

**UNITED STATES OF AMERICA**  
**NUCLEAR REGULATORY COMMISSION**

**Title:**           **BRIEFING ON NRC STATUS OF HIGH-LEVEL  
WASTE MANAGEMENT PROGRAM - PUBLIC  
MEETING**

**Location:**       **Rockville, Maryland**

**Date:**           **Tuesday, April 25, 1995**

**Pages:**          **1 - 55**

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2 NUCLEAR REGULATORY COMMISSION  
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6 BRIEFING ON NRC STATUS OF HIGH-LEVEL  
7 WASTE MANAGEMENT PROGRAM - PUBLIC MEETING  
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10 Nuclear Regulatory Commission  
11 One White Flint North  
12 Rockville, Maryland  
13

14 Tuesday, April 25, 1995  
15

16 The Commission met in open session, pursuant to  
17 notice, at 2:00 p.m., Ivan Selin, Chairman, presiding.  
18

19 COMMISSIONERS PRESENT:  
20

21 IVAN SELIN, Chairman of the Commission  
22 KENNETH C. ROGERS, Commissioner  
23 E. GAIL de PLANQUE, Commissioner  
24  
25

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1 STAFF SEATED AT THE COMMISSION TABLE:

2

3 KAREN CYR, General Counsel

4 ANDREW BATES, Acting Assistant Secretary

5 HUGH THOMPSON, Deputy Executive Director, NMSS & Operations

6 Support

7 DR. MALCOLM KNAPP, Director, Division of Waste Management,

8 NMSS

9 DR. CARL PAPERIELLO, Deputy Director, Office of Nuclear

10 Material Safety and Safeguards

11 MARGARET FEDERLINE, Deputy Director, Division of Waste

12 Management, NMSS

13 JOHN GREEVES, Division of Waste Management

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

[2:00 p.m.]

CHAIRMAN SELIN: Good afternoon, ladies and gentlemen.

The Commission is meeting now to be briefed by the staff on the review strategy for the DOE High-Level Waste Program approach. In fact, this is one of a series of presentations that we're going to receive. We're looking not just for the review strategy, of course, Mr. Thompson, but for our impression of what the program is and what the key issues will be so that they'll set some hypotheses so that when DOE appears before us we'll be better prepared to ask them questions that will be relevant to our own program, since this is a major regulatory responsibility and a major resource responsibility, both for the Commission.

We were last briefed by the staff in October of last year. DOE will soon be with us to talk to us about three separate programs, the licensing support system, the multipurpose canister program in which I notice they've just let a contract, and the overall high-level waste program which includes site characterization at Yucca Mountain.

Congress is also considering several bills. Many of these bills do two things, they look favorably on the program approach and they all propose significant modifications for the existing statutory basis for storage,

1 transportation and disposal of spent nuclear fuel, in  
2 particular breaking the prohibition against doing some kind  
3 of intermediate storage until a decision is made on where to  
4 site the geological repository.

5 With all this near-term activity in the high-  
6 level waste area, we believe it's timely to hear from the  
7 staff about their strategy and to put all of this work into  
8 context for us.

9 Commissioner Rogers?

10 Commissioner de Planque?

11 Mr. Thompson?

12 MR. THOMPSON: Thank you, Mr. Chairman. Today's  
13 placards up here, as you can tell, seem to have been made  
14 last week when Bob Bernero was still the office director.

15 Bob, you can run but you can't hide. He's there  
16 in the office. After 23 years of service, Bob, we  
17 appreciate your contribution to the High-Level Waste  
18 Program.

19 Today's briefing will be given by Margaret  
20 Federline who's the Deputy Division Director of the Division  
21 of Waste Management in NMSS. We will discuss the staff's  
22 views on the status of DOE's implementation of the program  
23 approach and NRC's new strategy for reviewing the DOE  
24 activities which are directed in making a site suitability  
25 determination by 1998. We will explain the use of what we

1 call now a vertical slice approach. This is a new approach  
2 that we have devised which provides our ability to identify  
3 in a more proactive manner those key technical issues which  
4 we are going to make sure both the Commission and DOE are  
5 clearly aware of that we believe are critical elements that  
6 must be resolved in doing the site suitability  
7 determination.

8 We have accelerated this briefing at the request  
9 of the Commission to provide an early insight, as you said  
10 earlier, in preparation of meetings with DOE. We will  
11 obviously be prepared at a later date to provide more  
12 details to you with respect to the budget implications. I  
13 think we owe the Commission a paper on those details, but we  
14 believe this new approach has the ability to be flexible yet  
15 also allows us to be proactive in identifying the key  
16 technical issues.

