team who's going to take the  
18 source term they provide and use the outputs. And every  
19 team has a member of the performance assessment team on  
20 it.

21 So with that introduction --

22 VICE CHAIRMAN GARRICK: Mike, have the team  
23 leaders all been designated?

24 DR. BELL: Yes, they have, for some time. In  
25 fact, most of them are here today and if you get into very

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1 tough questions that require some detailed technical  
2 answers, I'll be calling on some of them. Yes, all those  
3 people are, in fact, identified in the annual report.

4           So now, going through things in that order.  
5 Basically, DOE's waste isolation strategy has several  
6 hypotheses that are important to performance; that  
7 essentially only small amounts of water will infiltrate  
8 the mountain and percolate down to the repository horizon;  
9 that fracture flow won't be a significant pathway for  
10 carrying large amounts of water to the repository horizon.

11           In fact, some DOE conceptual models  
12 hypothesize an impermeable layer above the repository  
13 using fractures as sort of a gutter and downspout system  
14 to transport the water quickly down past the repository  
15 without ever becoming contaminated.

16           That capillary effects will reduce the amount  
17 of water that gets into the repository horizon and can  
18 impact the waste packages; that in fact, water will,  
19 because of capillary effects, be moved out of fractures  
20 and into the matrix where then it will have very long  
21 transport times. And that the impacts of climate change  
22 over whatever the period of performance is, can be  
23 bounded.

24           Looking at that strategy, in our program we  
25 have identified the subissues at the bottom. And in

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1 fiscal '96 and hopefully coming to conclusion in the first  
2 half of fiscal '97, we've been devoting a lot of time on  
3 the first three items there: the climate change, shallow  
4 infiltration, and then of the shallow infiltration, how  
5 much percolates down to the repository horizon.

6 Our plan is, in fact, early in this fiscal  
7 year to publish an issue resolution strategy report where  
8 we look at the, essentially, what would be acceptable  
9 methodologies for looking at things like climate change.

10 DOE is investing a lot of money in large  
11 global climate models, for example, and is that necessary,  
12 and what reliance will be placed on that type of  
13 information in their license application versus just  
14 looking at the paleoclimatic data and the range of past  
15 climates and using that information in a, say a more  
16 bounding way.

17 The USGS has been spending a lot of effort --  
18 and in fact we think, making a lot of progress -- on the  
19 infiltration issue. And in fact, their estimates of  
20 infiltration have been increasing, and we think we're in  
21 fact, approaching one another now in what our estimates  
22 would be. And that's another area where we anticipate  
23 being able to reach issue resolution, or put out an Issue  
24 Resolution Status Report this fiscal year.

25 Next fiscal year we'll be tackling some of the

1 issues at the bottom of the chart, and using things like  
2 the chlorine-36 data and other geochemical data to verify  
3 some of the models and the estimates that are being made  
4 by DOE and the USGS.

5 MEMBER HINZE: While you're on that point  
6 Mike, if I might ask? Does your staff believe that  
7 there's sufficient data available from the DOE at this  
8 time, or projected ahead to the middle of the year, that  
9 they will be able to get a handle on the dilution in the  
10 saturated zone?

11 DR. BELL: Well, that's an issue we're  
12 addressing, and in fact, it's a shared issue with my staff  
13 and the performance assessment staff, and I'm not sure --  
14 Tim, do you -- I mean, it's an issue that we're  
15 addressing. The question is, do we think we'll be able to  
16 resolve that particular issue this fiscal year?

17 MEMBER HINZE: You may have a result but they  
18 don't have enough data by then.

19 DR. McCARTIN: I mean, we're looking at it  
20 from two aspects. One is the data in terms of information  
21 in the saturated zone. The other aspect is, as Margaret  
22 referred to, the strategy in terms of revising Part 60 in  
23 the critical group and reference biosphere and things with  
24 that, and exactly what will need to be calculated to  
25 demonstrate compliance.

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1           There's kind of two aspects to it. There's  
2 dilution in the saturated zone but there's also say --  
3 just in the saturated zone isn't enough, you have to pump  
4 it through a water well and you get dilution in the well  
5 head, and so we're looking at it from a lot of different  
6 aspects right now.

7           MEMBER HINZE: And I guess we'll be hearing  
8 from Budhi about some of the results of that, right?

9           DR. McCARTIN: Tim McCartin of NRC. No, I  
10 don't know if Neil Coleman -- if you want to speak to the  
11 data? I mean, he's the, you know, we've been discussing  
12 this --

13          MEMBER HINZE: They're the team --

14          DR. McCARTIN: -- jointly.

15          DR. COLEMAN: Neil Coleman, NRC. About how  
16 confident we are about the data at the site. A major part  
17 of the issue resolution report that will deal with the  
18 saturated zone will be going through all the well data  
19 that's available from the site, the hydraulic testing  
20 data, the tracer testing that has been done and is still  
21 going on.

22               A major factor that has not been considered in  
23 our analyses, in DOE's analyses, is what happens when you  
24 physically pump a well. Especially in the case at Yucca  
25 Mountain where you have partial penetration of the

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1 aquifer.

2           You generate -- well, in this case not a  
3 spherical pumping pattern but a horizontal ellipsoid that  
4 draws in a very large quantity of water, especially in the  
5 case of the critical group which -- the scenario we're  
6 looking at involves very large discharge wells.

7           That is a case that will maximize the dilution  
8 factors. That has not been considered before and is one  
9 of the things we'll look at, especially in that IRSR.

10           MEMBER HINZE: How far away from the site are  
11 you doing these analyses? How far is your analysis  
12 extending in the Amargosa Valley?

13           DR. COLEMAN: Not very far. It would go out,  
14 oh, five to ten kilometers. Five kilometers is down to J-  
15 13.

16           VICE CHAIRMAN GARRICK: Mike, you may have  
17 answered this, but how much are you using the iterative  
18 performance assessment to answer the question with respect  
19 to climate, of what climate changes really make a  
20 difference? It seems to me that would be a very useful  
21 framework within which to deal with the details.

22           DR. BELL: Yes, I think Tim McCartin would  
23 like to address that.

24           DR. McCARTIN: Yes, Tim McCartin once again.  
25 We are looking at, as you'll see, a lot of the issues

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1 within the KTIs within the next phase 3 of our iterative  
2 performance assessment, and we'll be trying to look at the  
3 sensitivity's climate change, and its effect on  
4 infiltration is one of those.

5 We're also looking at, you know, with respect  
6 to what Neil was saying, with the water wells we're  
7 looking at a five kilometer location for historical  
8 purposes with respect to the old regulation, but also  
9 looking at variations of, you know, between 20 and 30  
10 kilometers for a group at Amargosa Desert, potentially.

11 But we're trying to explore different things:  
12 the aspects of the well; what assumptions about the wells;  
13 are we assuming all the contaminants get there? There's  
14 many aspects to the aspect of evaluating the doses to a  
15 critical group that need to be looked at with respect to  
16 small well discharges, large well discharges, etc.

17 VICE CHAIRMAN GARRICK: Thank you.

18 DR. BELL: Well, the things that the staff did  
19 in fiscal '96, much of it is still work-in-progress. We  
20 came up with the first draft of the Issue Resolution  
21 Status Report on climate, but basically this is when  
22 management decided to take this approach that, as part of  
23 the Issue Resolution Status Report after the staff went  
24 through its thinking, basically we should then have a  
25 section in the Issue Resolution Status Report that lays

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1 out, well, here was the review procedure we used and these  
2 were our acceptance criteria, and that's why we think  
3 we're able to resolve this particular issue.

4 If you recall, one of the casualties of the  
5 budget was our License Application and Review Plan; we're  
6 no longer working on the LARP. And so basically, what we  
7 see ourselves doing in these Issue Resolution Status  
8 Reports in part is, building pieces of what will  
9 eventually be our Review Plan.

10 We'll have documented the review procedures  
11 and acceptance criteria and if at some time in the future  
12 we needed to put together a Review Plan for the license  
13 application, we could take these from various documents  
14 and assemble them into a kind of a License Application  
15 Review Plan.

16 Basically, we've been looking at the USGS work  
17 on infiltration and percolation in doing some of our own  
18 modeling. It's a collaborative effort between my staff  
19 and the performance assessment people. And as you've  
20 heard, we've been looking at the question of the saturated  
21 zone dilution, and you know, for reasons like the things  
22 that Neil just described, while the underground -- while  
23 the underlying aquifer may not be a well mixed tank, there  
24 is credit for mixing due to the pumping at the user  
25 location and such that moves our estimate and DOE's

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1 estimate closer together.

2           Okay, the next KTI is the thermal effects on  
3 flow. Basically, DOE's isolation strategy hypothesizes  
4 that thermally induced changes can be bounded and  
5 essentially they're relying on the heated repository to  
6 keep water away from the waste packages and maintain a low  
7 relative humidity environment for long periods of time.

8           And you know, to investigate this we're  
9 looking at issues like gravity-driven refluxing, the  
10 adequacy of DOE's thermal modeling. Because these are  
11 very complex systems. I mean, you're really looking at 2-  
12 phase flow in fracture systems that you have to make  
13 approximations to the model, and we want to come to some  
14 agreements on resolution on what are acceptable ways to  
15 model these phenomenon.

16           And we have been looking at -- well, the last  
17 bullet, adequacy of the DOE thermal loading strategy --  
18 what we've really been focused on for the most part, is  
19 their thermal testing program. This combination of a  
20 single heater test, the large block tests at Fran Ridge  
21 which was off for a while but is now back in the program  
22 again. And finally, the drift scale heater test that DOE  
23 is excavating the alcove for at the present time.

24           And just last week I signed out a letter to  
25 Steve Brocum -- I'm sure your staff has received them; if

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1 they're distributed yet -- letter commenting on the  
2 thermal testing program.

3 And the points of the letter were essentially,  
4 we have no objections to DOE's phased approach. In fact,  
5 we find it acceptable, but we had three particular issues  
6 that we commented on.

7 One of which was the concern we have that the  
8 way they intend to run the drift scale heater test may not  
9 adequately reflect the repository conditions and so they  
10 may not see the phenomena that are of concern that have to  
11 be modeled for assessing repository performance.

12 Things we have identified that we see we need  
13 to do in fiscal '97 and '98 are shown on this slide. I  
14 think I've talked about a number of things in '97. I  
15 guess one of the things that we plan to get into this  
16 fiscal year that is just starting up is when you look at  
17 engineered features like backfill, ventilation and such,  
18 how to take these into account.

19 Basically, this "reviewed and agreed with  
20 findings" of DOE peer review team is a reference to the  
21 letter I mentioned. DOE had its own independent peer  
22 review of their thermal testing and modeling strategy, and  
23 basically a number of the comments that they raised, in  
24 fact we agreed with and included in the letter that I sent  
25 to DOE.

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1           The second bullet there in fact, is the  
2 concerns that I mentioned about the fact that, in order to  
3 accelerate the testing they are going to drive the  
4 temperatures much higher than you'll see in the repository  
5 in the drift scale heater test.

6           And as a result, that may be much more  
7 effective at drying out the system and therefore you won't  
8 see the phenomena that could impact performance, like  
9 gravity-driven refluxing.

10           The next item is now moving down closer to the  
11 waste packages -- what happens in the near-field.  
12 Basically, DOE is relying on low seepage into the drifts,  
13 that after waste packages do begin to fail the release  
14 from the waste packages would be low and that transport  
15 away from the drifts to the accessible environment to the  
16 underlying aquifer would take place at very low rates.

17           A number of subissues we're investigating:  
18 near-field chemical effects and how they impact the  
19 containment by the waste package; once waste packages fail  
20 how radionuclides enter the water and are transported away  
21 from the waste packages.

22           Our plans for making progress and resolving  
23 this issue are to publish the Issue Resolution Status  
24 Report this year on thermal hydrological chemical  
25 processes. In order to do that we'll be looking at DOE's

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1 geochemical models and developing our own for how the  
2 species interact between the natural systems -- the rock  
3 and the engineered materials.

4 In not only the waste package but other  
5 materials that are introduced into the repository like the  
6 large amounts of concrete, organic materials that may  
7 enter inadvertently coming from spills or things that get  
8 left behind.

9 MEMBER HORNBERGER: Mike, how much of that  
10 kind of work has DOE accomplished already? The  
11 geochemical analysis of concrete and organics and  
12 everything else?

13 DR. BELL: Well, I'm going to ask Neil to give  
14 his opinion, but this is one of the areas in DOE's own  
15 program when their budget was cut that was also reduced  
16 significantly. And I guess -- what's your judgment Neil,  
17 on --

18 DR. COLEMAN: I'm sorry, I didn't hear your  
19 question. I couldn't hear you when you spoke.

20 MEMBER HORNBERGER: I'm sorry. I was curious  
21 about -- my question was, how much work has DOE done on  
22 geochemical analyses related to external materials like  
23 concrete and organics?

24 DR. COLEMAN: That particular question I'm  
25 going to turn over to Bret -- Bret Leslie.

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1 DR. LESLIE: Bret Leslie from the NRC -- the  
2 team lead on this issue. They have done some work. The  
3 problem has been that they haven't brought it into their  
4 modeling. They've done it kind of offline, haven't  
5 integrated it in any sense into their performance.

6 MEMBER HINZE: While you're interrupted there  
7 Mike, I noticed the data synthesis report -- at one time  
8 the DOE was going to produce these data synthesis reports  
9 and process model. What are you receiving on that and  
10 what is the result to your program, of any lack of these  
11 reports?

12 DR. BELL: Yes, actually, I think this last  
13 bullet is in fact, the review of the data synthesis  
14 report, isn't that right, Bret?

15 DR. LESLIE: That's correct.

16 MEMBER HINZE: Do you have those reports and  
17 how are they coming in?

18 DR. BELL: Oh, in the mail. I'm not sure I  
19 understand your question.

20 (Laughter.)

21 MEMBER HINZE: Do you have any and how many do  
22 you have?

23 DR. BELL: I wasn't expecting that question.  
24 Most of the ones that they had scheduled have come in.  
25 The one notable report that I'm aware of that got delayed

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1 was the one on igneous activity. When they, I guess that  
2 during internal review they found some difficulties with  
3 it and withdrew it.

4 I mean, we can get you that answer. Rather  
5 than stand here and --

6 MEMBER HINZE: Well, in addition to getting  
7 the answer, could we see one of those reports? We were --

8 DR. BELL: You're not getting them?

9 MEMBER HINZE: We have not seen them. And we  
10 were unaware that they were even coming across the desk --  
11 NRC's desk.

12 DR. BELL: I guess I'm puzzled. You know,  
13 even if they aren't sending you them directly, they ought  
14 to be going into our RIDS system. Is that what it's still  
15 called? Going into our RIDS system and getting  
16 distributed internally.

17 MEMBER HINZE: At least I would be interested  
18 in looking at a couple of these to see what they're  
19 coverage is, that type of thing and so forth.

20 DR. BELL: And our intent is to publish Issue  
21 Resolution Status Report next fiscal year on the impacts  
22 of these man-made materials and I guess one of the things  
23 we are looking at with -- I guess in both this KTI and the  
24 container life and source term KTI is the impact of micro-  
25 organisms that might be present in the repository.

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1           Some of the things that we did in FY96. We  
2 looked at the sensitivity of some of these phenomena on  
3 coupled effects. We had some concerns that we've  
4 identified in the equivalent continuum models that DOE is  
5 using for some of its assessment. You see the points  
6 there.

7           In the repository design and thermal-  
8 mechanical effects, I guess this is the first one we've  
9 come to now where we've been impacted by the budget. Our  
10 Center support in this area is being phased out. Some of  
11 the -- I still have staff, one engineer working in this  
12 area.

13           Some of the modeling work and analysis work  
14 the Center was doing was being phased out and I guess,  
15 transitioned into the performance assessment KTI, but  
16 essentially our Center support in this area is about gone.

17           The isolation-type issues that we're looking  
18 into in this KTI basically had to do with performance of  
19 engineered barriers to prevent moisture from reaching the  
20 waste packages after waste packages failed to limit  
21 migration from the repository.

22           This KTI was also the area where we looked at  
23 a number of design and QA-type questions. Some of the  
24 things that my staff is still doing, for example, is  
25 looking at DOE's design control process of its QA program,

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1 and we have this outstanding issue that's a couple of  
2 years old and how regulatory requirements are reflected in  
3 DOE's design documents.

4 In fact, at the very end of the fiscal year we  
5 received a submittal from DOE on that topic that was  
6 intended to address our outstanding concerns and it's just  
7 a matter of having the manpower to review that document.

8 Also in this area is where the review of DOE's  
9 topical report on its seismic design methodology is taking  
10 place. You know, DOE had submitted an earlier topical  
11 report on its probabilistic hazard assessment methodology  
12 where they were proposing to employ a probabilistic hazard  
13 assessment methodology much like the new Appendix S to  
14 Part 100 would employ for reactors.

15 We reviewed that report, accepted the  
16 methodology and wrote an Issue Resolution Status Report on  
17 that one last year. Now we have the second report on how  
18 they're going to take the design inputs and use it in the  
19 design of both the surface structures and underground  
20 structures.

21 This review is underway. It's one of the  
22 things we're still trying to accomplish with our reduced  
23 resources, but the schedule is impacted.

24 The things we intend to try to accomplish in  
25 FY97 in order to resolve some of the design and thermal-

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1 mechanical issues with DOE are in fact: try to complete  
2 the review of this report on their design control process,  
3 issue an Issue Resolution Status Report on that, complete  
4 the review of the seismic design methodology report.

5 We have to continue to review DOE's design  
6 documents, in part because that information is input to  
7 other KTIs. I mean, if they change their conceptual  
8 designs that has to be reflected in either the performance  
9 assessment work or the waste package design work.  
10 Basically that kind of work still needs to go on.

11 The possible future work down there really  
12 depends on whether or not the budget in this area gets  
13 restored.

14 Most of the accomplishment I guess here, are  
15 all still work-in-progress. We had several interactions  
16 with DOE on the topical report on seismic design, meetings  
17 and -- we regularly take up the design control process in  
18 our quarterly ESF meetings with DOE. And basically in  
19 fiscal '96 we're working on trying to bring those topics  
20 to closure.