17 Margaret?

18 MS. FEDERLINE: Thank you.

19 Good afternoon. It's a pleasure to be here today  
20 to discuss our change in strategy for the High-Level Waste  
21 Program. There are two things that have motivated us to  
22 make these changes. The first is John's and my perception  
23 that there's a need for more real time feedback and real  
24 time interaction with DOE, enabling us to examine data, look  
25 at field activities that are going on. So, that's one

1 component of our strategy.

2 The next is a need to husband our resources  
3 through an audit approach of the prelicensing period. We  
4 believe that it makes sense to focus on what we believe are  
5 the key technical issues for licensing during this period,  
6 knowing full well that we will conduct a full licensing  
7 review of all the aspects when we do receive the license  
8 application.

9 May I have the next slide, please, the overview?

10 [Slide.]

11 MS. FEDERLINE: In June and December of '94, Dr.  
12 Dreyfus outlined the program approach. We believe that by  
13 nature of the process the geologic repository is a first of  
14 a kind activity and therefore it's evolutionary and our  
15 interactions need to be iterative as we proceed through the  
16 program approach. Now, given the schedule for the high-  
17 level findings and the peer review process, we focused our  
18 program on those issues that are most important to licensing  
19 so that we can have an effective conversation and  
20 interaction with all the parties as the data is being  
21 collected and we can identify any needs for additional data  
22 collection when the data will be least costly to obtain.

23 So, our goal is to make a timely assessment of  
24 whether the program approach will result in the necessary  
25 information for licensing, but in a time frame when these



1 needs can be discussed as part of the site suitability  
2 process.

3 Can I have the next slide, please?

4 [Slide.]

5 MS. FEDERLINE: I wanted to give you some insight  
6 as to what's going on at the Yucca Mountain site, just so  
7 you have a perspective of what is going on with DOE and what  
8 NRC is involved in at this particular time. This slide  
9 provides an overview of the major facilities at Yucca  
10 Mountain. The next two slides were not in the package that  
11 we sent up to you earlier because we wanted to provide you  
12 with the most recent information.

13 You can see at the upper left-hand corner the  
14 crest of Yucca Mountain and the North Portal is the place  
15 where the tunnel boring machine entered the mountain. Of  
16 course, the south portal is where the south ramp will be  
17 complete. Now, there's a lot of activity going on at the  
18 site. The ESF, which everyone is familiar with, but there  
19 are also 33 deep bore holes that have been dug to date,  
20 multi-instrumented, many data sets coming out of the bore  
21 hold. There will be 54 bore holes by September 1999.

22 Now, NRC is fully involved in this process. We  
23 have bimonthly ESF meetings. We discussed design and  
24 construction in those meetings. DOE also by Internet keeps  
25 us informed on a daily basis about the activities and the

1 progress that's being made at the ESF. Our on-site  
2 representatives, of course, are involved on a daily basis.

3 Although no activities have reached the threshold  
4 for formal reporting, DOE still continues to keep us  
5 informed and lets us know about difficult conditions or  
6 problems as they did with the recent poor tunneling  
7 conditions at Yucca Mountain.

8 May I have the next slide, please?

9 [Slide.]

10 MS. FEDERLINE: This provides a little more detail  
11 of the ESF. The main tunnel is expected to be five miles in  
12 length at a diameter of 26 feet and there's an additional  
13 10.5 miles scheduled to study the Calico Hills and the  
14 Solitario Canyon. Now, there are seven alcoves that are  
15 scheduled to be blasted and dug out of the main tunnel.  
16 Five alcoves will be in the north ramp. As a matter of  
17 fact, we learned this morning that they have completed the  
18 mapping for the second alcove and will be beginning  
19 construction next month.

20 The starter tunnel was constructed using drill and  
21 blast technology. They brought in the tunnel boring machine  
22 to construct the ESF because it minimizes damage to the rock  
23 surface and therefore minimizes damage to the waste  
24 isolation. As of this morning when we talked to the on-  
25 site reps., they were about 1900 feet into the mountain.

1           Now, in the past several weeks they've been  
2   encountering difficult tunneling conditions. They are in  
3   the area of the Imbricate Fault Zone. The Imbricate Fault  
4   Zone consists of broken rock the size of baseballs to beach  
5   balls and you can imagine that's pretty difficult to go  
6   through with a tunnel boring machine. What happened was  
7   that rock would fall around the cutter heads and create  
8   voids. Then it would be difficult for the tunnel boring  
9   machine to grasp the side of the mountain and pull itself  
10  along.

11           So, DOE implemented a couple of solutions. They  
12  pumped sand into the voids and they drilled bore holes ahead  
13  of the TBM and put grout in so that conditions would be more  
14  stable and they would be able to continue construction of  
15  the ESF.

16           Next slide, please.

17           [Slide.]

18           MS. FEDERLINE: We briefly want to summarize the  
19  status of DOE's implementation of the program approach and  
20  our concerns.

21           Slide 3.

22           [Slide.]

23           MS. FEDERLINE: Now, when Dr. Dreyfus met with you  
24  and discussed the program approach, he emphasized several  
25  management objectives for the program approach. One of key

1 importance to us is better integration of DOE's activities.  
2 He was also interested in facilitating stakeholder  
3 involvement and actually making more realistic schedules and  
4 making the program more consistent with budgets. So,  
5 currently, they are emphasizing the scientific and  
6 engineering activities, planning to provide a decision for  
7 technical site suitability by 1998. They are doing this by  
8 a sequential evaluation of the high-level findings which are  
9 found in the siting guidelines. They intend to have the  
10 technical basis reports reviewed by the National Academy of  
11 Science prior to making their high-level findings.

12 Now, in parallel, it's incumbent upon us to review  
13 this same information for its significance to licensing and  
14 we will be conducting those reviews. Now, if the site is  
15 found technically suitable, the focus will turn to the  
16 license application in 1998 and our responsibility is to  
17 submit a recommendation to the President in the year 2000 on  
18 the adequacy of characterization at depth as well as the  
19 waste package.

20 Now, DOE has indicated to us that they will  
21 continue performance confirmation for a longer period of  
22 time, possibly up to 100 years. So, all in all, we're  
23 generally favorably impressed with the increased integration  
24 of DOE activities, but we are very concerned that the scope  
25 of the data and the analysis methods can be completed in a

1 time frame consistent with the suitability decision.

2 COMMISSIONER ROGERS: Margaret, the technical  
3 basis reports, have any of those been completed yet?

4 MS. FEDERLINE: No, they have not.

5 COMMISSIONER ROGERS: Thank you.

6 [Slide.]

7 MS. FEDERLINE: The next slide is a slide from a  
8 DOE presentation. This was given in the March ACNW meeting  
9 and it was also used in the TRB meeting last week. As we  
10 understand it, DOE's waste isolation strategy is evolving,  
11 although the critical components, as you see them on this  
12 slide, are consistent. They plan to use a strategy of  
13 multiple barriers. They plan to depend upon the unsaturated  
14 environment and the engineered barriers with the natural  
15 barrier providing enhanced confidence that this waste  
16 isolation can be achieved.

17 Number 1 on this slide shows DOE's belief that the  
18 unsaturated rock will provide a favorable near field  
19 environment for the waste package. Number 2 represents  
20 DOE's intent to use a robust waste package to address the  
21 uncertainties in the waste package environment. Number 3  
22 shows their belief that there will be limited mobilization  
23 of radionuclides within the waste package. Number 4  
24 illustrates their assertion that there will be slow release  
25 of radionuclides through the engineered barriers and, number

1 5, they believe that there will be slow migration in the  
2 geosphere as well.

3 So, you can see this is the strategy that NRC is  
4 faced with and there are not many details at this point in  
5 time. But we must try to delve into it and probe the  
6 assumptions to ensure that they are collecting the right  
7 information.

8 COMMISSIONER ROGERS: Just before you leave that,  
9 the word "possible," what does that imply? Does that imply  
10 that they might in fact believe that to be an air gap and  
11 not put anything in there?

12 MR. GREEVES: That's correct.

13 COMMISSIONER ROGERS: And that decision has not  
14 yet been made?

15 MR. GREEVES: Dr. Dreyfus last week at the TRB  
16 meeting, which I was able to attend, he stressed that DOE  
17 wants to maintain its flexibility in these evaluations of  
18 designs and we've spoken to you about that in the past. It  
19 puts us in a little bit of a difficult position to be  
20 prepared. So, he very strongly stated that he wants to  
21 maintain his flexibility and does not want to be forced into  
22 an early decision. So, at the present time, you're keeping  
23 both options open, backfill and no backfill.