21 Work on parametric study of drift stability is  
22 some of the work I mentioned that is being closed out and,  
23 I guess completed in the total system performance  
24 assessment KTI. Essentially, we were doing work to  
25 develop a joint constitutive model that will be used in

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1 thermal-mechanical analyses and basically that work is --  
2 at least be deferred until the budget situation changes.

3 CHAIRMAN POMEROY: Mike, a couple of quick  
4 questions. In terms of when the IRSRs are going to be  
5 available, I see mid-FY97 year for most of the ones we've  
6 seen so far, and I wonder if that's true. We're about  
7 four months into FY97 now -- three or four months. Are we  
8 going to see all of these status reports in another few  
9 months?

10 DR. BELL: I think the one on topical report  
11 number 2 is likely to be doable. That won't happen for  
12 the one on design control work because the one staff  
13 member I have is working on the other topic. But it will  
14 be in FY97. And I don't know, were you just mainly  
15 concerned about this KTI or were you asking that question  
16 about other --

17 MEMBER HINZE: Well, I just saw that you're  
18 going to be producing all of these in mid-FY97.

19 DR. BELL: Well for example, the one on  
20 climate, we had a draft the last fiscal year; basically  
21 the management said, well, that's a good try but we've got  
22 this better idea; why don't you go redo it? In fact, I  
23 think we're near completion.

24 MEMBER HINZE: The other thing is more  
25 general, Mike. I'll put the questions this way. Has the

1 DOE formally conveyed to you their change in the footprint  
2 of the repository? That is, that the repository will be  
3 entirely to the west of the Ghost Dance Fault and extend  
4 further to the north, in order to provide the necessary --  
5 the accommodation for the -- in other words, they've  
6 changed the configuration.

7 DR. BELL: Yes, they've changed the  
8 configuration and --

9 MEMBER HINZE: Have they conveyed it to you  
10 formally?

11 DR. BELL: -- if by formally conveying it you  
12 mean have they come up with a new conceptual design  
13 document with a different layout, I don't think they have.

14 MEMBER HINZE: I guess that was my question.  
15 But what do you work with? I mean, that affects a couple  
16 of the KTIs that we've been talking about in some ways, in  
17 terms of where the data is for some of the infiltration  
18 and so forth.

19 DR. BELL: Well, the work we were describing  
20 that was done in '96 was really done under the previous  
21 advance conceptual design.

22 MEMBER HINZE: Okay, let me ask you this  
23 question. Does a change in the conceptual design or the  
24 conceptual footprint of the repository, affect -- you  
25 know, are you going to have to change any of this work to

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1 take into account that change?

2 DR. BELL: Not that I can identify right now,  
3 but it's a good question.

4 MEMBER HINZE: When they do convey something  
5 to you formally, could we get a copy of it?

6 DR. BELL: Okay. Yes, certainly.

7 MEMBER HINZE: Thank you.

8 DR. BELL: Basically, the next KTI on the  
9 container life and source term, DOE's waste containment  
10 and isolation strategy is based on having very long-lived  
11 waste packages that are designed to last for a thousand or  
12 more years, and that when these waste packages fail that  
13 the release rates will be very slow.

14 The design does include a double-walled  
15 container that has an outer general corrosion material and  
16 inner corrosion resistant-type material that they are  
17 relying on to provide galvanic protection of the inner  
18 package. Our program to look into these has identified  
19 the subissues at the bottom of this chart.

20 Essentially the corrosion mechanisms, the  
21 efficiency of their galvanic protection designs. An issue  
22 that always arises is when you have short-term data how do  
23 you use this to make long-term projections of performance?

24 As I mentioned earlier we're looking at  
25 microbiological corrosion and once waste packages fail

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1 we're looking at phenomena like dissolution rates and the  
2 impact of secondary mineral formations and formation  
3 colloids on release rates.

4 Now, this is another area, unfortunately,  
5 where as a result of the reduced budget, the work at the  
6 Center has been cut. I still have about two-and-a-half  
7 staff on my own staff working on this, and some of the  
8 work that the Center was doing has been picked up in other  
9 KTIs. Like some of the corrosion work is being completed  
10 in the near-field KTI; some of the work on the models has  
11 transferred into the total system performance KTI.

12 This was an area where the Center had a large  
13 effort; I think about the equivalent of five FTEs. And  
14 even with the work that's been transferred, it's probably  
15 less than two. Is that about right?

16 During FY96, I think you'll see in the next  
17 chart, one of the things we did was put out a NUREG report  
18 on dry oxidation and whether or not it's an important  
19 phenomenon to be considered in the waste package design.  
20 It's potentially a mechanism that even if DOE was  
21 successful in keeping low humidity, could begin corrosion  
22 of waste package, and we plan to publish an Issue  
23 Resolution Status Report on this.

24 Listed below are areas where we would plan to  
25 do future work but essentially we're resource limited.

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1           A number of the accomplishments that were  
2 achieved in this KTI in FY96 related to development of a  
3 computer model called EBSPAC, which is the model the staff  
4 plans to use to evaluate waste package performance and  
5 calculate the release rates in doing its own independent  
6 assessment of DOE's waste package designs.

7           The Center completed development of that code  
8 and turned it over to NRC at the end of FY96. It didn't  
9 have all the modules in it that we had originally  
10 anticipated, and basically, how we're proceeding now is,  
11 my staff is attempting in-house, to complete some of the  
12 development of that code.

13           It's basically intended to be either used as  
14 part of the TSPA code, or if it's just too large and slow  
15 to use it directly in the TSPA code, then to be used as an  
16 offline code to do detailed calculations that then would  
17 be abstracted and used in total system performance code.

18           This work is a key part of assessing DOE's  
19 waste package design and how the waste package performance  
20 affects the total system and its work that we've got to  
21 continue in-house, and hopefully it would be an area where  
22 I think if the resources at the Center got restored, it  
23 would be one of the first things that we would resume.

24           The next KTI, radionuclide transport.  
25 Basically how, after waste packages fail and contaminated

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1 liquid is transported away, how the natural barrier will  
2 delay, absorb the radionuclides and impact what eventually  
3 might reach the critical group.

4 A major subissue here is the flow of the  
5 contaminated material through fractures and how  
6 radioactive material might be retarded or absorbed in a  
7 fracture flow system rather than a porous flow system.

8 Some of the things we plan to do in this KTI  
9 are identify what are the key radionuclides impacting  
10 performance. Now we expect to have a new performance  
11 measure, a dose standard rather than a release standard,  
12 so some of the key radionuclides that we need to focus on  
13 may be different from the things that we did under the old  
14 EPA standard.

15 Reach some agreement or resolution with DOE on  
16 what are reasonable numbers for retardation of absorption  
17 of these key radionuclides. This of course, is important  
18 input to our total system performance models. Within this  
19 we get into the details of the question of isometrical  
20 flows through the fracture. Does matrix diffusion really  
21 take place or does material remain in the fractures and  
22 get transported more quickly?

23 The one individual as you note at the bottom -  
24 - this is another area where the Center support has been  
25 cut -- the one individual who's left working in this area

1 has also been looking at the mixing/dilution issue and  
2 also the chlorine-36 data on the transport of material  
3 through fractures.

4 I guess this is also the area where we had  
5 been looking at pneumatic pathways.

6 VICE CHAIRMAN GARRICK: Mike, if you believe  
7 the performance assessment, hasn't this been reduced to a  
8 very small number of radionuclides that you have to worry  
9 about?

10 DR. BELL: Hopefully.

11 VICE CHAIRMAN GARRICK: Depending on the  
12 percolation rate as far as the peak risk is concerned,  
13 it's driven by either neptunium or technetium. Does it go  
14 much beyond that?

15 DR. BELL: Well, yes, I think there's still a  
16 few more nuclides we're looking at. I see Tim shaking his  
17 head back there. Do you want to identify a few more for  
18 Dr. Garrick?

19 VICE CHAIRMAN GARRICK: Well, I'm thinking of  
20 the things that really drive the issue of peak risk way  
21 out of time. As I say, the TSPA-95 seemed to say that  
22 that was pretty much those two radionuclides.

23 DR. McCARTIN: Neptunium and technetium are  
24 important but there are other radionuclides that we're  
25 looking -- we have approximately 20 to 28 that we're

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1 looking at. Part of it's tied to, what do you want to  
2 believe for retardation and whether it's in fractures or  
3 matrix, and that does have an impact. Neptunium,  
4 certainly there's a lot of it, it's very mobile, it's  
5 slightly retarded. Technetium is the same way. But we're  
6 looking at others.

7 DR. BELL: And I guess some of the things we  
8 did accomplish in FY96. I think the Center published a  
9 general article on neptunium sorption. The, I guess "smart  
10  $K_d$ " approach to sorption modeling.

11 If you've got detailed questions on that I'll  
12 have to ask John to explain that a little better. John  
13 Bradbury's been this individual on my staff who's been  
14 following the work on the chlorine-36 that's been observed  
15 down at the repository horizon.

16 And basically, what work will continue to be  
17 done in this KTI will essentially all be showing up under  
18 other KTIs. I think there is a statement in the annual  
19 report that at least one member of the ACNW staff found  
20 alarming in that it read like we're not going to be doing  
21 anything all in transport anymore.

22 I still have the one individual on my staff  
23 who will be doing the same kinds of things but his,  
24 basically his activities will be done now under the total  
25 system performance KTI or the near-field flow. There were

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1 so little resources left in this that it just did not make  
2 good a guess fiscal sense, to budget for it. It's a  
3 fraction of an FTE on my staff.

4 Now we turn to the two KTIs that could  
5 potentially disrupt the repository system; igneous  
6 activity being one. This is an area where we devoted a  
7 lot of attention to and we think made a lot of progress.  
8 In fact, DOE itself devoted a lot of attention to the  
9 probability question in FY96 and conducted a probabilistic  
10 volcanic hazard assessment, published a report on that  
11 topic.

12 And basically it's an area where we think it's  
13 right for resolution, between the work the DOE has done on  
14 the probability of volcanism and the work that we've been  
15 doing at the Center. We have different approaches,  
16 different viewpoints, but there is an intersection of what  
17 they think the range of the probability might be and what  
18 we think the range of probabilities might be. And so next  
19 month in fact, we have a techno-exchange scheduled with  
20 them where we hope to make some progress on resolving this  
21 issue.

22 The Center has also been doing work on  
23 consequence models for volcanism. They've both developed  
24 a model for the dispersal of radioactive materials due to  
25 a volcanic event at the repository, and then using natural

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1 analog volcanoes, calibrated this, and we think developed  
2 an assessment tool for looking at consequences of  
3 volcanism that would be very useful to the licensing  
4 staff.

5           During our techno-exchange with DOE next month  
6 we also plan to lay out for them the work we have been  
7 doing. DOE's work has focused more on the probability of  
8 volcanism, and recently has not done consequence modeling,  
9 and I guess we'd like to reach some agreement on what the  
10 kinds of consequence models might make sense for them to  
11 look at, in either their TSPA that they do for the  
12 viability assessment, or certainly the one they do at time  
13 of licensing.

14           One of the things we had planned to be doing  
15 by this time was reviewing DOE's synthesis report on  
16 igneous activity, but I think as I mentioned earlier,  
17 that's been delayed. And so one of the things we'll be  
18 talking about next month is, what's the status of that  
19 document?

20           CHAIRMAN POMEROY: Does your staff know  
21 whether they're doing any work on consequences, currently?

22           DR. BELL: Not that we're aware of. In fact,  
23 I guess what our understanding is, that many of the staff  
24 who actually were doing the volcanism work at DOE are no  
25 loner on the program. Now, that doesn't mean that there

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1 aren't staff who have backgrounds in geology and igneous  
2 activity working as part of their TSPA team doing that  
3 kind of work. In fact, we hope to probe those kinds of  
4 questions next month.

5 CHAIRMAN POMEROY: Right. We'll be there with  
6 you.

7 DR. BELL: In the annual report the Center  
8 describes models that they developed for estimating the  
9 probability of volcanism, how they relate it to the  
10 structural features at the site and the past record that,  
11 I guess we think makes a strong case for supporting an  
12 approach to estimating the probability of volcanism  
13 disrupting the repository. And we'll be discussing this  
14 next month with DOE and discussing their probabilistic  
15 volcanic hazard assessment.

16 One of the things we have been doing is -- the  
17 question that always comes up is well you have this low  
18 probability but potentially high consequence events. What  
19 does it mean as far as performance is concerned?

20 And so the Center has been conducting for us,  
21 sensitivity studies, and one of the things we --  
22 unfortunately this is still work-in-progress. We don't  
23 have a good answer to that question yet, but we're doing  
24 the work to eventually answer for ourselves at least, what  
25 is the contribution of igneous activity to total system

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1 performance?

2 In the work that's been done so far we've  
3 identified some key parameters in the models. Clearly,  
4 how many waste packages would get affected, disrupted.  
5 When material gets incorporated into the erupted material,  
6 what the particle sizes might be. That has a big  
7 influence on how far material might get transported. And  
8 the incorporation ratio is another factor.

9 Another potentially disruptive event that  
10 we've been considering is the impact of structural  
11 deformation and seismicity. This KTI in fact, was the  
12 area where we reviewed DOE's topical report number 1 on  
13 the probabilistic seismic hazard assessment methodology.

14 DOE is now, in fact, in the process of  
15 implementing that methodology, conducting a series of  
16 expert solicitations where they're now using it to come up  
17 with what they're going to use as the seismic inputs and  
18 the fault displacements that ought to be considered in  
19 their designs and in their analyses.

20 My staff is -- and in fact, both my staff and  
21 the performance assessment staff have been observing  
22 these. And I think this whole area of seismic hazard  
23 assessment methodology, design methodology, and eventually  
24 the inputs, are areas where it looks like agreement is  
25 achievable and it's just a matter of continuing to observe

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1 the processes that DOE is carrying out.

2 Another important activity in this KTI is  
3 basically the understanding you have of the geology of  
4 Yucca Mountain. What are acceptable tectonic models?  
5 There are still a number of alternative conceptual models  
6 for the geology of the site, and depending on which model  
7 you use, you could have a large range in the impacts on  
8 performance.

9 During this period we had a, I guess an  
10 Appendix 7 meeting on that topic, with DOE, and I guess  
11 narrowed the range of viable tectonic models for the Yucca  
12 Mountain site. And this is an area where this fiscal year  
13 we think we could publish an Issue Resolution Status  
14 Report that, I guess had the tone that you ought to  
15 consider at least these alternative conceptual models.

16 Basically, the second bullet would be the  
17 fallout of our review of the work DOE is doing to  
18 implement its probabilistic seismic hazard assessment  
19 methodology. And as I mentioned, I think -- basically  
20 we've already agreed on the overall methodology. If they  
21 apply it the way we think it was intended to be applied,  
22 we should be able to reach agreement on this and in fact,  
23 in the schedule it will be useful for DOE's viability  
24 assessment.

25 And the last bullet you notice, this is an

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1 area where again, there are linkages between our  
2 understanding of the geologic models and other KTIs, and  
3 in fact, the relationship between faults and the  
4 probability of volcanic disruption.

5 (Slide)

6 MR. BELL: One of the outputs of this would  
7 be, in fact, an input to the EBSPAC code, some measure of  
8 the probability and magnitude of a faulting event that  
9 might disrupt the actual emplacement area in the  
10 repository and cause a release that would need to be  
11 considered in total system performance.

12 And I guess within this, there are also  
13 linkages between what we understand about the fracture  
14 system as far as geologists and what the geologists can  
15 tell the hydrologists about how that might be important  
16 for flow.

17 Finally, the last bullet, we have been  
18 developing a three-dimensional geologic information system  
19 database that I think you've had demonstrated up on the  
20 seventh floor in our computer center. If you haven't, you  
21 should.

22 We keep adding to it. It started out  
23 basically with geologic and faulting information. They're  
24 now starting to add things like the water, location of the  
25 water, table. And you can observe things in three

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1 dimensions that were really hard to visualize reading it  
2 in reports and seeing two-dimensional figures.

3 (Slide)

4 MR. BELL: The I guess listed -- each of these  
5 I think has resulted in -- well, let's see. The  
6 identified Type I faults have resulted in a center  
7 publication, where basically they looked at the faults  
8 within a large radius of the Yucca Mountain site and their  
9 historical activity and identified the faults.

10 The Type I fault is one that would need to be  
11 considered in repository performance. Essentially, it was  
12 large enough, had moved recently enough that it would  
13 impact the seismic design of the repository.

14 Okay. And I think that would be a good time  
15 for me to stop and turn it over to Budhi, but I'd be happy  
16 to answer any questions while I'm still up here.

17 CHAIRMAN POMEROY: Questions? Go ahead.

18 VICE CHAIRMAN GARRICK: On the thermal load  
19 issue, I take it that it still is one that has  
20 considerable uncertainty associated with it. Is the  
21 uncertainty mostly related to the effect of temperature on  
22 the containment performance capability of the repository  
23 or is a considerable amount of the uncertainty still due  
24 to the inventory and the heat load itself; that is, the  
25 source?

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1                   And if it's the latter, if that's a  
2 significant contribution, what consideration is being  
3 given to being able to control that given the increased  
4 tendency towards an interim storage facility? It would  
5 seem that that would be an issue that you could bound very  
6 easily if you could control the feed into the repository,  
7 which you surely could do with very simple measurements if  
8 you had an interim storage facility?

9                   I've asked several questions.

10                  MR. BELL: Well, actually I probably should  
11 have cut you off and say it's really the former. One of  
12 the issues that we had with DOE about this time last year  
13 is they were looking at a range of thermal loads and you  
14 could never get them to tell you whether they were talking  
15 about a cold repository or a hot repository.

16                  One of the things they have done in Fiscal '96  
17 is they have picked the heat loading. And so basically  
18 there is a reference number now that we're looking at.

19                  VICE CHAIRMAN GARRICK: So that would imply  
20 that they are committed to controlling the feed into the  
21 repository. Otherwise, how would they be able to pick a  
22 number?