24 As a point of information, backfill would not go  
25 in until they closed the facility up. So, if they kept the

1 retrievability period, they're talking about 100 years now.  
2 But however long they kept that open, there would not be any  
3 backfill there. The question is would the design call for  
4 it at the end of that point in time. But this is one of the  
5 challenges that's facing us and part of the reason we're  
6 using the vertical slice approach.

7 COMMISSIONER ROGERS: Thank you.

8 MS. FEDERLINE: Now, staff has pursued many  
9 avenues to try and better understand the program approach.  
10 We reviewed their five year plan and their draft program  
11 plan and we, in fact, submitted two papers to the Commission  
12 outlining our concerns. We continue to be involved in the  
13 ACNW meetings and the TRB meetings and we're finding their  
14 technical program reviews to be the most revealing for us in  
15 terms of details. So, we're planning to be involved in  
16 those.

17 However, our focus on the progress report and the  
18 annotated outline show that those documents do not have  
19 significantly more detail on the program approach than they  
20 did about a year ago. So, this is one of the motivations  
21 that we've had in proposing this new more reactive approach.

22 On this slide I've summarized several of our major  
23 staff views on the program approach. You have seen these in  
24 our Commission paper, but just let me emphasize two of  
25 these. We're concerned that by streamlining the site

1 characterization it will result in additional uncertainty at  
2 the time of the license application because of the bounding  
3 analysis. For some issues, only short-term testing will be  
4 involved at that point in time. Data for suitability will  
5 need to be in by '96 and for licensing by '98. So, it's  
6 clear that there will be significant uncertainties at the  
7 time the application comes in.

8           Also, I just wanted to emphasize that since  
9 determinations on site suitability need to be made in the  
10 context of the repository design, a reasonably complete  
11 reference design and thermal loading strategy are very  
12 important for us to be able to conduct our reviews. We were  
13 pleased at the TRB meeting last week to understand that DOE  
14 is going to pursue a maximum design thermal loading concept.  
15 We're unsure of the details of this at this point in time,  
16 but we feel that this will at least allow us to see the  
17 maximum thermal load under consideration.

18           MR. GREEVES: Yes. The problem we had before was  
19 the concept of them coming in with an application with a low  
20 thermal load and then a number of years later trying to say,  
21 "Well, no, we want to go to the high thermal load." So, I  
22 was pleased at the TRB meeting where they basically reported  
23 that they have an internal white paper on the thermal  
24 loading issue. They know how important this is and they are  
25 bringing forward this maximum design thermal load concept



1     which I find to be a good approach. You tell everybody  
2     going in that, "This is the range I'm considering and I may  
3     go this high," as opposed to announcing that at some later  
4     time after the license application.

5             I've personally been concerned about it and I've  
6     found that approach to be one that seemed to make a lot more  
7     sense to me. So, we'll find out more about that, but each  
8     of these meetings we go to we find out a little bit more and  
9     the program is evolving. So, I look forward to getting that  
10    white paper after they do their internal review.

11            COMMISSIONER ROGERS: Is it clear that the maximum  
12    thermal load design has the most uncertainties associated  
13    with it or is it possible that you've got either end of the  
14    spectrum, that there are different kinds of uncertainties at  
15    a very low thermal load that don't appear at the high  
16    thermal load but the other ones do? Just one reference  
17    design of the high thermal load may leave you with -- I mean  
18    if that ultimately is not the design, whether it still may  
19    leave you with a collection of different kinds of  
20    uncertainties that you may have to deal with.

21            MR. GREEVES: It was expressed that there's  
22    uncertainties throughout the spectrum and some even voiced,  
23    "Well, we may be better off at the low," but other experts  
24    in the audience said you could have some problems at the low  
25    end you don't want to deal with also. It may be a mid-

1 range that would, in fact, have the lowest uncertainties.

2 But from my perspective, I was pleased that they would bring  
3 forward an approach that describes the full range, tells the  
4 regulator, the public, "This is my maximum design thermal  
5 load." I was having some troubles with the concept of  
6 coming in low and six years later saying, "Well, I'd like to  
7 go to the high now."

8 So, as I say, they've got a white paper within the  
9 M&O under review and they revealed the mechanics of it in  
10 the outline and it to me made more sense than the things I'd  
11 seen in the past. So, I'm looking forward to it and  
12 possibly you'll hear some more about it when Dr. Dreyfus  
13 visits.