23                  MR. BELL: Well, let's see. I've got all  
24 kinds of people jumping up.

25                  VICE CHAIRMAN GARRICK: Yes.

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1 MR. BELL: Let's see. Jeff, do you want to --

2 MR. POHLE: Jeff Pohle, NRC staff.

3 I was in Albuquerque last week and observed  
4 one of the abstraction workshops. And this one was on the  
5 thermal hydrology. No discussions of controlling the feed  
6 due to on-site storage. I think there was an assumption,  
7 at least the people who were doing the work were in a  
8 sense assuming, no controls that whatever comes in has to  
9 go in the repository.

10 So they're doing a lot of modeling work  
11 looking at line sources and the drift or where the  
12 containers are butted almost together as a heat source and  
13 then as point sources, where there's some distance. And  
14 they're talking about: What if we put in some of the  
15 defense waste in between? And you start to get into this  
16 hot/cold, hot/cold, hot/cold. And that could channel  
17 moisture toward the colder packages. They're still  
18 looking at all of these alternatives calculational.

19 That's as far as I can tell you. I don't know  
20 the planning. And maybe Rick can tell you.

21 VICE CHAIRMAN GARRICK: My only point there is  
22 that that part of the problem would be -- it seems to me  
23 there's great opportunity for minimizing the uncertainty  
24 associated with that part of the problem.

25 MR. POHLE: Yes. They made it clear, at least

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1 the people who have to do the calculations. There is a  
2 lot of uncertainty in the waste stream to them. So  
3 they're dealing with it, but, like I say, there were no  
4 discussions on controlling that through other ways.

5 MR. BELL: But I would say for our technical  
6 program, I'd say we would approach that as, well, that's  
7 an engineering --

8 VICE CHAIRMAN GARRICK: Yes.

9 MR. BELL: -- question. I mean, we're focused  
10 more on the physical phenomenon, the couplings and such,  
11 and the ability of the model, the impact of heat on the  
12 hydrology, the chemistry.

13 VICE CHAIRMAN GARRICK: Yes. My only point is  
14 that if there are opportunities for fixing some of these  
15 things, how much attention is being given to those  
16 opportunities. And why are we not putting more effort to  
17 reducing the uncertainties about which we have some  
18 flexibility and control over?

19 Part of your answer is that that's not the  
20 greater source of uncertainty, it's more on the  
21 containment end than the inventory end. But I think the  
22 gentleman who was just up there did say they still haven't  
23 resolved the inventory question yet.

24 MR. WELLER: Dr. Garrick, Rick Weller from the  
25 NRC.

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1           Let me mention a couple of other things that  
2 are important in this consideration. And one is the  
3 period of operations. I hear DOE now talking about a  
4 150-year period of operation in which with the operation  
5 of a ventilation system, they can dissipate that heat for  
6 a longer period of time. Right now they're committed to a  
7 minimum operational period of 100 years.

8           The other important consideration is the use  
9 of backfill. And when you place that backfill, if your  
10 strategy is to dissipate as much heat up front before you  
11 close the repository and place backfill if indeed DOE  
12 intends to use backfill late in that period, that's  
13 another opportunity to dissipate that heat before they  
14 essentially create somewhat of an adiabatic system by  
15 placing backfill in the repository.

16           So those are a couple of things that DOE is  
17 considering to minimize that impact as best they can.

18           VICE CHAIRMAN GARRICK: Thank you.

19           CHAIRMAN POMEROY: Other questions. Bill?

20           MEMBER HINZE: Yes. Just to make a point,  
21 Mike, I want to draw your attention to the fact that there  
22 is a spelling error in the caption of Page 486. We're  
23 trying. Okay? Maybe a little too trying.

24           A few general questions that will help me to  
25 get a flavor of what is going on with the KTI and the

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1 vertical slice approach. You have terminated, at least  
2 for the time being, activities on some of the ten KTIs, if  
3 I understand correctly, because of budgetary problems.

4 What I haven't heard here is whether you  
5 anticipate closing out and reaching issue resolution with  
6 DOE on any of these KTIs during this next fiscal year or  
7 will they all be achieved in '98? What's looking ahead  
8 here?

9 MR. BELL: The three KTIs where the budget has  
10 been cut, we --

11 MEMBER HINZE: I'm talking about them all.

12 MR. BELL: Oh, them all. Okay.

13 MEMBER HINZE: All of them, looking ahead.

14 MR. BELL: Well, basically the things we laid  
15 out are things that we think are important to do and are  
16 doable by the time of the viability assessment. By the  
17 time of licensing, essentially not only these ten KTIs but  
18 all the other things in the program that were cut in the  
19 last round of budget cuts are back on the table.

20 MEMBER HINZE: You anticipate all of these  
21 remaining on your KTI list until --

22 MR. BELL: Oh, yes. Those are issues. I  
23 mean, the issues haven't gone away. The issues are still  
24 there. They're just --

25 MEMBER HINZE: That clarifies it.

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1 MR. BELL: -- being worked on at a reduced  
2 level.

3 MEMBER HINZE: What's in the wings? What's in  
4 the wings? One of the concerns about the KTI that  
5 certainly was addressed by everyone was: Maybe we're  
6 missing something here. There are holes in what we're  
7 doing or holes in what DOE is doing. Your budget was  
8 ramped up.

9 Do you have any idea of what the next KTI that  
10 would be added to this list of --

11 MR. BELL: We're hopeful we might be able to  
12 get back to these ten. You're saying: Well, if there  
13 were an 11th, --

14 MEMBER HINZE: Yes, right.

15 MR. BELL: -- what would that be? I don't  
16 remember, but when we went and identified these ten KTIs,  
17 we went through a systematic process. There is a list.  
18 And somewhere there is --

19 MEMBER HINZE: But as a result of one of the  
20 ingredients that we were enamored with, or at least I was  
21 enamored with, is that the KTI and the vertical slice  
22 approach had this flexibility so that we would learn as we  
23 went along and perhaps develop KTIs.

24 We have learned there have been some really  
25 significant changes, as you pointed out, in what DOE has

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1 learned in the last year. The window is changing.

2 MS. FEDERLINE: Mike, can I respond?

3 MEMBER HINZE: Does this lead us to other  
4 KTIs?

5 MS. FEDERLINE: I think we feel, we felt at  
6 the time we came up with the KTIs, that these are the big  
7 picture issues. I mean, we have been studying the  
8 mountain for a long time, as has DOE.

9 I think where we're seeing some shift in  
10 emphasis is the change in the vertical slices within the  
11 issues. And that is becoming apparent to us as we follow  
12 DOE's program. As Tim McCartin would say, as we develop  
13 the standard, as we understand, as it becomes clear what  
14 critical group we are working with, there are changes in  
15 the vertical slices that are going to occur.

16 But in terms of the big picture issues, Mike  
17 and Budhi can answer, but I don't see any fatal flaws  
18 coming down the pike. At least we haven't recognized one  
19 to date that would suggest we would be adding an 11th  
20 issue.

21 MEMBER HINZE: You've answered, in part, my  
22 next question. And that is you've completed your first  
23 full year of looking at a number of these KTIs. What  
24 about lessons learned internally? What about integration?  
25 What lessons have you learned about the integration

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1 problem? That was brought up. What have you learned  
2 about your interactions with DOE? What is the --

3 MR. BELL: It's a shame John Thoma isn't  
4 following me directly. That's exactly the kinds of  
5 questions we've been asking and that he's going to share  
6 with you.

7 I mean, some of it's not as good as we had  
8 hoped, but, as you say, it was our first year. And we're  
9 looking at how well we worked and where there were  
10 weaknesses and trying to improve it. But I think we ought  
11 to just let that wait until John's presentation and let --

12 MEMBER HINZE: We can defer.

13 MR. BELL: -- Budhi finish up this part of the  
14 presentation.

15 CHAIRMAN POMEROY: Anything else?

16 (No response.)

17 CHAIRMAN POMEROY: Margaret, can I interject  
18 here? As you know, we're going to talk to you and John  
19 Greeves.

20 MS. FEDERLINE: Yes.

21 CHAIRMAN POMEROY: You're on the schedule at  
22 10:45. Do we have sufficient time to hear everything that  
23 we need to?

24 MS. FEDERLINE: Yes, yes. As we understood  
25 it, you were willing for this part to run over by perhaps

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1 15 minutes and then John would run over by perhaps 15  
2 minutes. We had discussed that with your staff.

3 CHAIRMAN POMEROY: Right.

4 MS. FEDERLINE: Is that still agreeable?

5 CHAIRMAN POMEROY: That's still valid.

6 Welcome, Budhi.

7 MR. SAGAR: Thank you. Thank you.

8 (Slide)

9 MR. SAGAR: Good morning. My name is Budhi  
10 Sagar. And I work at the Center for Nuclear Waste  
11 Regulatory Analysis in San Antonio. John Austin couldn't  
12 be here as he's in Nevada attending the NWTRB meeting. So  
13 it's my duty to present the last two of the ten KTIs.

14 I would support Margaret's earlier view that  
15 when we sat as a board to choose the ten KTI issues, I  
16 think we covered most of the issues we could think about  
17 that are important to performance. And I don't see  
18 bringing in new issues, even though, depending on the  
19 budget constraints, emphasis within an issue would change.  
20 And that essentially means the vertical slice approach.  
21 The emphasis might change.

22 The night KTI we talk about is the EPA  
23 standard KTI, which is slightly different from the other  
24 nine KTIs in the sense that this is not directly related  
25 to assessing the performance. This is related to setting

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1 a standard, the EPA standard, and then eventual  
2 modification or revision of the 10 CFR 60.

3 All parties to the ways to program are, of  
4 course, affected by the EPA standard, including NRC and  
5 DOE. And the primary NRC interest is to assure that the  
6 standard that would be set would be implementable, that it  
7 would be practical in a manner that you don't have to go  
8 through many gyrations to establish whether the standard  
9 is met or not.

10 There are four main subissues that were  
11 defined that are of importance in setting the standard.  
12 The compliance period is one. There's a question whether  
13 you should look for the peak risk time or you should set a  
14 period up front, like 10,000 years.

15 The selection of the critical group, the  
16 location of the critical group, the definition of the  
17 critical group is another one. How to evaluate the human  
18 intrusion, whether there's a stylized scenario, or to  
19 include this in the overall dose calculation is the other  
20 issue. And should we or shouldn't we define disruptive  
21 events up front in the rule or should we leave it open to  
22 be defined later is the other last one that we looked at.

23 The primary way we did all this is to do some  
24 analysis, preliminary analysis, ourselves and then provide  
25 the results to EPA, discuss the results with the EPA staff

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1 so they would have that in their hands while they  
2 formulate a standard.

3 (Slide)

4 MR. SAGAR: We intend to continue that  
5 interaction with EPA. I don't know the latest status of  
6 where the draft EPA standard is. It went to the OMB, I  
7 understood. But maybe some NRC staff could update us on  
8 that issue. I don't know where that is.

9 MS. FEDERLINE: Tim McCartin is our liaison  
10 with EPA.

11 MR. McCARTIN: Yes. No, the standard has not  
12 gone to OMB.

13 MR. SAGAR: Oh, it has not?

14 MR. McCARTIN: Yes, it's still at EPA.  
15 They're still discussing certain aspects of it. We would  
16 hope it gets soon to OMB, but we don't have a date as yet.

17 MR. SAGAR: Okay. On the time period of  
18 interest, we thought of four different factors that might  
19 affect the choice. The relative radioactive hazard is a  
20 purely technical aspect of it, which is: Could we look at  
21 at what time does the hazard equal or is similar to that  
22 of an old body, for example? And maybe that would be an  
23 appropriate time for the compliance period.

24 The peak dose if that's of interest, as the  
25 NAS standard had suggested, then the peak dose, the time

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1 at which the peak dose occurs is also a function of the  
2 location of the critical group. It's not a totally  
3 independent factor. And we tried to see how the peak  
4 dose, the time of the peak dose, would be affected as the  
5 critical group location change.

6 Similarly, the time period, the compliance  
7 time period, is also affected by the disruptive events.  
8 That is, if you have a longer compliance period and some  
9 disruptive events, weakness activity, for example, could  
10 happen more than once in that period. And the way you  
11 would implement such a standard would have to change  
12 somewhat.

13 It's a policy issue in the end, despite the  
14 technical considerations. So the public comments and the  
15 NRC policy, the past precedence, would play a role. We  
16 knew that.

17 On the reference biosphere, the location and  
18 the definition of the critical group, the exposure  
19 scenarios will become part of the standard in some way.  
20 And this is different from the remanded EPA standard  
21 because that was based on a five-kilometer location and  
22 cumulative release, rather than the dose.

23 The human intrusion scenario, again, the NAS  
24 recommendation was to treat it as a stylized scenario  
25 separately from the other scenarios, reason being that

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1 once the site is selected, the human intrusions -- you  
2 could use the human intrusion scenario to distinguish  
3 between sites, but once you have a site, you have it. So  
4 you still have to, of course, look at the possible  
5 consequences, but should we or shouldn't we include that  
6 as part of the overall dose calculation? So we have to  
7 take a position on that.

8 (Slide)

9 MR. SAGAR: All of these issues were  
10 considered in F.Y. '96, preliminary calculations were done  
11 and discussed with the EPA staff. We found, for example,  
12 that the relative radiation hazard from the waste was  
13 within a factor at about 10,000 years. There's a lot of  
14 uncertainties, a lot of assumptions made in that  
15 calculation, but if you look at the relative hazard,  
16 10,000 years is not a bad selection, bad choice for the  
17 compliance period.

18 The peak dose certainly depended upon the  
19 location of the critical group. As we move the critical  
20 group out from the repository, the time for the peak dose  
21 increased. So you could go as high as 100,000 years or  
22 between 100,000 to a million years if you were just  
23 looking at the peak dose.

24 And, again, this is still being considered,  
25 but I think that most people who have looked at this issue

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1 favor fixing a time, rather than leaving the peak dose and  
2 leaving the compliance period unstated in the rules. So  
3 10,000 years still is favored.

4           The human intrusion, we did a stylized human  
5 intrusion analysis stylized in the sense that a single  
6 bore hole would interrupt the repository and will bring up  
7 some waste. And we calculated the dose and found that it  
8 does not affect the performance a whole lot. I think most  
9 of the technical staff that has looked at that issue  
10 believe that a stylized human intrusion would be  
11 acceptable to be done, that probably you don't need to  
12 include human intrusion as part of the overall system  
13 performance.

14           Again, the importance of disruptive events is  
15 dependent upon the choice of the compliance period as the  
16 compliance period increases, the repetitive occurrence of  
17 a disruptive event has to be considered.

18           For example, roughly speaking with a very  
19 preliminary back-of-the-envelope calculation, the  
20 importance of igneous activity may go up by a factor of  
21 two or three if we extended the time period to a million  
22 years because of the possibility of multiple volcanic  
23 events happening.

24           (Slide)

25           MR. SAGAR: The last KTI is the total system

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1 performance assessment. And you will note the inclusion  
2 of the word "integration" in the title of this KTI because  
3 it was thought that the integration would indeed occur at  
4 the level of the total system, that all of the other KTIs  
5 would bring in input to the total system KTI and that a  
6 total system KTI would be able to look at the big picture,  
7 at the system picture, and be able to tell us which  
8 particular aspect of this system was really important to  
9 performance.

10 As was stated earlier, the management board  
11 set up a subgroup of four people to look at the  
12 integration aspects. That group talked to all of the KTI  
13 leads, and we looked at the issues like: Is the  
14 integration being really effective? I think that's always  
15 an issue. It's good to use the word, but the  
16 effectiveness of actually doing the work and trying to say  
17 at the end that the integration did happen is not always  
18 easy. And John Thoma would come after me to brief you on  
19 what we found on that issue.

20 On the system level, obviously all of the 15  
21 hypotheses of DOE's waste calculation with containment and  
22 isolation strategy apply. Again, I guess we have to think  
23 in the sense that these are just hypotheses and that DOE  
24 would indeed try to show that those hypotheses hold. And  
25 if they do hold, then we want to see whether the

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1 performance standards are met or not.

2           There are two major components if we divide  
3 into subsystem level. One is that the containment of  
4 radionuclides would be affected, near total containment  
5 of radionuclides and the engineered barriers would be  
6 affected for thousands of years. And this is based on a  
7 combination of low calculation rates and heat load, some  
8 optimum heat loads, at which the containers don't get wet  
9 too soon.

10           And that necessarily doesn't mean a very high  
11 heat load. That doesn't necessarily mean a cold  
12 repository. There is an optimum heat load which gives you  
13 the highest container life. And if all the 15 hypotheses  
14 held, then the end-ward dose to an individual in a  
15 critical group would be below the regulatory limit, would  
16 be acceptable.

17           We are interested under this KTI to look at  
18 whether the abstraction process that the DOE would follow  
19 for doing their total system assessment is reasonable, is  
20 acceptable or not.

21           And we would also be interested in seeing the  
22 level of the proof, the level of investigation that the 15  
23 hypotheses are indeed addressed adequately in the  
24 system-level performance.

25           The third tick mark here is an internal

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1 objective for NRC, which is that: Using the total system  
2 performance, can we assess the relative importance of each  
3 one of these issues, the 10 K technical issues, or even  
4 within an issue, could we through sensitivity analysis,  
5 through importance analysis check the relative importance  
6 to total system importance so that the allocation of  
7 resources and the definition of work from year to year  
8 could be improved?

9 (Slide)

10 MR. SAGAR: Again, as Mike had shown you for  
11 the earlier eight KTIs, we intend to write the issue  
12 resolution status reports. When we say issue resolution  
13 status reports, the acceptance criteria are part of them.  
14 This is in lieu of the license application review plan.

15 So we do want to focus the staff on thinking  
16 that: If there is an issue or a subissue, what is the way  
17 to resolve it that we can think about? And how would we  
18 know whether we are close to resolution or not?

19 That's all acceptance criterion means, if this  
20 is done, if that is done, if method is like this, if data  
21 is like this. Then yes, we are close to resolution.  
22 That's essentially what acceptance criteria would look  
23 like.

24 The model abstraction is a major issue in the  
25 total system performance level. There are all sorts of

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1 simplifications. We all agree that simplifications would  
2 be done. It's a question of how those simplifications  
3 would flow into the system-level performance and whether  
4 at abstraction that level of simplification would provide  
5 you a reasonable estimate, a conservative estimate, of the  
6 overall performance.

7           We have done an audit review of TSPA-95. This  
8 is DOE's TSPA completed in '95. And based on DOE's own  
9 sensitivity analysis, we would select a few areas, a few  
10 critical areas, a few sensitive areas, that would be  
11 checked independently by the NRC staff.

12           This is the same method that we intend to  
13 follow in reviewing the viability analysis as well as the  
14 license application; that is, do an audit review first of  
15 the entire performance assessment, look at what areas are  
16 critical, and then those selected topics, do an  
17 independent calculation to see that things are acceptable.

18           For that, we do need to maintain NRC PA  
19 capability in the sense of codes, in the sense of  
20 expertise to perform such an analysis. And there's a  
21 desire to provide early feedback to DOE. Most of the  
22 thinking is that before the viability analysis is on the  
23 street, we should be able to indicate what the critical  
24 issues and that DOE ought to be able to have an  
25 opportunity to include those or to resolve those in the

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1 viability analysis; TSPA, for example.

2           The relative importance of the waste  
3 containment and isolation strategy hypothesis, which are  
4 15 in number, to the system performance, that's another  
5 one of the issues. Again, we think that the importance  
6 will tell us how much resources, how much time to devote  
7 to some of these. These include a study of parameter and  
8 model uncertainties and the scenario methodology.

9           The last bullet here is the documentation of  
10 TSPA. I think most of the people have realized at the  
11 international level in various other nations that the  
12 understanding of the performance assessment through proper  
13 documentation is quite important in the sense that the  
14 reader ought to be able to understand what changed, what  
15 presumptions were made, what data was used, et cetera, et  
16 cetera. So this would state what's the expectation on the  
17 documentation of TSPA.

18           (Slide)

19           MR. SAGAR: What we did in F.Y. '96 included  
20 an audit review of TSP in '95 and a meeting. This was a  
21 technical exchange with DOE that provided them the audit  
22 review comments.

23           The first four tick marks were the main  
24 comments that were provided to DOE. That is, the DOE used  
25 an infiltration and percolation model, which uses low

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1 percolation rates. And it's a non-conservative  
2 assumption.

3           The DOE is depending we believe significantly  
4 on dilution to meet the system performance requirement.  
5 This didn't use to be the case when there was a time when  
6 the performance requirement was supposed to be met at the  
7 interface of the unsaturated and the saturated zone. That  
8 has changed.

9           There is significant emphasis on dilution and  
10 mixing in the saturated zone now. We thought that the  
11 dilution factors calculated or used in TSP in '95 were  
12 overly optimistic, were larger than the logic given in  
13 TSP-95 would support.

14           For the calculation of the container life, the  
15 temperature and humidity calculations were not  
16 well-documented. By that, we mean if we tried to  
17 reproduce them, there wasn't enough data in the  
18 documentation that we could pick it up and say, "Okay.  
19 Well, let's check if the temperature and humidity are  
20 calculated correctly." And there were some assumptions  
21 that would give you non-conservative results.

22           The waste package failure models were limited  
23 to general corrosion and pitting corrosion, but other  
24 failure modes like mechanical loads and hydrosion  
25 embrittlement, et cetera, were not included in TSP-95.

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1           The other bullet that's not here is that in  
2 TSP-95, DOE did not consider any disruptive events.

3           The overall result was that, in fact, the two  
4 major things that happened in TSP-95, for example,  
5 compared to TSP-93 were that in TSP-95, the source terms  
6 were much lower than in TSP-93.

7           The end result, the dose as well as the  
8 cumulative release calculated were quite low.

9           MEMBER HORNBERGER: Budhi, I have a question  
10 of clarification here. When you do this, I guess my  
11 question revolves around the use of the word  
12 "non-conservative" here.

13           It's my understanding that this is to be a  
14 performance assessment, that it's to incorporate  
15 probabilistic elements. Therefore, I wouldn't expect  
16 individual assumptions to be conservative in the normal  
17 use of the word.

18           Have I missed something or is this --

19           MR. SAGAR: No, you haven't missed something.  
20 But even in a probabilistic setting, let's say we are doing  
21 a probability distribution up in filtration. Whether you  
22 assume the mean of that distribution to be three  
23 millimeters or ten millimeters is an issue; right?

24           You have included a band of uncertainty, but  
25 you can skew the distribution. You can set the mean

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1 differently. And that's what makes it conservative or  
2 non-conservative.

3 MEMBER HORNBERGER: Yes. But it's really not  
4 -- well, you said they used the wrong distribution, not  
5 that they were non-conservative.

6 VICE CHAIRMAN GARRICK: George, the real  
7 answer is they haven't really gone probablistic all the  
8 way yet. It varies --

9 MR. SAGAR: It's a mixture.

10 VICE CHAIRMAN GARRICK: -- depending on where  
11 you're looking in the analysis.

12 MR. SAGAR: I would hesitate to call anything  
13 wrong. That's my problem. So I would rather say, "Well,  
14 it's non-conservative." Okay.

15 (Slide)

16 MR. SAGAR: The NRC and the center staff have  
17 worked over several years to write a computer code, which  
18 is called total system performance assessment code, TPA  
19 code, which would be a vehicle for us to, a tool for us to  
20 review, to do the independent calculations ourselves. And  
21 it's a code that is still developing. We enhance it. We  
22 add the new modules, the new thinking, the new  
23 abstractions, et cetera, et cetera. So that is still  
24 going on.

25 A couple other things that were done in F.Y.

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1 '96: A branch technical position on expert elicitation is  
2 now published as a NUREG. That is out on the street.

3 And we set up a licensing support system, a  
4 test bed, a test system, at the center that people could  
5 access on the internet. And there would be documents  
6 noted in the LSS test bed. So we have an experimental  
7 setup, a test setup, that's functioning at this point.

8 CHAIRMAN POMEROY: I read that last night,  
9 Budhi. And I was very interested in it. Can we get --

10 MR. SAGAR: Oh, you bet. We can give you a  
11 test.

12 CHAIRMAN POMEROY: Can we get some  
13 instructions on how to get into it?

14 MR. SAGAR: Yes. In fact, we have the center  
15 staff here today. And any time we can provide you that.

16 CHAIRMAN POMEROY: Okay. Very good.

17 MR. SAGAR: We'll log on and show you how it  
18 works.

19 (Slide)

20 MR. SAGAR: This slide should really come  
21 after John Thoma's discussion, but I think to save time,  
22 I'll just summarize it now.

23 CHAIRMAN POMEROY: Great.

24 MR. SAGAR: As you have heard from Margaret  
25 and Mike, in response to the resource constraints that

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1 were imposed on the program, the entire NRC program was  
2 refocused for high-level waste in F.Y. '96, and we chose  
3 the ten key technical issues to focus staff's work. And  
4 it's being again refocused, as you heard, during a  
5 presentation in F.Y. '97 due to further constraints, where  
6 three of the KTIs are not fully being worked at at this  
7 point.

8           We correlated the NRC key technical issues and  
9 the vertical slices under them to the DOE's hypothesis for  
10 waste isolation because we thought the best thing we could  
11 do as a regulator would be to verify those hypotheses. If  
12 we can verify them and if we can show they're together,  
13 those 15, if it helps you meet the system standard  
14 performance, well, then it's okay.

15           Again, as a mechanism for focusing work, we  
16 said staff ought to not only look at problems that exist  
17 but also how those problems would be solved, what would be  
18 a reasonable path to resolving those problems, and  
19 actually think about the methodology and the data that you  
20 will need. We intend to document that starting with F.Y.  
21 '97 in the issue resolution status reports.

22           We believe that significant progress was made  
23 on these aspects of the key technical issues. And I've  
24 already said that in the future we do intend to let DOE  
25 and others know what the thinking is through publishing

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1 the issue resolution status reports, which, again, would  
2 be brief reports.

3 We don't intend to provide comprehensive  
4 literature review on what exists, et cetera, et cetera.  
5 It would be maybe, my guess, five pages, ten pages long.  
6 It would basically state. "Here is the issue. This is  
7 what we think" and be done. And this would be acceptable.

8 Thank you. Any questions?

9 CHAIRMAN POMEROY: Thank you, Budhi.

10 Are there any critical questions?

11 MEMBER HINZE: I've got to ask a question  
12 about that last one because I'm still confused. You've  
13 got "Issue Resolution Status Reports to Close" the  
14 "Subissues at the Staff Level." Does this mean that if  
15 you have issue resolution, that you close it at the staff  
16 level necessarily?

17 MR. SAGAR: My understanding is that if we can  
18 come to an understanding on a unique part that would  
19 resolve and we have the tools at the NRC staff level to do  
20 that, we would devote those resources to something else.  
21 We would be done.

22 Margaret may choose to look at it very  
23 differently.

24 CHAIRMAN POMEROY: Margaret?

25 MS. FEDERLINE: Yes. You have to keep in mind

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1 with the definition of issue resolution, which we have  
2 achieved as part of the agreement with DOE, it means staff  
3 has no further questions at this point in time.

4 But, as I was indicating in my presentation,  
5 we're going to be looking at the relative importance of  
6 these things in the performance assessment. And, of  
7 course, if our understanding of our resolution changed, we  
8 would be able to go back and modify that because under our  
9 agreement, it says if new information comes to light.

10 But we want to have some definitive milestones  
11 of based on what we know today, that it makes sense to  
12 agree at this point and devote our resources elsewhere.

13 MEMBER HINZE: Thank you.

14 MR. SAGAR: And, as Margaret said earlier, if  
15 DOE chooses to adopt another method, which is okay, then  
16 you still have to go look at that method to assure  
17 yourself that that's acceptable or not.

18 CHAIRMAN POMEROY: Okay. I guess that's it,  
19 Budhi. Thank you very much.

20 MR. SAGAR: John, it's all yours.

21 MS. FEDERLINE: Let me say while John is  
22 getting hooked up. We are sort of in an introspective  
23 process in the high-level waste, you know, shrinking  
24 budgets, a multidisciplinary program, very long time  
25 periods.

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1           So one thing that the board decided in forming  
2 this task group was it makes sense to go back and ask  
3 ourselves some questions. Are there any things that we  
4 can do to improve the way we're operating because we're  
5 making transitions?

6           Our attempt was to form this small group who  
7 would go around and talk to people, hopefully people would  
8 be comfortable talking to this group and we would really  
9 get people's true ideas about how things are going.

10          So, with that, let me turn it over to John.

11          CHAIRMAN POMEROY: John, welcome.

12          (Slide)

13          MR. THOMA: Thank you.

14          6.2 STATUS REPORT ON THE INTEGRATION TASK FORCE

15          My name is John Thoma. And I'm here to give  
16 you a status report on the integration task report. I was  
17 hoping to say that Mike Bell and Budhi covered all of the  
18 issues. But they kept deferring to me. So I guess I'll  
19 have to go ahead. And in the interest of saving time, I'm  
20 going right to Slide 3. Slide 2 was just an outline of my  
21 presentation.

22          (Slide)

23          MR. THOMA: To give you a little bit of a  
24 background, in mid July to late July, the management board  
25 started raising questions in its discussions about the

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1 integration of our efforts. They had looked very closely  
2 at each individual KTI and had brought the KTI and  
3 discussed it in detail.

4 But questions were raised about how  
5 effectively the KTI has been integrated. And the answers  
6 were not immediately obvious. So the management board  
7 decided to put together a task force to investigate it.

8 The task force consisted of: Budhi Sagar from  
9 the center and the NRC staff of Norm Eisenberg, Keith  
10 McConnell, Robert Johnson, Sandy Wastler, and myself. And  
11 I was named chairman of the group.

12 We were specifically tasked with looking at  
13 integration. We were not looking at the technical  
14 adequacy of each individual KTI but how is the program  
15 being integrated.

16 We conducted interviews with all ten KTI team  
17 leads, including their center counterparts. We gave them  
18 written questions in advance. We had an interview with  
19 each one of them that lasted between one and two hours.

20 We did emphasize to the team leads at that  
21 time that we were not direction-setting, we were simply  
22 gathering information. If they felt like corrective  
23 action needed to be taken at that time, they should bring  
24 it up through their management chain. And they did. I  
25 have a slide that will discuss some of the changes that

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1 were made because of that.

2 (Slide)

3 MR. THOMA: Some of the overall observations  
4 that we made before we got to our conclusions were there  
5 were some positive aspects to what the program was doing.  
6 It was focused on the more significant issues.

7 We did find and they are doing more work  
8 towards sensitivity analysis because we've still got to  
9 determine: From the overall perspective, are the most  
10 important vertical slices being done? But they were still  
11 making the attempt of what they had right now to focus on  
12 the most important issues.

13 The TSPA-95 review was an audit review. It  
14 was a complicated review that had to be integrated across  
15 all the KTIs. It was done straightforward, fairly short  
16 fashion with the teams getting assignments, doing them,  
17 and coming back. We thought it was a good example of an  
18 integrated effort that worked. There was a good meeting  
19 with DOE. The ACNW was briefed on that meeting.

20 The KTI involved with the EPA standard, again,  
21 had a series of very short deadline items where they were  
22 making recommendations on what comments we would give to  
23 EPA. They had to be coordinated across and integrated  
24 across all the ten KTIs. It took a big effort for them to  
25 do that, and we thought that was a good example of a team

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1 that was in operation.

2           If you look at our KTI implementation plans,  
3 -- and you can read them in the annual report that you  
4 have a copy of -- there's a whole section devoted to  
5 input/output tables. And that section is a good effort at  
6 identifying what needs to be integrated.

7           The last thing that we thought was good, that  
8 we had tied our plans, we had linked them in with DOE's  
9 waste containment isolation strategy because we also need  
10 to integrate the national program. Things that we think  
11 are important we ought to make sure that DOE thinks are  
12 important and vice versa. And by linking our two programs  
13 to common elements, that was a way to achieve that.

14           (Slide)

15           MR. THOMA: However, we did reach a conclusion  
16 that there was room for improvement. The individual plans  
17 were working fairly well, but, for example, the  
18 input/output sections needed to have better follow-through  
19 to make sure that those actions were really being done.

20           A couple of examples. People knew they had to  
21 provide an output to another KTI. They didn't necessarily  
22 go to the other KTI and say, "What schedule do you need it  
23 by? And what format do you want it in?" nor did they ask  
24 somebody who was supposed to provide them an input.

25           We found examples where the same element was

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1 being computed by three different KTIs for valid reasons.  
2 Take temperature. Temperature was calculated in the far  
3 field. Temperature was calculated in the near field. And  
4 temperature was calculated at container wall. A simple  
5 question we asked was: Do these calculations converge at  
6 the boundaries?

7           They weren't sure. It wasn't an area they had  
8 looked at because they had been focusing in the area of  
9 their KTI. And that was something that was going to have  
10 to be done because you would hate to have some kind of  
11 step change in your performance change code because of a  
12 difference in assumptions or things of that nature.

13           Performance assessment was an area that we  
14 felt that coordination and integration needed improvement.  
15 There were a lot of instances where individual KTIs knew  
16 what they were doing and said, "We're going to pass this  
17 off to the performance assessment. That black box is  
18 going to do whatever it is and come back and tell me if  
19 it's important or not."

20           And we're saying, "No. You should be over  
21 there understanding why performance assessment is coming  
22 back with the priority ranking that they come up with.  
23 And you should agree with it. And if you don't agree with  
24 it, it should be something that we discuss."

25           Now, this started back in August. And, as a

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1 result of these interviews, people's attentions were  
2 focused on integrations, and actions were taken. The task  
3 force itself has not taken credit for these actions.  
4 These are things that by raising people's awareness, they  
5 stepped forward and started making some changes.

6 (Slide)

7 MR. THOMA: Some of the more significant ones  
8 that we put up here were our KTI activity tables were  
9 updated to include better scheduling of: When do I need  
10 this? Many people were working with the viability  
11 assessment in late '98, "That's when my input is due" when  
12 the real answer is "My input may be due mid '97 so TSPA  
13 can have an output by late '98."

14 In our implementation plans that we developed  
15 for '97, we've done a better job in not only discussing  
16 schedule but: What format should it look like? What are  
17 they really needing to have handed off to them?

18 And something that would be transparent to  
19 most people but we found significant, we also did a better  
20 job of tying the KTI implementation plans to the  
21 high-level waste operating plan.

22 High-level waste operating plan is a plan  
23 that, like all the operating plans for the office, go up  
24 to the office director. Things that are on the plan tend  
25 to have more management attention. And by making sure

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1 that some of the important integration activities are in  
2 the operating plan, that places more management attention  
3 on making sure that they're done.

4 We have a Yucca Mountain team meeting that  
5 meets every Wednesday morning. We canceled it this  
6 morning so that most of the members could be here. But  
7 we're working in that team meeting to open a better  
8 dialogue.

9 We used to just have a general discussion of  
10 "All ten KTIs, report what you're doing." What we're  
11 attempting to do is each week take two of the KTIs and  
12 have them go in more detail of what they're doing and what  
13 help they need from other KTIs, things of that nature.

14 Members of the management board are coming to  
15 the Yucca Mountain team meeting and engage in a more  
16 active discussion with more of the staff on, "Where is the  
17 program going? What would the management board like to  
18 see?"; things of that nature.

19 Outside of this task force, division  
20 management did bring in an outside consultant, a man by  
21 the name of Bill King, to look at how we were doing on  
22 forming our teams and how our teams were doing working  
23 together.

24 Now, he produced a detailed report. And, yes,  
25 his report said that we had areas where we could improve

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1 or areas that we need to focus on, but I think one of the  
2 important things and one of the important inputs that I  
3 got from his report was he said, based on his experience  
4 of looking at other government agencies and nonfederal  
5 identities, we were doing a fairly good job in our  
6 team-building effort. We had things that we could  
7 improve, but overall we were focusing on the right issues.