14 MS. FEDERLINE: In order to illustrate how we plan  
15 to audit DOE's program, I wanted to discuss with you our  
16 identification of key technical issues because this is the  
17 real heart of our program. We're moving more away from a  
18 reactive review in looking at DOE documents in sequence.  
19 You're probably aware that we've received study plans,  
20 topical reports, technical reports, AOs, progress reports.  
21 We're sort of drowning in paper. So, what our approach is  
22 now is to identify several key technical issues and pull all  
23 the relevant documents, data, exercises, assessment methods  
24 together and examine this issue in an integrated fashion.  
25 So, what I'd like to do today is focus on two of those

1 issues and explain how the process works. I regret we don't  
2 have time to go into all of them, but we could, of course,  
3 come back at another time and do that.

4 Next slide, please.

5 [Slide.]

6 MS. FEDERLINE: DOE right now is focusing on site  
7 suitability and we believe it's incumbent on us to focus on  
8 suitability in the context of licensing. So, what we have  
9 tried to do is benefit from the experience we've gained  
10 through our systematic regulatory analysis and our iterative  
11 performance assessment. Dr. Knapp briefed you last April on  
12 our work in SRA. What we're doing in formulating these key  
13 technical issues is capitalizing on what we believe is a  
14 broad basic understanding of the program at this point in  
15 time. We've been involved in this program for a number of  
16 years and we with some confidence believe that we can  
17 identify key issues for licensing.

18 So, you're aware that we have identified  
19 uncertainties whose existence we believe poses a high risk  
20 of non-compliance with the performance objectives. Our  
21 rationale for choosing these top technical issues is that  
22 they, most importantly, have a significant impact on  
23 performance. They've been gained through our experience, as  
24 I've said, and these issues have come up time after time in  
25 our prelicensing interactions with DOE and other parties.

1 Next slide, please.

2 [Slide.]

3 MS. FEDERLINE: Now, the next slide illustrates  
4 the list of key technical issues that we have under  
5 consideration. We're still in the process of finalizing  
6 this list and we have talked to DOE and other parties about  
7 these and they've expressed an interest in coming in and  
8 discussing the key technical issues because DOE is pursuing  
9 a parallel process of identifying key uncertainties. So, I  
10 think it's very important that we dialogue on these.

11 One point I wanted to make is that there are key  
12 underlying design issues like the thermal loading issue and  
13 others that relate to a number of these key technical  
14 issues. So, because you don't see design on the list does  
15 not mean that we have forgotten design.

16 COMMISSIONER ROGERS: How do you feel about the  
17 issue of human intrusion? Is that put in a separate kind of  
18 category? It has been an issue that's been discussed at  
19 great length.

20 MS. FEDERLINE: Yes.

21 COMMISSIONER ROGERS: Do you see that as not on  
22 some other kind of a list?

23 MS. FEDERLINE: That would fall in our list of  
24 scenario selection and calculation of consequences. Our  
25 prime areas there are climate change, human intrusion,

1 earthquake and fault displacement. So, these would be the  
2 disruptive scenarios that we're focusing on.

3 COMMISSIONER ROGERS: Good. Fine.

4 MS. FEDERLINE: The first issue that I wanted to  
5 touch on is volcanism probability and consequence.  
6 Volcanism is a potentially disruptive process which is  
7 really very poorly understood. Uncertainties exist in our  
8 ability to detect and describe past volcanic features and  
9 the effect that they will have on the repository. We also  
10 have uncertainties in the factors which control the volcanic  
11 processes, as well as a broad range of potential  
12 consequences.

13 Next slide, please.

14 [Slide.]

15 MS. FEDERLINE: How is DOE planning to address  
16 these issues? I've laid out a number of aspects of DOE's  
17 program on this slide. They are continuing exploration and  
18 mapping. We have urged them for a number of years to  
19 increase their use of geophysics to investigate the  
20 subsurface volcanic figures and to provide insight into some  
21 structural relationships. They are, in fact, going to do  
22 that. So, we're pleased to see that.

23 The one that I would like to emphasize on this  
24 slide is the conducting of expert elicitation as a basis for  
25 probability estimates. You're aware that we're coming back

1 to brief the Commission on our guidance during the summer  
2 and we hope to publish it in the fall. But the thing that  
3 we did not want to do is keep a lid on any issues that we  
4 recognized and bring them out beyond the time when it was  
5 really useful to DOE and other parties. So, we have been  
6 participating in this expert elicitation as observers and  
7 DOE has given us an opportunity to speak at the end of each  
8 session. We have actually identified two issues which we  
9 raised to DOE in our last management meeting and we are  
10 having subsequent technical discussions with DOE. So, we  
11 believe that this more proactive involvement is going to  
12 raise issues earlier and set us on a course of focusing any  
13 differences that we might have among the parties.