8 I was glad to see that in his report because  
9 when you're in the midst of that and you don't have  
10 experience dealing with teams a whole lot, there are  
11 problems. You don't know their significance or how  
12 they're related. That's not saying he gave us a clean  
13 bill of health. He's saying there are some things we  
14 could do, but I thought that was positive.

15 (Slide)

16 MR. THOMA: Now, the task group put together  
17 some 16 to 18 specific recommendations. The ACNW has been  
18 provided with a copy of the initial recommendations that  
19 we gave to the management board.

20 The management board -- this slide here  
21 summarizes the three major areas where you could divide  
22 those recommendations. The management board took those  
23 recommendations, held an all-hands meeting, where we  
24 internally discussed them. The management board now has  
25 taken both our recommendation and the results of that

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1 all-hands meeting and are determining what our future  
2 course of action will be.

3 They want to have something -- it won't be  
4 something where the management board says, "One, two,  
5 three, four, five. This is what you do. Integration is  
6 done. It's over." It's: How will the program better  
7 integrate itself in the future? How can we put into the  
8 management line focuses on the proper integration? And  
9 how can we make sure we have staff buy-off?

10 So I imagine a lot of the things that will  
11 come out of the management board decisions will be other  
12 activities that the individual KTI teams or other groups  
13 will have to put together to come up with a plan of  
14 action. But that will take a period of time.

15 That summarizes what I have to say. Are there  
16 any particular questions?

17 CHAIRMAN POMEROY: Great. Thank you, John.  
18 Are there questions?

19 6.3) ROUND TABLE DISCUSSION

20 VICE CHAIRMAN GARRICK: I think this is great.

21 CHAIRMAN POMEROY: Yes. In a nutshell, that's  
22 the --

23 MR. THOMA: Okay.

24 MEMBER HINZE: I do have one question. And  
25 that is you have done an excellent job of providing us

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1 with basically lessons learned internally and in terms of  
2 integration. I'm wondering if there are any lessons  
3 learned in terms of the interaction with DOE with the KTI  
4 and the vertical slice approach.

5 MR. THOMA: Well, one of the things that --  
6 and I don't know if you'd call it a lesson learned, but  
7 one of the things that we have focused on, even before we  
8 did the integration task effort, is started a real focus  
9 about a year ago. Every meeting had to have an objective.  
10 You had to go into the meeting with what you wanted to  
11 accomplish. And you had to communicate it in advance to  
12 DOE. Now, I think that's had a very positive impact.

13 Now, it hasn't been easy because staff was  
14 used to getting a lot of status reports. DOE was used to  
15 giving a lot of status reports. But the management of  
16 both sides agree that you can't just have a meeting for a  
17 status report. There ought to be something that you're  
18 getting out of that meeting when you're having it with  
19 DOE.

20 Margaret, I don't know if you have anything  
21 else you'd like to add.

22 MS. FEDERLINE: I think, coupled with that,  
23 one, we want to emphasize do your thinking before you go  
24 into the meeting. Be prepared. Even if we have to have a  
25 second meeting, we can establish some interim objectives.

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1 And that's fine.

2 The second thing is don't languish. If there  
3 are differences that need to be resolved, we have a  
4 hierarchy now where we interact with DOE, Appendix 7,  
5 technical changes, management meetings. And, of course,  
6 Dr. Paperiello has expressed an interest in getting  
7 involved. So we're now routinely briefing him on key  
8 issues that are of concern.

9 So don't let an issue languish. Take the time  
10 that you need to get the technical information, but then  
11 raise it in the process so that we can have dialogues and  
12 make sure that the right actions occur on both sides in  
13 each agency.

14 CHAIRMAN POMEROY: Okay. George?

15 (No response.)

16 CHAIRMAN POMEROY: Okay. Thank you very much,  
17 John.

18 Margaret, do you have any summary words or --

19 MS. FEDERLINE: No, I have nothing.

20 CHAIRMAN POMEROY: Okay. I'd like to take a  
21 seven-minute break, if we can.

22 (Whereupon, the foregoing matter went off the  
23 record at 11:07 a.m. and went back on the  
24 record at 11:17 a.m.)

25 CHAIRMAN POMEROY: The meeting will come to

1 order, please. The next item on our agenda is a  
2 discussion with the Director of the Division of Waste  
3 Management at NMSS: John Greeves.

4 John, welcome. I think I'll not say anything  
5 about what subjects you're going to cover. I'll let you  
6 do that. But, as always, we're pleased to have you here.  
7 And we look forward to the information that you're going  
8 to talk to us about. So the floor is yours.

9 MR. GREEVES: Thank you.

10 7) DISCUSSION WITH THE DIRECTOR,  
11 DIVISION OF WASTE MANAGEMENT, NMSS

12 MR. GREEVES: It's good to be back. I think,  
13 as most know, I spent much of last year up with Carl  
14 Paperiello as his acting deputy, which didn't give me the  
15 opportunity to visit with you as much as I would like.

16 And so I came back in November. And I think I  
17 missed your last meeting. You had one in November? I  
18 think I was out of town. So this is really the first time  
19 I've had the chance to get back together with you.

20 And Margaret has been doing a terrific job in  
21 my absence. I heard the calls of "John who?" but that's  
22 okay. Margaret does a terrific job, and I think it's to  
23 our advantage to have these kind of people available. So  
24 I'm pleased to come back and spend a little time with you.

25 Unfortunately, I find in coming to this

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1 meeting that the list of things I want to talk to you  
2 about is rather long. So, whether I'll get through them  
3 all or not, I'm not sure. And if I don't, we'll take them  
4 up another time or at another venue.

5 So, with that, I'll just sort of start in and  
6 go through the list, as we have in the past, somewhat  
7 informally. I don't have any slides, just a number of  
8 topics I think we have mutual interest in.

9 I would like to confirm one point, though.  
10 I've been getting your mail. Robert Johnson did a nice  
11 job of assembling all the letters that you put out this  
12 past year. And I refreshed my memory on all of them in  
13 the last day or two.

14 And we had some difficulty in making sure you  
15 got all our products over the last year, which I've talked  
16 to you about. And we've instituted some new procedures,  
17 where you are clearly on distribution for all the products  
18 at the branch chief level. So, either now or at some  
19 point in time, I'd like to get some feedback from you that  
20 that seems to be working.

21 I think you're going to get a lot of mail 'hat  
22 maybe you won't be looking at, but please give me some  
23 feedback in terms of: Are you getting what you think you  
24 need? And if you're not, pick up the phone. Let me know.  
25 And I'll do something else about it.

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1 CHAIRMAN POMEROY: Right. I think we're still  
2 seeing some of the influx of that, John, right now, in  
3 fact.

4 MR. GREEVES: If your In box looks anything  
5 like mine, I expect you are.

6 CHAIRMAN POMEROY: But we will get back to you  
7 on it if there's any --

8 MR. GREEVES: I would like some feedback on  
9 that --

10 CHAIRMAN POMEROY: Sure.

11 MR. GREEVES: -- because I want to make sure  
12 that's not a problem.

13 Okay. This morning Margaret and the staff  
14 gave you background on what we call the annual progress  
15 report. I think this is an area that ought to be on your  
16 radar screen. And you're obviously giving it attention.  
17 I spent a few minutes down here this morning when Margaret  
18 was making some introductions. So I know you have that  
19 background.

20 Essentially that report summarizes how we've  
21 been conducting the refocus program and illustrates the  
22 progress we felt we made during the past year. It is a  
23 little bit dated, as I'm sure Margaret and the staff  
24 pointed out to you. Obviously there's a time clock where  
25 you have to cut off the input and put that together.

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1           We think it documents the accomplishments that  
2 the staff made during the last year and sort of gives the  
3 road map, the path that we're on and as these things are  
4 produced over time will show progress.

5           Margaret and I went down and met with Lake  
6 Barrett and his staff and personally hand-carried a copy  
7 of this document to him. Was that about a week ago?

8           MS. FEDERLINE: Yes. The 15th.

9           MR. GREEVES: Okay. And I felt it was  
10 substantive enough that we wanted to give it to Lake and  
11 let him know what it was and what it wasn't. I think  
12 Margaret probably went over a lot of that with you this  
13 morning.

14           As you read it over time, it's quite detailed,  
15 quite technical. You will see that we're trying to head  
16 towards resolution of some of these issues. I did stick  
17 my head in earlier and saw Margaret get a couple of  
18 questions, comments on issue resolution.

19           In many ways, if we can get within an order of  
20 magnitude on some issues, for the time being, maybe that's  
21 good enough. This question of what is issue resolution, I  
22 heard a couple of questions about that. It can be a  
23 little confusing to people, but I think our job is to try  
24 and narrow the issues.

25           Obviously the big ones are going to get

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1 presented and discussed in the licensing, the formal  
2 licensing, phase. So to the extent we can narrow those  
3 issues, I think that's going a long way towards resolving  
4 some of them so that we can "Hey, what's more important  
5 now? Let's turn our attention to" whatever that is. With  
6 the resources we, the rest of the community have, we've  
7 got to put our attention on the important issues.

8           So, in any event, I just offer that. I think  
9 this document will facilitate that dialogue with the  
10 Department of Energy, ACNW, other parties. And I hope you  
11 find it useful. And I got some good feedback on the  
12 briefing this morning.

13           So we would look forward to engaging you in  
14 some select number of those topics. So over time again  
15 that's an item that I'd like to hear feedback from you on  
16 as to what your view of that is.

17           We will be taking up some of those issues  
18 subsequently that you saw in the annual report; for  
19 example, igneous activity. DOE has agreed to meet with  
20 us. I believe the dates are February 25th and 26th. And  
21 it's my understanding several of you are going to attend  
22 that meeting. So I think that's quite good, and we would  
23 look forward to that type of participation.

24           The staff I'm sure this morning identified  
25 that we had to drop three of our key issues for '96.

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1 There's not enough time here to go through our budget  
2 process, but I think you're pretty familiar with that.

3 Margaret and I are I think somewhat optimistic  
4 that in the next fiscal year or two, that we're going to  
5 bring those back. You don't ever regain the lost ground  
6 as such, but we're getting a lot of support out of the  
7 Commission for this program. And I think you probably  
8 have some visibility of that.

9 So I'd look forward to us trying to get those  
10 three issues back on line. Unfortunately, I think during  
11 this fiscal year, we may not be able to give it as much  
12 attention as we would like or you would like.

13 Several of them are on your priority list. So  
14 there may be some tension there in terms of how much  
15 ability we're going to have to participate, even with you,  
16 on those topics. But I think you understand that.

17 And, even with that, people talk about a \$17  
18 million program. That's not where we were when we were  
19 doing a program at \$22 million. It doesn't get us in a  
20 position to develop the review plan. I think you  
21 understand this very well.

22 So my optimism goes towards getting back to  
23 addressing all ten issues. We still have the issue of:  
24 How do we put together a review plan for the licensing  
25 process? So maybe over time I'll talk to you about that.

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1 Maybe you've got some ideas on that.

2 But, anyhow, that's the comments that I wanted  
3 to --

4 MEMBER HINZE: Can I ask you a question about  
5 that, John?

6 MR. GREEVES: Sure.

7 MEMBER HINZE: What are the plans for reacting  
8 to the viability assessment? What's the situation there  
9 in terms of formal matters?

10 MR. GREEVES: Well, Margaret, jump in and help  
11 me on this when you get the chance.

12 First, DOE has clearly stated the viability  
13 assessment is something they're doing. It's actually in  
14 legislation space now. It has background in legislation.

15 There is no call for NRC comment on  
16 viabilities. There's no legal requirement for NRC to do  
17 anything on viability assessment. However, Margaret, I,  
18 the staff in looking at it, just common sense, you need to  
19 recognize that something that substantive, somebody is  
20 going to be looking for the staff's view on that document.  
21 And we fully expect the Commission is going to be looking  
22 for the staff's view on that document.

23 So our plans are to be prepared to comment on  
24 the substantive document, the viability assessment, in  
25 that time frame. And so we were putting ourselves in a

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1 position that we could provide those comments. And if the  
2 Commission wanted to, they could provide such comments to  
3 DOE or anybody else who might ask in that time frame.

4 So my expectation is that there will be some  
5 comments in that time frame expected from the regulator.  
6 And we are putting the staff in a position to be able to  
7 provide such comments.

8 But I don't expect that there are going to be  
9 any big surprises. Our comments are going to start  
10 showing up in these annual reports that we're putting  
11 together. And we've talked to Lake Barrett about this.  
12 And we said that we want to stay current with what's going  
13 on within the resources that we're given.

14 So that's sort of where it is. Again, I don't  
15 see any legal requirement for us to make comments. DOE is  
16 not asking for anything. But, realistically, let's face  
17 it. Somebody is going to want to know where the NRC is on  
18 this. And Margaret and I are putting ourselves in a  
19 position to be able to make such comments.

20 Margaret, do you want to add to that?

21 MS. FEDERLINE: Yes. Let me just add to the  
22 process. As you heard this morning, we're planning to  
23 develop these issue resolution status reports. And it's  
24 our goal by the time of the viability assessment to have  
25 at least produced an issue resolution status report on

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1 most of the KTIs, budget permitting.

2 And, as we explained this morning, we're going  
3 to develop acceptance criteria as a part of that. So our  
4 review will essentially be based on the acceptance  
5 criteria that we develop as part of the issue resolution  
6 status report process.

7 And so everybody will sort of have an idea of,  
8 not only what our comment is, but what the basis for our  
9 comment is. And, depending upon the budget, there will be  
10 some issues perhaps that our comments, we will not have  
11 gotten to that point yet. But that's just sort of a wild  
12 card.

13 MR. GREEVES: Well, in, for example, the  
14 design issue, which is one of the ones we have had to put  
15 some hold on during this particular fiscal year we're in.  
16 That's a key element of the viability assessment; whereas,  
17 seven of the ten issues we will go full steam on.  
18 hopefully we can pick up a couple, maybe even three, of  
19 these next year. So, anyhow, the budget does affect our  
20 ability to comment on viability assessment or anything  
21 else that comes along the line.

22 So I hope I've clarified or clearly answered  
23 your question. I don't think there's a requirement, but I  
24 think everybody expects the staff will be in a position to  
25 provide comments. And we're pointing towards having that

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1 information available for the Commission.

2 MEMBER HINZE: And other than the issue of  
3 resolution reports, there is no formal structure that you  
4 have in view at this point?

5 MR. GREEVES: We don't have one. Maybe if  
6 you've got some ideas to share over time, I'd enjoy  
7 hearing those. But we certainly as it gets closer will be  
8 talking about how we might structure such comments.

9 MS. FEDERLINE: Yes. I think our plan is to  
10 use the vertical slice approach. In other words, it's  
11 going to be consistent with the framework that we're using  
12 now. That would be the way we would structure the review.

13 VICE CHAIRMAN GARRICK: John, the reason that  
14 this strikes us as a rather important milestone; that is  
15 to say, the viability assessment is, some of us have heard  
16 DOE officials describe it as a dry run for the licensing  
17 application. And I guess some of us have great difficulty  
18 seeing how it can be that if the NRC is not going to be  
19 involved.

20 MR. GREEVES: Well, I don't know who the DOE  
21 officials are, but I can tell you that Lake talks to  
22 Margaret and me. And what we're getting is that they  
23 aren't asking for comments. They know they're going to  
24 get some comments.

25 VICE CHAIRMAN GARRICK: Yes.



1 MR. GREEVES: And a goal I have is that we're  
2 in what I call the pre-licensing process. And if we've  
3 got a comment, a substantive comment, we're going to give  
4 it to DOE when we have it. We're not going to hold these  
5 things back and, "Oh, where's the viability assessment?"  
6 There it is. Let's launch our -- that doesn't help  
7 anybody.

8 So I think it will be a significant document  
9 and a lot of attention will be paid to it. And we will do  
10 our part in putting together what comments we have. If  
11 there's new information in it, we would be commenting for  
12 the first time on it.

13 So maybe I'd enjoy some conversation with you  
14 about ideas you have. Margaret and I wrestle with this  
15 along with a bunch of other questions regularly. And if  
16 you've got some ideas of how to package this because there  
17 is no guidepost as such. Nobody has produced something  
18 called a viability assessment before. Maybe we could take  
19 that up with you.

20 CHAIRMAN POMEROY: Okay.

21 MR. GREEVES: Okay? So the second topic is  
22 "Status of Legislation." There was a bill put forward,  
23 Senate 104. I asked for copies of it to come down to your  
24 staff. Now, we just received it. So you're I think in  
25 receipt of warm copies. I think we got these down to you

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1 yesterday. I don't expect anybody's had a chance to look  
2 at it in detail.

3 So status is it's there. And I believe you  
4 have copies of it. Senator Murkowski is planning on  
5 looking into this aggressively. I understand there's a  
6 hearing on February 5th regarding this. And it's reported  
7 it's virtually identical to 1936. I think you're familiar  
8 with that --

9 CHAIRMAN POMEROY: Yes.

10 MR. GREEVES: -- from last year. Staff has  
11 not reviewed this document yet. So we don't have any  
12 observations to make at this time. But obviously it's  
13 something that we need to keep an eye on, and we will be  
14 paying attention to it.

15 CHAIRMAN POMEROY: John, do they normally  
16 introduce a House bill, a companion House bill, at the  
17 same time or do you have any idea? That's way outside of  
18 both of our fields.

19 MR. GREEVES: Yes. I'm probably best not  
20 giving an answer on that.

21 CHAIRMAN POMEROY: Okay.

22 MR. GREEVES: Like you say, I can --  
23 Congressional Affairs is probably the group that can  
24 answer that question accurately.

25 CHAIRMAN POMEROY: Right. Great.

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1 MR. GREEVES: I really don't have anything  
2 else to say on the legislation issue.

3 MEMBER HINZE: While you're on that type of  
4 issue, are you going to say something about how you're  
5 going to interact with the 960?