14 Just to touch on our concerns, we plan to use our  
15 vertical slice process which I will discuss in a few  
16 minutes, to focus our reviews and our field investigations  
17 and our interactions with DOE in order to resolve the  
18 concerns that we identify. You're probably aware that  
19 there's a range of views on the part of the experts on the  
20 interpretation of basic volcanic features. The volcanic and  
21 structural investigations are not well integrated. Our  
22 modeling at the center indicates that there's a potential  
23 for structural control of volcanism. We believe that  
24 additional geophysics techniques should be used to explore  
25 the structural relationships and particularly any undetected

1     igneous features that might exist at the site. In fact, the  
2     center is going to be conducting some work at Crater Flats  
3     and will be publishing a report later in the summer on this  
4     issue of undetected igneous features.

5             I also wanted to point out that DOE's performance  
6     assessments, we feel, may not fully bound the range of  
7     probabilities and consequences, particularly those that the  
8     center has observed recently in its active analog work at  
9     Tebulchek.

10            COMMISSIONER ROGERS: So this is a kind of a  
11     criticism of how those performance assessments have been  
12     conducted so far?

13            MS. FEDERLINE: Yes.

14            COMMISSIONER ROGERS: I mean it's not a limitation  
15     by themselves imposed by the performance assessments.

16            MS. FEDERLINE: That's correct.

17            COMMISSIONER ROGERS: But just that they haven't  
18     covered the full possible range.

19            MS. FEDERLINE: That's right. And we really see  
20     progress in DOE, the performance assessment people coming  
21     together with the discipline people to make sure that the  
22     most recent data is incorporated in the performance  
23     assessment. So, I think we expect some improvement in this  
24     concern in TSPA '95.

25            The next issue that I wanted to touch on are waste

1 package degradation processes. I was thinking to myself  
2 when you raised the question about low and high thermal  
3 loading, the issue of microbial processes degrading waste  
4 packages is an example of an issue where at low thermal  
5 loads it's a problem, at high thermal loads it would not be  
6 as much of a problem. So, we have to be sensitive as we  
7 observe these degradation processes to the full range of  
8 potentially impacts to the repository.

9 Let me just touch on two of these. The evaluation  
10 of the engineered barrier system, including the waste  
11 package, is dependent on the repository design. The key  
12 issue here is the waste package environment and how quickly  
13 rewetting of the waste package occurs. This is largely due  
14 to thermal loading.

15 Also, the performance models for corrosion and  
16 material stability have significant uncertainties for the  
17 period of regulatory interest. For instance, there are  
18 great uncertainties as to how the microstructure of the  
19 metals might be affected from prolonged heat, from thermal  
20 exposure.

21 I would just note that the center has been doing  
22 some very useful work in this area of modeling. They  
23 developed a model as the moisture drips onto the waste  
24 package, contains dissolved salts, as that moisture is  
25 evaporated it leaves a thin layer of dissolved salts on the



1 surface of the waste package. As the package is rewet, that  
2 could increase the boiling point and could increase the  
3 corrosion potential of the waste package. So, this was sort  
4 of a new idea that now is being explored in the scientific  
5 community as a result of the center's work.

6 I wanted to touch on DOE's current approach. As  
7 John mentioned, we're learning more as we go to each of  
8 these meetings. As we understand it, they now intend to use  
9 a waste package design with two or more materials as a  
10 defense in depth. They plan to use both a corrosion  
11 resistant and a corrosion allowant material. At the TRB  
12 meeting last week, we learned that they're planning to  
13 evaluate four conceptual waste package designs with two  
14 backfill options and two ventilation options. So, we will  
15 need to stay on top of those.

16 I'll just touch on the last bullet. They're  
17 planning on conducting of laboratory and field tests to  
18 reduce uncertainty and provide bounding values. They're  
19 planning on conducting long-term corrosion tests and, of  
20 course, this is one of the areas of whether enough data will  
21 be in to make a decision early on in the process. They're  
22 also planning to conduct a large block thermal test to learn  
23 more about the environment that's going to be impacting the  
24 waste package. That's another area where we're concerned if  
25 the data will be in in time.