6 7.2) STATUS OF STAFF'S EFFORTS ON REVISING PART 60

7 7.4) STATUS OF EPA HLW STANDARDS

8 MR. GREEVES: Yes. The third issue that I  
9 just wanted to talk about was the EPA standard and NRC's  
10 actions on Part 60. I think you're fully aware that EPA  
11 is developing 40 CFR 197. We have had some interactions  
12 with them on that. My expectation is we probably briefed  
13 you on those types of activities in past meetings.

14 I think they're pretty far along in that  
15 process. And my understanding is that it has not gone to  
16 OMB yet, Margaret.

17 MS. FEDERLINE: That's correct.

18 MR. GREEVES: That's accurate. So it's out  
19 there cooking. So it hasn't gone to the stage of going to  
20 OMB yet. We have given hem our best insights on these  
21 issues. And I think they're still deliberating on how  
22 they want to put the final pieces in place. So that's the  
23 status as we know it on the EPA standard.

24 As far as Part 60, in parallel with that  
25 effort, we need to be working on this Part 60 effort. I

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1 will say that you received a letter from us December 31st.  
2 And in the letter, you'll see mention of it being held in  
3 abeyance. Well, we are now working on it. So just let  
4 this be notice that being held in abeyance is  
5 discontinued. We are, in fact, now working on Part 60 at  
6 the staff level and developing our strategy for how we  
7 would put together such a document.

8 I think we have enough insights into what EPA  
9 may come forward with that it is useful for us to start  
10 that process. So we're thinking in terms of developing a  
11 separate part for Yucca Mountain. Again, these are  
12 pre-decisional things, but this is the direction the staff  
13 is looking into.

14 The substantive differences would be a dose  
15 standard versus the integrated release-type approach with  
16 what you find in Part 60 at the present time. I'm going  
17 to have to account for a stylized human intrusion type of  
18 scenario.

19 I expect it's going to be much more  
20 performance-based in terms of its approach to regulatory  
21 activity. And we will in due course be developing a  
22 Commission paper and give the Commission some options. I  
23 expect that that will probably happen in the spring time  
24 frame. I would also expect that as the EPA standard comes  
25 out, that we would be providing comments on that also.

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1 CHAIRMAN POMEROY: John, do you have any  
2 feeling -- I know what you'd like to see in the standard,  
3 but do you have any feeling whether there's any feeling  
4 over there that they're going to specify things that we  
5 would rather control here, such as the critical group,  
6 specifying reference biosphere, specifying various kinds  
7 of --

8 MR. GREEVES: Margaret, could you?

9 MS. FEDERLINE: Yes.

10 MR. GREEVES: Margaret is actually closer to  
11 that topic than I am. I'd like her to try and address  
12 that.

13 MS. FEDERLINE: We've made comments to EPA in  
14 that regard. The last time we talked to them, it appeared  
15 that there was going to be flexibility for the implementer  
16 on many issues. But, again, we don't know what the final  
17 standard is going to look like.

18 So, Tim, did you want to add anything?

19 MR. MCCARTIN: No. That's fine.

20 MR. GREEVES: Again, the process calls for EPA  
21 to put out something, and lots of people are going to  
22 comment on it. I think we've made our wishes known to  
23 them.

24 There are a couple of areas where we don't  
25 exactly line up, but that's the due process here. Let's

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1 get the standard out there. And we'll make our formal  
2 comments on the areas we think we'd like to adjust. And  
3 so will everybody else.

4 So I think you probably have pretty good  
5 insight as to where we were coming out on it. But as it  
6 pops out, I'd enjoy some interaction with you on it also.

7 So that's sort of the summary of where these  
8 things are. There is a GAO report out on this. And also  
9 I've asked for that to come down to your offices. It's a  
10 final report at this point in time. It discusses the  
11 implementation of these things. So you might be  
12 interested in taking a look at that.

13 CHAIRMAN POMEROY: Yes.

14 7.3) STATUS OF PART 960 OPTIONS PAPER

15 MR. GREEVES: All right. The fourth topic  
16 that I had in mind was 960 that Bill mentioned. We ought  
17 to talk about that.

18 DOE announced that they were going to look at  
19 the guidelines in September. They acknowledged that some  
20 sort of re-concurrence by the NRC would be part of that  
21 process. I think, as most are aware, they put it out  
22 December 16th for comment.

23 They recently had a meeting on January 23rd, a  
24 public meeting, to take comment on the document. The  
25 on-site reps were there, and I understand that a number of

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1 the people commented and were looking for an extension in  
2 the comment period.

3           It's my understanding what was a 60-day  
4 comment period now is a 90-day comment period. And I  
5 believe it goes to March 17th. So there will be  
6 additional time to provide comments.

7           The principal change is that there would be a  
8 new subpart which is Yucca Mountain-specific. And they  
9 would be conducting a total system performance assessment  
10 analysis. And they will compare that with the applicable  
11 EPA and NRC standards.

12           They have the problem that they don't exist at  
13 this point in time, but they do commit that when they do  
14 come forward, they would be comparing them with those  
15 standards. So they are proposing specific revisions to  
16 both the post and pre-closure system guidelines.

17           We're in the process of preparing a Commission  
18 paper to give the Commission some insights from the staff  
19 level as to what we think about this. We also expect that  
20 we would be making at the staff level comments on the  
21 guidelines.

22           And, again, comments on these guidelines would  
23 be coming forward within the March 17th time frame. So  
24 we'll I'm sure find a way to talk to you about this  
25 process, but that's sort of a thumbnail sketch.

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1 Margaret, do you want to add anything to that?

2 MS. FEDERLINE: No. I think the only thing is  
3 that they do commit in the proposed guidelines not to move  
4 forward with suitability until the final rules are  
5 promulgated. So that's a pretty firm commitment on their  
6 part to bring them into -- I think our earlier comment,  
7 the thing the Commission was really worried about back in  
8 the early time was ending up having an inconsistency  
9 between suitability and licensing. And I think there are  
10 certain precautions, in at least the proposal, that does  
11 provide some assurances in that regard.

12 CHAIRMAN POMEROY: So there they have a  
13 commitment, then, to not make the suitability decision  
14 final until both the EPA standard and revised Part 60 are  
15 --

16 MS. FEDERLINE: Well, let's ask Mike Lee. Am  
17 I saying it wrong?

18 MR. LEE: Good morning.

19 MS. FEDERLINE: Give your name.

20 MR. LEE: Mike Lee, NMSS Waste Management.

21 OGC was reviewing the preamble to the actual  
22 changes in the statement of considerations. And they're  
23 concerned that, although the revisions, as John Greeves  
24 has pointed out and Margaret has also, acknowledge that  
25 the revisions are to demonstrate compliance with the EPA

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1 and the NRC regulations, the language in the preamble says  
2 they commit. They won't make a decision unless the EPA  
3 standard is out. So we have to clear that up with them.

4 So that would probably be one of our comments  
5 at the staff level during the public comment period. So  
6 we --

7 MS. FEDERLINE: We're still working with OGC  
8 to flesh out all of these comments. So this is where we  
9 are at this point in time.

10 MR. GREEVES: And it's going to receive a lot  
11 of attention, --

12 CHAIRMAN POMEROY: Thank you.

13 MR. GREEVES: -- as it has already. So that's  
14 just a thumbnail sketch of where we are on 960 status.  
15 And as these things pop out, you'll be on distribution and  
16 enjoy some conversation with you over time I'm sure.

17 CHAIRMAN POMEROY: Great.

18 7.1) THE STATUS OF SITE CHARACTERIZATION AT  
19 THE PROPOSED YUCCA MOUNTAIN REPOSITORY

20 MR. GREEVES: Okay. The next, the fifth  
21 topic, that I had on my list was Yucca Mountain site  
22 characterization highlights. Just a couple of things on  
23 this front.

24 One that had some attention on the past is the  
25 pneumatic monitoring program. I just wanted to make sure

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1 you were aware that DOE had completed their monitoring in  
2 two bore holes: NRG-6 and NRG-7A. They've used these  
3 bore holes to monitor pressure changes in the mountain.  
4 It has been an issue that I know you have paid some  
5 attention to in the past. I just want to make sure you  
6 were aware that they had finished that monitoring of these  
7 two holes.

8 The staff has no objection to DOE's decision  
9 to discontinuing monitoring in these two particular holes.  
10 We think that adequate data are available to show changes  
11 in the conditions in these holes. We understand DOE while  
12 they're terminating monitoring in NRG-6 and 7A, it is  
13 continuing pneumatic monitoring in several other bore  
14 holes, UZ-4, 5, 7A, and SD-12 and 7.

15 In any event, I thought you would appreciate  
16 being updated on this.

17 CHAIRMAN POMEROY: Right.

18 MR. GREEVES: And to the extent you have some  
19 concerns, you could maybe come back and talk to us about  
20 that. But this was a topic. We had a number of special  
21 meetings on it. And I just wanted to make sure you were  
22 up-to-date on it.

23 As far as the exploratory shaft test facility,  
24 as of about yesterday -- and I'm going to talk in miles  
25 because they're pretty far along here. I never get the

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1 feet or the meters exactly right. I understand they're  
2 about 4.4 miles into this program. And it's a five-mile  
3 program. So they're on the outward-bound leg here. And I  
4 expect you all have actually stayed pretty current on  
5 what's going on out there.

6 They in the November time frame were in what  
7 they call Category I ground. That's where they can make a  
8 lot of progress and move rapidly, you know, in the tens of  
9 meters a day.

10 However, lately they've run back into what  
11 they call Category IV ground, which is much more difficult  
12 to maneuver in. And since probably mid December, they've  
13 remained in what they call Category IV ground, which  
14 requires shotcrete, some hand mucking, et cetera. They  
15 have problems with the grippers.

16 I think we all went through this and watched  
17 this very closely when they entered the mountain a while  
18 back. So they're experiencing the same difficulties,  
19 getting back to what looks like the Bow Ridge Fault zone.  
20 So I don't think it's a big surprise, but I'm sure that  
21 lots of people wish that let's daylight this particular  
22 phase of the activity.

23 So I think they're about 30 days behind their  
24 expected schedule. They would like to have finished what  
25 they call hole out in the end of March. So I think the

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1 information that we have is it's probably going to be  
2 April sometime before they actually daylight the tunnel.

3 As far as some of the alcove testing, I  
4 understand that Alcove 5, where a lot of the heater  
5 testing is being set up, is substantially complete.  
6 They've started the single heater test in August. And I  
7 understand that's going to take about a year to heat up  
8 and cool down. So that's still in progress. They have  
9 done the construction in the main heater test area.

10 And I would like to point out to you a letter  
11 that was signed out to Steve Brocum by Mike Bell recently,  
12 which includes our comments on their thermal hydrologic  
13 testing and modeling program. It is dated January 23rd.  
14 And it gives I think some good feedback to the DOE  
15 program. So I recommend it for your reading in terms of  
16 some of your activities.

17 As far as Alcove 6, I understand that they've  
18 put some bore holes out from that alcove. And they have  
19 located the Ghost Dance Fault. And investigations  
20 regarding that activity are in progress.

21 I also understand DOE has started some  
22 construction at the south portal. They did a lot of  
23 preparatory effort on the north portal in terms of going  
24 in and getting that machine set up. So I expect that  
25 there is going to be a similar type of effort at the south

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1 portal to allow a machine to come out.

2 The last item I had was I understand they do  
3 continue tracer tests in the C hole complex. That's kind  
4 of a little bit of a summary sketch of what's going on out  
5 at the exploratory shaft facilities.

6 CHAIRMAN POMEROY: Great. Bill?

7 MEMBER HINZE: Could I ask a question? We  
8 have heard about John Braderhoff preparing a paper, which  
9 I understand is submitted for publication, in which he and  
10 his coauthor arrive at the decision that at least Midway  
11 Valley faults have a very high permeability. This is just  
12 street talk.

13 And I'm wondering. I believe this work was  
14 done with relationship to or in association with Nye  
15 County. I'm not certain about that. The work is, of  
16 course, important to all of us. I'm wondering if you have  
17 any information on it.

18 MR. GREEVES: I don't. Margaret, is it  
19 something we want to get back to them on or does somebody?

20 MS. FEDERLINE: Mike, is somebody here from  
21 your staff who could address that?

22 MR. BELL: I'm looking around the room.

23 MR. GREEVES: Why don't you let us get back to  
24 you? We'll take a note on that one.

25 MEMBER HINZE: It's very important.

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1                    7.5) STATUS OF ACTIVITIES AT ENVIROCARE

2                    MR. GREEVES: Okay. I'll move on to the next  
3 topic, Number 6 on my list, which is Envirocare. I don't  
4 think there's anybody who hasn't read a news article on  
5 this. This is a concern. Any time you start hearing  
6 about extortion, regulators taking dollars, this is  
7 obviously a concern for all of us. I find it difficult to  
8 express my feelings on this topic. So I'm not going to go  
9 too deep into it.

10                   Again, there are allegations at this point. I  
11 think many of you are familiar with the articles in the  
12 Salt Lake Tribune. And to the extent you feel like you  
13 need to know more, we have a lot of that information. So  
14 if you or your staff wants to come up, we'd be happy to  
15 share some of that with you.

16                   It exceeds the amount of material I was  
17 reading on your background, and it's growing. So I offer  
18 if you want some information, either you or your staff  
19 come on up and visit with us. And we'll give you the  
20 background on it.

21                   I think you know the details. The owner of  
22 Envirocare is talking about extortion in terms of  
23 \$600,000, and there's a regulatory official who is suing  
24 for 5 million. I mean, this is the kind of stuff you just  
25 usually think you see in the movies. I really don't want

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1 to go too far into it.

2 Rest assured that we have notified the  
3 appropriate federal officials associated with this. The  
4 NRC has a point of contact with those people. And we have  
5 talked to the State of Utah. They're currently reviewing  
6 the Envirocare license in a renewal program typical with  
7 ours. And they have offered to provide and share with us  
8 that information.

9 I think there are actually five license-type  
10 activities out there. So there's a lot of people involved  
11 with this. We have what we call an 11(e)(2) byproduct  
12 license with them, which is basically the mill tailings  
13 program, which the State of Utah did not obtain. We do  
14 continue to regulate that license.

15 In addition to that, I understand Utah has a  
16 NORM license, a mixed waste license, a mixed waste  
17 processing license. And I forget what the other one is,  
18 but there are about five different licensing activities  
19 out there.

20 As far as our license that we hold with  
21 Envirocare, we have scratched, talked to the staff, and  
22 looked to see if there was any reliance on the State of  
23 Utah in terms of documentation for our issuance of our  
24 license and our safety evaluation report. And the answer  
25 coming back is no. We did an independent evaluation to

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1 evaluate our license and write up our typical safety  
2 evaluation report.

3 We, I'm sure as many of you have heard, have  
4 received a 2.206 petition by the Nuclear Resources Defense  
5 Council. And we are reviewing that at the present time.  
6 They ask for a number of things, including revocation of  
7 Envirocare's license, NRC's license, the state's  
8 authority, et cetera. I think you can just refer to that  
9 document for the details. We're currently reviewing that  
10 petition. And we expect we will be getting back to NRDC  
11 shortly on that.

12 Also, for your information, we're conducting  
13 an inspection at Envirocare this week. It turns out that  
14 before these articles hit the paper, we did an inspection  
15 a while back. And there were a couple of issues that the  
16 inspection showed that needed follow-up. So we had  
17 already scheduled an inspection for this time frame.

18 So the staff is out there this week looking at  
19 those issues, and I understand they're getting a fair  
20 amount of help from other people who are interested in  
21 this topic at the present time.

22 CHAIRMAN POMEROY: Right. In regard to that,  
23 John, if I can interrupt you a second, we have a request  
24 in to get a copy of the inspection report. We didn't know  
25 it was an ongoing inspection, but we have requested a copy

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1 of the inspection report. So when that's available, we  
2 would like to see it.

3 MR. GREEVES: No problem.

4 CHAIRMAN POMEROY: I understand that some  
5 parts of it are written but are still in management  
6 review.

7 MR. GREEVES: Yes. If somebody is in the  
8 audience, Joe Holonich, are you with us? If Joe shows up  
9 and wants to tell us when that inspection report is coming  
10 out, but we will make it available to you. Others have  
11 asked also.

12 Harold, what's the status? Now, this is the  
13 inspection report dated what, November?

14 MR. LEFEVRE: This would be for the November  
15 inspection.

16 MR. GREEVES: Right.

17 MR. LEFEVRE: And I understand -- I got an  
18 e-mail yesterday from Region 4. And they indicated that  
19 the document is available now. I understand it was to  
20 have been signed out late yesterday afternoon. So we can  
21 provide a November inspection report to the Committee.

22 MR. GREEVES: Harold, you'd better get a  
23 couple of copies of that on your desk. Provide one of  
24 them to --

25 MS. FEDERLINE: Harold Lefevre is our project

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1 manager on this.

2 CHAIRMAN POMEROY: We'd like to get one.

3 MR. LEFEVRE: Sure.

4 MR. GREEVES: So, as I said, we right now have  
5 an inspection going on at the site. And I want to stress  
6 that this is an inspection that we would do anyhow. It  
7 has a focus on the issues that we identified in November.  
8 It is not as a result of the newspaper articles, et  
9 cetera, but obviously the team is aware of those issues.  
10 And they'll have their antennae up as they go through the  
11 inspection.

12 We also recently received a document from the  
13 American College of Nuclear Physicians signed by Carol  
14 Marcus raising some additional issues regarding this. So  
15 we're in the process of taking a look at that.

16 As I said, there's a lot of interest in this  
17 site. I'd characterize us in a gathering information mode  
18 at the present time. Obviously we want to make sure we  
19 get the information that's needed and use it properly.

20 I would want to end with one of the first  
21 things that Margaret, I, other managers, Joe want to ask  
22 the staff is: Do you know of any safety-significant  
23 problems at this site? Does anybody know of any  
24 safety-significant problems at this site? And the answer  
25 so far is no.

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1           The issues in front of us obviously are cause  
2 for concern, but our job first is safety. And we have not  
3 identified any significant safety issues. So I just  
4 wanted to leave you with that piece of information and to  
5 let you know that we're vigilant and that we are looking  
6 into these and other issues. There are probably more to  
7 come. It's going to take a while for this one to get  
8 sorted out.