1 COMMISSIONER ROGERS: What does long-term mean  
2 here? How many years?

3 MR. GREEVES: I went to the meeting last week and  
4 they had a session on testing. They're doing tests now. I  
5 think the block test Margaret was talking about is actually  
6 outside --

7 MS. FEDERLINE: Yes.

8 MR. GREEVES: -- of the facility. So, it has the  
9 limitation that it's not underground. But one of the  
10 handouts we got last week put the tests in perspective.  
11 They'll do short-term -- and I'll just focus on thermal for  
12 the moment. They'll do short-term thermal tests which they  
13 can complete within about a year when they get underground.  
14 These are just single element heater tests and they will  
15 start room scale thermal tests when they get underground,  
16 get the room opened up, and do something on an MPC scale.  
17 But the data from that particular test, all you will have is  
18 the ramp-up portion of it by 2001. So, those types of tests  
19 take five years say. Part of the question we're going to be  
20 struggling with is how do we deal with a licensing process  
21 where a fair amount of data is actually going to come after  
22 the license application hits the door. You will have the  
23 ramp-up data if the schedules are met, but is this answering  
24 the question you had?

25 COMMISSIONER ROGERS: Well, it seems to me I

1 recall that the Technical Review Board was talking about  
2 decades.

3 MR. GREEVES: Some of the tests can take seven or  
4 eight years for the large scale thermocouple tests. I think  
5 by the license to emplace you will have a good handle on  
6 that. But at license application it's a little bit of a  
7 gradation.

8 COMMISSIONER de PLANQUE: Is there a clear  
9 understanding or agreement as to how long these tests need  
10 to be conducted or is that still an unknown?

11 MS. FEDERLINE: This is what we're trying to  
12 achieve through the vertical slice as having sort of one on  
13 one discussions between the scientists, all the parties  
14 among the scientists to try and identify what are the key  
15 tests. One of the next slides that I'm going to talk about,  
16 one of our concerns the center has is that the range of  
17 environmental parameters is not broad enough to evaluate the  
18 impact on the waste package. So, that's a question, what is  
19 broad enough in terms of environment parameters. Those are  
20 the kinds of things that scientists need to sit down and  
21 discuss face to face. Articles need to be published in peer  
22 review journals and that's an approach that we're going to  
23 be pushing in our new approach.

24 I'm not sure we answered your question about how  
25 long is long-term, but I think that's what we have

1 recognized, is that we have to attack this on an issue by  
2 issue basis and understand how significant is this  
3 particular parameter to the performance of the repository.  
4 That will tell us how long the data needs to be collected  
5 and how significant it is for reasonable assurance.

6 MR. GREEVES: Was your question how long these  
7 tests are needed to be evaluated?

8 COMMISSIONER de PLANQUE: Is there some agreement  
9 as to how long they --

10 MR. GREEVES: My impression, and again there's a  
11 bunch of experts pouring over this issue, the experts agree  
12 that the suite of tests DOE presented to the TRB last week  
13 is what needs to be done. They do span -- as I said, the  
14 shorter term ones can run for a year. There's a mid-term  
15 group that runs from a few years and others that run for  
16 like seven or eight years. The comfort I got out of it was  
17 that it looks like you have enough time by emplacement to  
18 have that under your belt, understood and confirmed.

19 So, I think that's a partial answer to your  
20 question. But this type of a licensing activity is nothing  
21 like anything I've dealt with in the past. I think the  
22 support grounds that we look at for other types of  
23 activities, I'm not sure how useful they are in this  
24 particular arena. So, they will continue to run some of  
25 these tests for at least a decade, some of these longer term

1 ones.

2 MS. FEDERLINE: And I think there's precedence for  
3 that in the reactor program. There was a confirmatory  
4 research program run for a number of years to confirm  
5 issues. So, it's the question of what's necessary for  
6 reasonable assurance.

7 Next slide, please.

8 [Slide.]

9 MS. FEDERLINE: On this slide a major concern that  
10 we have as we've discussed is the need for an understanding  
11 of the thermal loading that will be pursued. Our concern is  
12 if it's delayed and DOE pursues it as an amendment late in  
13 the process that there will be near field conditions that  
14 will be raised as a result of a higher thermal loading that  
15 may not have been accounted for or data may not exist for.

16 Let me touch on the third bullet, the approach for  
17 rating alternate materials is subjective and does not  
18 consider coupled performance factors. They've taken what  
19 our experts believe to be a good process in examining  
20 corrosion and weldability and strength, but they've  
21 considered these separately and have not integrated them.  
22 So, our scientists believe that there's a need to evaluate  
23 these in combination.