9           So that's the update.

10          CHAIRMAN POMEROY: Great, John.

11          Let me ask the members whether anybody has any  
12 questions for John on these subjects. We can feel free to  
13 ask him other questions, but he may not be immediately  
14 prepared to answer. But he usually comes through.

15          MR. GREEVES: We can take the question and  
16 maybe get back to you. Things I've said I think are  
17 pretty much available out there. So, as I said, I'd be  
18 happy to visit with you or your staff.

19          Joe Holonich has got a file that's growing.  
20 And we'd be happy to go over that with your staff  
21 upstairs. But if you've got a question right now, I'd at  
22 least entertain it.

23          CHAIRMAN POMEROY: Questions, George? Bill?  
24 John?

25          MEMBER HORNBERGER: Didn't you have another

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1 issue?

2 MR. GREEVES: Yes, I've got some other issues.

3 CHAIRMAN POMEROY: Oh, you have more issues?

4 I'm sorry. Go ahead. Please go on.

5 MR. GREEVES: It's been a while.

6 CHAIRMAN POMEROY: Please go on, John.

7 MR. GREEVES: How much time do you --

8 CHAIRMAN POMEROY: I want to give you as much  
9 time as you have to cover.

10 MR. GREEVES: All right. Good. I'll keep  
11 going, then. Okay.

12 7.6) OUTSIDE REGULATION OF DOE

13 MR. GREEVES: The next item on my list is DOE  
14 regulation. You got a copy of the news release that DOE  
15 put out. And it indicated that they expect to submit  
16 legislation, transferring oversight to basically NRC over  
17 a ten-year period. And this would establish NRC as the  
18 regulator of DOE facilities and phase out the Defense  
19 Board.

20 Within about the first five years, it would  
21 look towards the nuclear energy facilities and the energy  
22 research facilities transferring over. I think the  
23 thinking here is these are the ones that are probably most  
24 like NRC facilities at the present time. So we could  
25 maybe cut our teeth on these in that process.

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1           Then environmental management facilities,  
2   which in some ways may be more problematic, would be  
3   transferred. And by the end of the ten years, defense  
4   program facilities would follow along.

5           I think the sense that I'm getting is that  
6   there would probably be some time frame next couple of  
7   years where legislation would be required on this front.  
8   So it may take a couple of years.

9           And then once that were to be sorted out, they  
10   would start into this process of moving over to NRC  
11   regulation. I think you'll hear numbers like a \$135  
12   million annual program. I think that's the total program.  
13   NRC is a subset of that.

14           The rest of it would be DOE activities. And  
15   people talk in terms of pilot programs, trying a couple of  
16   different facilities. In fact, in many ways, we're  
17   already starting to do some of these things. I think  
18   you're familiar with the Hanford tank activities that the  
19   fuel cycle program is working on with appropriated budget.

20           Margaret, in fact, is just coming back from a  
21   visit with Savannah River Lab in terms of looking at some  
22   of their efforts with the aluminum clad fuel. And one  
23   we've been working on for a long time, West Valley, is  
24   starting to heat up. They are looking at getting their  
25   EIS and record of decision process moving along.

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1           So lots of these things are actually starting  
2 to come in the door through various vehicles. And I think  
3 people are thinking of the USEC model, where maybe we'd do  
4 a certification kind of process for existing facilities.

5           So this looks like something that's coming at  
6 the agency over, say, the next ten years. And we all  
7 collectively probably have to do a fair amount of thinking  
8 as to how to bite into this. I think the expectation on  
9 the DOE's side is that there would be some kind of a  
10 ramp-up process, some pilot facilities, et cetera. I know  
11 Carl has some ideas on this, and I expect he will be  
12 talking to you about it over time.

13           So that's the background on review of DOE  
14 regulation.

15           CHAIRMAN POMEROY: John, in terms of that, I  
16 wondered. I presume that there must be a group of people  
17 somewhere within NRC that have a very good grasp of  
18 exactly what the problems are at the various DOE sites and  
19 that somebody has done a very careful analysis of what  
20 it's going to cost to do this.

21           It seems to me there's a great inherent  
22 danger, if you will, in taking on the regulatory  
23 responsibility for some specific site without having a  
24 fairly detailed knowledge of what's there and what the  
25 problems are. And you may well end up in that kind of a

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1 -- if you didn't have information, you might well end up  
2 with not enough money to cope with it basically.

3 So I assume somebody is doing that. Is that a  
4 fair assumption?

5 MR. GREEVES: Well, it's certainly been a  
6 topic of discussion with DOE. There's been a lot of  
7 energy put into this, discussions with DOE at high levels.  
8 And you're right. It's a huge program.

9 I think that, in fact, DOE, just for them to  
10 get their arms around this program is somewhat difficult.  
11 It's just many, many different programs to put it  
12 together.

13 So there's been a fair amount of effort on the  
14 NRC staff to look at: What is this, how big is it, and  
15 what would it take to regulate this? There's been a fair  
16 amount of thinking within the agency on that. And I think  
17 that will continue.

18 CHAIRMAN POMEROY: Is that monitored out of or  
19 is that coordinated out of the EDO's office, then?

20 MR. GREEVES: Yes, it is. The EDO is directly  
21 involved in that process. And Dr. Paperiello is a key  
22 player in that process. I would expect that it's going to  
23 be a topic within the agency in years to come as to how  
24 that transition will take place.

25 CHAIRMAN POMEROY: Great.

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7.7) OTHER TOPICS

1  
2 MR. GREEVES: Okay. That's all I had on that.  
3 I've just got a couple of items here, and I can mention  
4 them. And I'm just about done at that point.

5 The first is the low-level waste branch  
6 technical position. We were looking to get that out for  
7 comment in January. Well, we've only got a couple of  
8 days. But I think that it will be out in February.

9 And I'd like to get your insight, spend some  
10 time with you, here or in some other venue, on that  
11 particular topic. So I just wanted to give you a head's  
12 up. That's substantive. That's something that should be  
13 on your radar screen.

14 The other one is the decommissioning rule. I  
15 expect something's going to come out on that. It's taken  
16 a long time. So I just wanted to give you a heads up that  
17 that's another one. There's going to be a lot of  
18 follow-up on that in terms of implementation. So I just  
19 share with you, expect to see that pop out sometime in the  
20 reasonable future.

21 A problem that Margaret and I wrestle with  
22 daily is I've only gone through a partial list of the  
23 things that are on my plate. With the limited resources  
24 that we have in government, how do we manage those  
25 resources in an effective way?

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1 I read your priority list. And you share the  
2 same process of: Gee, how many of these can I bite into?  
3 So sometime when we get a chance, I'd like to visit with  
4 you a little bit and just make sure. There are priority  
5 lists, but I don't know how we're going to get to all of  
6 them.

7 CHAIRMAN POMEROY: You're not alone, John.  
8 You're not alone.

9 MR. GREEVES: You, as you pointed out in your  
10 letter, have the situation where you don't have to so much  
11 pay attention to the budget, but it's a reality. So I  
12 encourage you. When you get the chance or when we get the  
13 chance, let's try and talk through. To the best of our  
14 ability, we'll share with you what we think the best use  
15 of our resources.

16 That's what we're going to do. We're going to  
17 work on those issues.

18 CHAIRMAN POMEROY: Right.

19 MR. GREEVES: And there are going to be some  
20 items that we just -- not that they aren't priority and  
21 not that they aren't important, but I find you can dilute  
22 yourself. And you try and cover them all, and you can  
23 really get yourself in trouble on substantive issues if  
24 you don't put the proper amount of energy into it.

25 So I don't have any magic answer to that, but

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1 over time I hope that we can talk.

2 CHAIRMAN POMEROY: We would like to do that,  
3 definitely.

4 MR. GREEVES: Okay. So when you get a chance,  
5 maybe I'll talk to you about your priority list and let  
6 you know where --

7 CHAIRMAN POMEROY: Very good.

8 MR. GREEVES: Actually, I did get through my  
9 list. I went a little quickly, but I'm glad that I was  
10 able to do a little bit of catchup. So I'm at this point  
11 open to adjourning or answering other questions. And from  
12 time to time Margaret and I would like to come back and do  
13 this again.

14 CHAIRMAN POMEROY: Well, we'd certainly like  
15 to have that happen, John. You're always welcome down  
16 here. We especially like this informal interchange of  
17 updating us on where things are.

18 Other questions for John, folks?

19 MEMBER HINZE: No, but I really appreciate you  
20 coming down and giving us this extensive discussion. It's  
21 very helpful. It puts things in context for us, which is  
22 most useful.

23 MR. GREEVES: Great.

24 MEMBER HINZE: It helps us also to set some  
25 priorities.

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1 MR. GREEVES: Yes.

2 CHAIRMAN POMEROY: I should ask you one last  
3 question, I guess.

4 MR. GREEVES: Sure.

5 CHAIRMAN POMEROY: Did Mal come back or is Mal  
6 still --

7 MR. GREEVES: He's back. He's in the  
8 building.

9 CHAIRMAN POMEROY: He is back?

10 MR. GREEVES: Yes.

11 CHAIRMAN POMEROY: Okay.

12 MR. GREEVES: He's doing well. He's  
13 jet-setting.

14 CHAIRMAN POMEROY: Then, with that, John, I'd  
15 like to thank you again. We all appreciate your coming  
16 down. We know it's difficult to take this much time away  
17 from your schedule, but we do appreciate it. And we look  
18 forward to talking with you in the future, informally and  
19 here as well.

20 MR. GREEVES: Thank you.

21 CHAIRMAN POMEROY: Thank you.

22 With that, I'd like to take a one-hour recess.  
23 I'd like to reconvene at 10 minutes after 1:00. And if I  
24 could get the attention of the Committee for just a  
25 second, after you get some food, I would like to meet to

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1 talk in there.

2 (Whereupon, a luncheon recess was taken at  
3 12:12 p.m.)  
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ADVISORY COMMITTEE ON NUCLEAR WASTE

JANUARY 29, 1997

The contents of this transcript of the proceedings of the United States Nuclear Regulatory Commission's Advisory Committee on Nuclear Waste on JANUARY 29, 1996, as reported herein, is a record of the discussions recorded at the meeting held on the above date.

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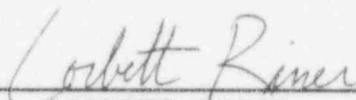
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Docket Number: N/A

Place of Proceeding: ROCKVILLE, MARYLAND

were held as herein appears, and that this is the original  
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CORBETT RINER

Official Reporter

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**HIGH-LEVEL WASTE PROGRAM  
FY96 ANNUAL PROGRESS REPORT**

**Presented to:**

**Advisory Committee on Nuclear Waste**

**January 29, 1997**

**By:**

**Margaret Federline, Deputy Director  
Division of Waste Management  
Office of Nuclear Material Safety and Safeguards**

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## **OVERVIEW**

- **The HLW Annual Report provides status of NRC-HLW work conducted in FY96 and an assessment of progress toward resolution of the 10 Key Technical Issues.**
- **For each individual KTI, the specific path to resolution is unique and reflects both the nature of the issue and progress of the DOE and NRC technical work to date.**



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## **LIMITATIONS/EXPECTATIONS**

- **Not a licensing document.**
  - **Conclusions are not NRC findings or requirements for future action.**
  - **DOE remains ultimately responsible for developing an integrated safety case and may choose to adopt a different path to issue resolution than NRC**
- **Purpose is to document progress and facilitate a dialog between NRC and DOE.**



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**FY96 REPOSITORY PROGRAM SUMMARY**

- **NRC Repository Program Refocused and Reorganized**
- **NRC KTI's Closely Related to DOE's WCIS**
- **KTI's Investigated by Detailed Examination of Vertical Slice**
- **Objective: Define a Path to Resolution, Including Acceptance Criteria, for NRC Review of DOE Submittals**
- **Significant Progress in Groundwork for Subissue Resolution**



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## **REPOSITORY PROGRAM FUTURE ACTIVITIES**

- **Issue Resolution Status Report (IRSR) and Annual Reports**
  - **Primary NRC Documentation of NRC/DOE Prelicensing Process**
  - **Vehicles for Discussion and Integration**
- **FY97-98 Sensitivity Analyses to Evaluate Performance Impact**
- **Reduced FY97 Budget Eliminated CNWRA Support in 3 KTI's**



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**HIGH-LEVEL WASTE PROGRAM  
FY96 ANNUAL PROGRESS REPORT  
SUMMARY OF TECHNICAL ACTIVITIES**

Presented to:

**Advisory Committee on Nuclear Waste**

January 29, 1997

By: M. Bell, Branch Chief  
Division of Waste Management  
Nuclear Regulatory Commission  
and

B. Sagar, Technical Director  
Center for Nuclear Waste Regulatory Analyses

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## **PRESENTATION OUTLINE**

**For Each NRC Key Technical Issue (KTI) Provide a Brief Summary of:**

- **KTI and the Associated Elements of the DOE Waste Containment and Isolation Strategy (WCIS)**
- **Path to Resolution for Each KTI**
- **FY96 Accomplishments for Each KTI**
- **Integration and Information Flow Between the KTIs (See Report)**



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## **SEQUENCE OF KTI PRESENTATION**

- **UNSATURATED AND SATURATED FLOW UNDER ISOTHERMAL CONDITIONS**
- **THERMAL EFFECTS ON FLOW**
- **EVOLUTION OF THE NEAR-FIELD ENVIRONMENT**
- **REPOSITORY DESIGN AND THERMAL-MECHANICAL EFFECTS**
- **CONTAINER LIFE AND SOURCE TERM**
- **RADIONUCLIDE TRANSPORT**
- **IGNEOUS ACTIVITY**
- **STRUCTURAL DEFORMATION AND SEISMICITY**
- **ACTIVITIES RELATED TO DEVELOPMENT OF THE EPA STANDARD**
- **TOTAL SYSTEM PERFORMANCE ASSESSMENT AND INTEGRATION**





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**RELATIONSHIP BETWEEN THE KTI AND DOE  
WASTE CONTAINMENT AND ISOLATION STRATEGY:  
UNSATURATED AND SATURATED FLOW  
UNDER ISOTHERMAL CONDITIONS**

- **DOE WCIS:**
  - Percolation Is Significantly Less Than Infiltration
  - Rapid Fracture Flow Affects a Limited Volume of the Repository
  - Capillary Effects Will Reduce Seepage
  - Impacts of Climate Can Be Bounded
  
- **NRC SUBISSUES:**
  - Climate Over the Performance Period
  - Shallow Infiltration Under Current Conditions
  - Deep Percolation Under Current Conditions
  - Deep Percolation Over the Performance Period
  - Dilution in the Saturated Zone



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**PATH TO RESOLUTION: UNSATURATED AND  
SATURATED FLOW UNDER ISOTHERMAL CONDITIONS**

- **Publish Issue Resolution Status Report (IRSR) Including Acceptance Criteria on Future Climate, Shallow Infiltration, and Deep Percolation—Early FY97**
  - **Investigate Bounds on Future Climate Based on Geologic Record**
  - **Bound Shallow Infiltration Considering Spatial Variability**
  - **Reach Agreement on Method to Model Deep Percolation or Obtain Conservative Bound**
- **Publish IRSR on Dilution in Saturated Zone—FY98**
  - **Evaluate Conceptual Models Including Flow Channeling**
  - **Analyze Geochemical Data to Corroborate Hydrologic Estimates of Dilution**



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**ACCOMPLISHMENTS IN FY96: UNSATURATED AND  
SATURATED FLOW UNDER ISOTHERMAL CONDITIONS**

- Drafted an Issue Resolution Status Report on Climate
- Modeled Shallow Infiltration and Potential for Perching Considering Site Characteristics
- Used Hydrologic and Chemical Constraints to Estimate Percolation Flux
- Initiated Study of Saturated Zone Dilution



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**RELATIONSHIP BETWEEN THE KTI AND DOE WASTE  
CONTAINMENT AND ISOLATION STRATEGY:  
THERMAL EFFECTS ON FLOW**

- **DOE WCIS:**
  - Thermally Induced Changes in Seepage Rates Can Be Bounded
  - Emplaced Waste Will Reduce the Relative Humidity
- **NRC SUBISSUES:**
  - Adequacy of DOE Thermal Testing to Evaluate Gravity-Driven Refluxing
  - Adequacy of Thermal Modeling to Assess the Nature of and Bound the Thermally Induced Flux
  - Adequacy of the DOE Thermal Loading Strategy with Respect to Waste Package Performance



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## **PATH TO RESOLUTION: THERMAL EFFECTS ON FLOW**

- **Publish IRSR on Gravity-Driven Refluxing—End FY97**
  - **Evaluate Conceptual Models: Fracture Dripping and Gravity-Driven Refluxing**
  - **Reach Agreement on Range of Conditions for Field Tests**
  - **Determine Effects of Backfill, Hydraulic Properties, Ventilation, and Geologic Features**
  - **Evaluate Whether Important Thermal Processes Are Included in PA**
  
- **Publish IRSR on Thermally Induced Perturbations on Water Flux—FY98**
  - **Evaluate Effect of Heat on Perched Water Bodies**
  - **Evaluate Sensitivity of Dose to Thermally Induced Perturbations on Water Flux**



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**ACCOMPLISHMENTS IN FY96: THERMAL EFFECTS  
ON FLOW**

- Reviewed and Agreed With Findings of DOE Peer Review Team
- Evaluation of DOE Heater Tests Indicated That Gravity Refluxing May Not Be Observed in Drift-Scale Test
- Benchmarking of DOE/NRC Computer Codes Did Not Show Major Differences
- Sensitivity Analyses Showed Cooling Effects of Fracture Flow and Ventilation



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**RELATIONSHIP BETWEEN THE KTI AND DOE WASTE  
CONTAINMENT AND ISOLATION STRATEGY:  
EVOLUTION OF THE NEAR-FIELD ENVIRONMENT**

- **DOE WCIS:**
  - Seepage into Drifts Will Be a Small Percentage of Percolation
  - Radionuclide Release Will Be Low
  - Transport Properties of Engineered Barriers Will Reduce Radionuclide Concentrations
- **NRC SUBISSUES:**
  - Near-Field Chemical Effects on Seepage
  - Effects of Near-Field Environment on Containment
  - Effects of Near-Field Environment on Radionuclide Mobilization
  - Effects of Near-Field Environment on Radionuclide Transport



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**PATH TO RESOLUTION: EVOLUTION OF THE  
NEAR-FIELD ENVIRONMENT**

- Publish IRSR on Effect of Coupled Processes on Containment, Release and Transport—Mid FY97
  - Develop Geochemical Models for Interactions Among Water and Natural and Engineered Materials
  - Evaluate the Adequacy of DOE Near-Field Environment Model and Associated Data Synthesis Report
  - Bound the Range of Near-Field T-H-C Effects and Their Influence on Performance
- Publish IRSR on Effect of Mineralogy, Petrology and Rock Chemistry on Near-Field Environment—End FY97
  - Review Data and Models
  - Estimate Sensitivity of Dose to Related Parameters





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**PATH TO RESOLUTION: EVOLUTION OF THE  
NEAR-FIELD ENVIRONMENT (continued)**

- **Publish IRSR on Effects of Man Made Materials — FY98**
  - **Bound the Range of Effects of Man-Made Materials and Micro-Organisms**



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## **ACCOMPLISHMENTS IN FY96: EVOLUTION OF THE NEAR-FIELD ENVIRONMENT**

- Sensitivity Analyses of T-H-C Effects for a Range of Aqueous Components, Heat, and Fluid Flow Conditions Showed Significant Effects on pH and Chloride Concentrations
- Initial Calculations Showed that the Equivalent Continuum Models Did Not Accurately Simulate Flow Through Fractures
- Estimated Effects of Cementitious Materials, but Uncertainties Are High
- Found Bacterial Colonies Were Viable at Repository Temperatures



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**RELATIONSHIP BETWEEN THE KTI AND DOE WASTE  
CONTAINMENT AND ISOLATION STRATEGY:  
REPOSITORY DESIGN AND  
THERMAL-MECHANICAL EFFECTS**

- **DOE WCIS:**
  - Flow Rate into Repository Will Be Low
  - Engineered Barriers will Limit Migration of Radionuclides
- **NRC SUBISSUES:**
  - Design of Repository to Meet Pre- and Post-Closure Objectives
  - Evaluation of Thermal Effects on Underground Design
  - Role of Repository Seals in Meeting Performance Objectives



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## **PATH TO RESOLUTION\*: REPOSITORY DESIGN AND THERMAL-MECHANICAL EFFECTS**

- **Publish IRSR on Design Control Process — Mid FY97**
  - **Agree on Seismic Design Methodology and Input Data**
  - **Ensure DOE Design Documents Incorporate Regulatory Requirements**
  - **DOE Implements Adequate Design Control Process**
- **Possible Future IRSR**
  - **Evaluate DOE Heater Tests and Results**
  - **Complete Evaluation of Adequacy of Continuum Model and Parameter Values for Analysis of Rock Stability**

\* Due to budget constraints, contractor work has been eliminated in FY97 and NRC staff work has



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**ACCOMPLISHMENTS IN FY96: REPOSITORY DESIGN  
AND THERMAL-MECHANICAL EFFECTS**

- DOE Seismic Topical Report No. 2 Was Reviewed and DOE Responses are Being Evaluated
- Evaluated DOE Design Control Process and Flow-Down of Requirements
- Conducted Parametric Study of Drift Stability; Stresses and Slip Rates Are Sensitive to Fracture Patterns
- Developed Rock Joint Constitutive Model that Includes Effects of Reverse Shear
- Initiated Evaluation of Effects of Seismic Load on Yield Zone



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**RELATIONSHIP BETWEEN THE KTI AND DOE WASTE  
CONTAINMENT AND ISOLATION STRATEGY:  
CONTAINER LIFE AND SOURCE TERM**

- **DOE WCIS:**
  - Corrosion Rates Are Very Low
  - Double-Walled Containers Will Provide Galvanic Protection
  - Radionuclide Release from Waste Forms Will Be Slow
- **NRC SUBISSUES:**
  - Method for Estimating Corrosion Initiation and Corrosion Rates
  - Efficiency of Galvanic Protection
  - Extrapolation of Short-Term Data on Dry Oxidation and Humid Air Corrosion
  - Effects of Long-Term Thermal Exposure and Mechanical Loads
  - Effects of Micro-Organisms on Corrosion
  - Significance of Dissolution Rate, Secondary Mineral Formation, and Colloids on Release



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**PATH TO RESOLUTION\*: CONTAINER LIFE  
AND SOURCE TERM**

- Publish IRSR on Dry Oxidation—Mid FY97
- Topics for Inclusion in Future IRSRs
  - Complete Long-Term Critical Potential Measurements, Incorporate in TPA Calculations
  - Evaluate DOE Estimates of Corrosion by Using Repassivation Potential Methodology
  - Bound Stress, Flaw Size, Grain Boundary Phosphorus, and Material Factors Affecting Mechanical Stability
  - Evaluate Galvanic Effects on Waste Container Life

\* Due to budget constraints, contractor work has been eliminated in FY97 and NRC staff work has been reduced significantly.



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## **ACCOMPLISHMENTS IN FY96: CONTAINER LIFE AND SOURCE TERM**

- Demonstrated Applicability of Repassivation Potential as a Bound for Initiation of Localized Corrosion
- Determined that Microbial Effects Can Be Incorporated in Repassivation Potentials
- Evaluated Dry Oxidation Rate
- Identified Method for Evaluating Thermal Embrittlement Based on Grain-Boundary Phosphorus
- Calculated that Galvanic Coupling Could Extend Waste Package Life Substantially
- Determined that Formation of Secondary Minerals Will Control the Rate of Waste Dissolution
- Developed the First Version of the EBSPAC Computer Code





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**RELATIONSHIP BETWEEN THE KTI AND DOE WASTE  
CONTAINMENT AND ISOLATION STRATEGY:  
RADIONUCLIDE TRANSPORT**

- **DOE WCIS:**
  - Transport Properties of Natural Barriers Will Significantly Reduce Radionuclide Concentrations
- **NRC SUBISSUES:**
  - Conceptual and Mathematical Models for Radionuclide Retardation
  - Identification of Radionuclides Requiring Some Form of Retardation to Meet Performance Standards at Yucca Mountain
  - Geochemical and Hydrological Controls on Rates of Radionuclide Transport



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## **PATH TO RESOLUTION\*: RADIONUCLIDE TRANSPORT**

- **Obtain Agreement on Lower Bounds of Sorption for Key Elements**
- **Implement Improved Sorption Models in TPA to Evaluate Sensitivity**
- **Evaluate Degree of Matrix Diffusion at Yucca Mountain**
- **Use Site Data to Bound Mixing/Dilution**

\* Due to budget constraints, contractor work has been eliminated in FY97, NRC staff work continues, but is shifted to other KTIs.



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**ACCOMPLISHMENTS IN FY96:  
RADIONUCLIDE TRANSPORT**

- Evaluated the Sensitivity of Np and U Sorption to Geochemical Parameters; Sorption Changes by Orders of Magnitude with Changes in Ph
- Developed a "Smart  $K_d$ " Approach to Sorption Modeling
- Evaluated the DOE  $^{36}\text{Cl}$  Measurements; Measured  $^{36}\text{Cl}$  in ESF Indicates Presence of Fracture Flow
- Evaluated Saturated Zone Mixing Using Hydrochemical Data



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**RELATIONSHIP BETWEEN THE KTI AND DOE  
WASTE CONTAINMENT AND ISOLATION  
STRATEGY: IGNEOUS ACTIVITY**

- **DOE WCIS:**
  - Volcanic Events within the Controlled Area will be Rare and the Consequences of Volcanism will be Acceptable
- **NRC SUBISSUES:**
  - Probability—Recurrence Rates, Geologic Factors Influencing Timing and Location
  - Consequences—Physical Characteristics of Eruptions, Models of Effects on Repository and Waste Packages and Dispersal of Contaminants
  - Data Quality—Accuracy, Precision, and Completeness of the Data Used to Support Models and Associated Evaluations



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## **PATH TO RESOLUTION: IGNEOUS ACTIVITY**

- **Publish IRSR Criteria on Probability—Late FY97**
  - Integrate Spatially-Dependent Probability Models into the TPA Code for Performance Assessment
  - Include Results of Investigations on Influence of Structure on Probability
- **Publish IRSR on Consequences of Magmatic Disruption—Late FY98**
  - Characterize YMR Volcano Dispersal Capabilities
  - Gather Geologic Data to Evaluate Subsurface Areas of Disruption
  - Conduct Sensitivity Studies of Key Parameters Using the TPA Code
- **Evaluate DOE Igneous Activity Synthesis Report**
  - Maintain and Develop Systems to Evaluate Large Data Sets (GIS, PVHVIEW)
  - Maintain Consistency of Approach with SDS and TSPAI KTIs



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## **ACCOMPLISHMENTS IN FY96: IGNEOUS ACTIVITY**

- **Estimated Annual Probability by Alternate Models and That Will Provide Basis for Subissue Resolution**
- **Developed Initial Calculations of Dose to Critical Group**
- **Identified Sensitivity of Dose to Number of Waste Packages Affected, Fuel Particle Size, and Incorporation Ratio**
- **Updated Database to Support Development of Alternative Models and Evaluation of the DOE Viability Assessment**



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**RELATIONSHIP BETWEEN THE KTI AND DOE WASTE  
CONTAINMENT AND ISOLATION STRATEGY:  
STRUCTURAL DEFORMATION AND SEISMICITY**

- **DOE WCIS:**
  - Movement on Faults Too Small and Infrequent to Bring Waste to Surface or Impact Containment
  - Only Slight Increase in Rockfall and Drift Collapse Due to Severity of Future Ground Motion
- **NRC SUBISSUES:**
  - Conceptual Tectonic Models
  - Impact of Future Faulting on Waste Packages
  - Effects of Structure and Stresses on Groundwater Flow
  - Potential Fault-Dike Interactions



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## **PATH TO RESOLUTION: STRUCTURAL DEFORMATION AND SEISMICITY**

- **Publish IRSR on Conceptual Models—End FY97**
  - Update Geological and Geophysical Database
  - Further Narrow Range of Viable Models
  
- **Publish IRSR on Probabilistic Seismic Hazard Analysis (PSHA)—FY98**
  - Reach Agreement on Probabilistic Fault and Seismic Hazard Analysis Methods
  - Using TPA Code, Investigate Sensitivity of Dose to Seismicity
  
- **Publish IRSR on Fault Control of Magma—FY98**
  - Determine Effects of Fault-Dike Interactions on Performance





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**PATH TO RESOLUTION: STRUCTURAL DEFORMATION  
AND SEISMICITY (continued)**

- Publish IRSR on Fault Disruption of Waste Packages
  - Analyze Sensitivity of Performance to Faulting
- Publish IRSR on Fracture Models—FY98
  - Evaluate Fracture Models and Effects of Stress on Flow
  - Evaluate Influence of Structure on Large Hydraulic Gradient
- Continue GIS Development



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**ACCOMPLISHMENTS IN FY96: STRUCTURAL  
DEFORMATION AND SEISMICITY**

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- **Narrowed Number of Viable Tectonic Models**
- **Identified Type I Faults**
- **Initial Modeling Results Indicated that Empirical Attenuation Functions May Underestimate Ground Motions**
- **Initial Investigation of Influence of *In Situ* Stress on Flow Anisotropy Showed Significant Change in Flow Direction**



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**RELATIONSHIP BETWEEN THE KTI AND DOE WASTE  
CONTAINMENT AND ISOLATION STRATEGY:  
ACTIVITIES RELATED TO DEVELOPMENT  
OF THE EPA STANDARD**

- DOE WCIS: Not Directly Applicable
- Defining a Compliance Period
- Selecting Critical Group(s)
- Evaluating Results of Human Intrusion
- Considering Disruptive Events



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**PATH TO RESOLUTION: ACTIVITIES RELATED TO  
DEVELOPMENT OF THE EPA STANDARD**

- Continue Interactions with EPA; Provide Formal Comments on Draft Standard
- Select an Appropriate Time Period of Interest Considering
  - Relative Radioactive Hazard
  - Time of Peak Dose at Appropriate Locations
  - Influence of Disruptive Events Relative to Baseline Processes
  - NRC Policy and Public Comments
- Develop Guidance on Reference Biospheres, Exposure Scenario(s), and Critical Group(s)
- Adopt a Position Regarding Treatment of Human Intrusion Based on NAS Input, Legislative Direction, and/or Other Factors



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**ACCOMPLISHMENTS IN FY96: ACTIVITIES RELATED  
TO DEVELOPMENT OF THE EPA STANDARD**

- Evaluated Radiological Hazard Relative to Uranium Dose
- Studied the Relationship Between the Peak Dose and Location of Critical Group
- Determined the Consequences of a Stylized Human Intrusion
- Analyzed the Magnitude and Relative Importance of Disruptive Events for 10,000- and 1,000,000-Year Time Periods



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**RELATIONSHIP BETWEEN THE KTI AND DOE WASTE  
CONTAINMENT AND ISOLATION STRATEGY: TOTAL  
SYSTEM PERFORMANCE ASSESSMENT  
AND INTEGRATION**

- DOE WCIS: All 15 Hypotheses Addressing the Goals of
  - Near-Complete Containment of Radionuclides for 1,000s of Years
  - Acceptably Low Annual Doses to the Public
- NRC SUBISSUES:
  - Adequacy of the DOE TSPA Methodology
  - Adequacy of DOE WCIS in Representing and Testing the Major Performance-Affecting Site Attributes and Processes
  - Working with the other KTIs, Continue Ongoing Assessments of the Relative Importance to the Impact on Performance of the NRC/KTIs



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**PATH TO RESOLUTION: TOTAL SYSTEM  
PERFORMANCE ASSESSMENT AND INTEGRATION**

- Publish IRSR on Model Abstraction in DOE's TSPA—FY97
  - Conduct Detailed Reviews of TSPA-95 in Selected Focus Areas
  - Develop and Maintain NRC PA Capability
  - Provide Early Feedback to DOE Via Technical Exchanges and Appendix 7 Visits
- Publish IRSR on Relative Importance of KTIs and WCIS—End FY97
  - Technical Subissues Regarding Model Abstraction, Parameter and Model Uncertainties, and Scenario Methodology
- Publish IRSR on Documentation of TSPA—FY98
  - Investigate "Transparency of PA"



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**ACCOMPLISHMENTS IN FY96: TOTAL SYSTEM  
PERFORMANCE ASSESSMENT AND INTEGRATION**

- Conducted Audit Review of DOE TSPA-95
  - Infiltration and Percolation Model is Nonconservative
  - Groundwater Dilution Is Overly Optimistic and not Supported by Geochemical Data
  - Temperature and Humidity Calculations Were Not Well Documented, but Appear Conservative
  - Waste Package Failure Models Are Limited to General and Pitting Corrosion, and May Be Nonconservative
  - Subsystem Abstraction for Transport Results in Lower Cumulative Releases and Individual Doses





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**ACCOMPLISHMENTS IN FY96: TOTAL SYSTEM  
PERFORMANCE ASSESSMENT AND INTEGRATION**

(continued)

- Support to Improving the TPA Code
  - Incorporated Capability to Address Alternate Regulatory Requirements
  - Accommodated In-Drift Emplacement Repository Designs
  - Enhanced Process Models
- Completed BTP on Expert Elicitation
- Completed Licensing Support System Test Bed



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## **SUMMARY AND CONCLUSIONS**

- **The Entire NRC Repository Program Was Refocused and Reorganized — FY96**
- **The NRC KTIs Are Closely Related to the DOE Waste Containment and Isolation Strategy**
- **Paths to Resolution Have Been Developed for Each KTI**
- **Significant Progress Was Made on Resolution of Subissues in FY96**
- **Future Work Will Employ Issue Resolution Status Reports as a Vehicle to Close Subissues at the Staff Level**



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**HLW INTEGRATION TASK GROUP REPORT**

**Presented to:**

**Advisory Committee on Nuclear Waste**

**January 29, 1997**

**By:**

**John O. Thoma, Section Leader**  
**Performance Assessment & HLW Integration Branch**  
**Division of Waste Management**  
**Office of Nuclear Material Safety and Safeguards**

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**OUTLINE**

- **Background**
- **Observations**
- **Conclusions**
- **Short Term Actions**
- **Long Term Recommendations**



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## **BACKGROUND**

- **The Management Board raised questions on the effectiveness of integration in HLW Program**
- **Group identified and tasked to investigate the level of integration in the HLW Program**
- **All 10 KTI Team Leads and CNWRA counterparts interviewed**



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**OBSERVATIONS**

- **Several examples of positive aspects to the program:**
  - **Focused on the more significant issues**
  - **TSPA-95 audit review supported by coordinated analysis involving many KTIs**
  - **EPA Standard KTI**
  - **KTI Implementation Plans**
    - + **Input/output tables**
    - + **Linked to DOE's Waste Containment Isolation Strategy**



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**CONCLUSIONS**

- Although each KTI has made progress based on individual plans, there is still room for improvement in the overall implementation of the program.
  - Improvement needed in follow-through on input/output section of the KTI Implementation Plans
  - Improved integration needed in implementing performance assessment activities



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**SHORT TERM ACTIONS**

- **KTI Plan activity tables recently updated to include:**
  - **A more integrated approach that identifies KTI activities supporting specific issue resolution and PA activities**
  - **Products with completion dates better defined for each activity with improved integration of completion dates**
- **Yucca Mountain Team meetings are attempting new approaches to foster more open dialogue.**
- **An independent consultant has reviewed team building across the Division for HLW activities.**





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## **LONG TERM RECOMMENDATIONS**

- The HLW Program needs to develop and continuously nurture a shared vision for performance assessment, its role in the program, and its relationship to other technical activities
- Management needs to continuously promote and support a team approach to the HLW Program to ensure effective implementation of plans
- Communication across the HLW Program should be improved.