24 Also, we believe there's an need for increased  
25 emphasis on a mechanistic understanding of the degradation

1 processes. We're worried that some of the programs that  
2 they're designing using a laboratory approach are perhaps  
3 too empirical to result in the kind of understanding that we  
4 believe is needed.

5 Next slide, please.

6 [Slide.]

7 MS. FEDERLINE: Now that we've given you some  
8 insight into what we believe the key issues are, we'd like  
9 to discuss how we plan to review DOE's implementation of  
10 this approach. We presented this approach to DOE and other  
11 parties in our April 11th management meeting and we've  
12 received a letter back from DOE indicating that they believe  
13 it will complement the ongoing issue resolution process and  
14 that they're eager to talk to us about the identification of  
15 the issues as well as how we document that the issues are  
16 resolved.

17 CHAIRMAN SELIN: They must have really been afraid  
18 of the alternative if you got a letter back in ten days from  
19 them.

20 MS. FEDERLINE: May I have the next slide, please?

21 [Slide.]

22 MS. FEDERLINE: Now, the vertical slice approach  
23 is intended to answer the question of whether the program  
24 approach process will result in sufficient information for  
25 licensing through an audit approach. We're not going to

1 look at everything in detail, but we believe that by looking  
2 at key issues we can infer enough about the process that  
3 we'll be able to provide feedback to DOE on a real time  
4 basis and that more data can then be collected in the most  
5 cost efficient fashion.

6 So, the vertical slice approach will focus on  
7 prelicensing reviews on the key technical issues that I've  
8 been discussing. We will place more emphasis on proactive  
9 reviews. Those are our infield verifications, our site  
10 visits and our data, our review of significant data to  
11 obtain real life information. Also, we'll be focusing our  
12 research and our technical assessment method development on  
13 key issues. This is an approach that we've just embarked  
14 upon and we are developing vertical slice plans for each of  
15 these key issues so that we can pull together all of the key  
16 elements. One thing that came out of the very first one  
17 that we were doing was two very important areas of research.  
18 This is the active analog work that Research is doing at  
19 Tebulchek to look at volcanic consequence analysis as well  
20 as the geophysics techniques to evaluate undetected igneous  
21 activity.

22 So, we believe as we look at these issues in an  
23 integrated fashion that we will be able to identify certain  
24 research projects which are more important than others and  
25 accelerate those, place more emphasis on them.

1           We'll also be developing the necessary license  
2 application review plans and we'll be able to do this in an  
3 appropriate time frame since we will only be focusing on  
4 certain key technical issues. We will continue our  
5 performance assessment on a systems basis to identify any  
6 vulnerabilities that we might be missing. Once shortcoming  
7 which I'll talk about on the next slide, when you conduct an  
8 audit approach there's a risk that you'll miss of  
9 vulnerability in repository performance. But we believe if  
10 we continue the iterative performance assessment on a  
11 systems basis, that we'll be able to identify uncertainties  
12 that we may not have recognized intuitively.

13           I touched on the in-depth integrated review in my  
14 last slide. Another strength is that we will be providing  
15 real time feedback to DOE in the face of an accelerated  
16 program which we think will be best for the national program  
17 as well. This allows us to more efficiently evaluate DOE's  
18 program. As I mentioned to you, we were getting in 10 or 12  
19 different document types and we have now told DOE that we  
20 plan to focus on progress reports and annotated outlines.  
21 We will be preparing a safety evaluation report when they  
22 deliver an annotated outline so there will be a way of  
23 documenting at the staff level when issues appear to be  
24 resolved. This will also allow us to focus prioritization  
25 of our activities in the face of level or declining budgets



1 as well, and as I mentioned, it will allow us to focus our  
2 research on technical assessment work.

3 CHAIRMAN SELIN: What gives us confidence that the  
4 sequence of vertical slices will, in fact, cover the major  
5 issues if they're all done?

6 MS. FEDERLINE: We're basing that judgment on our  
7 experience. We've done a systematic regulatory analysis to  
8 see were there any loopholes. This was a systematic  
9 analysis which went through the whole repository system to  
10 decide if there were any loopholes. Plus we're now doing  
11 iterative performance assessment and we have done several  
12 phases of that which looks for vulnerabilities in repository  
13 performance. So, it's our combination of experience plus  
14 the large amount of expert judgment that we have on staff.  
15 We really have an extremely talented staff in a wide variety  
16 of disciplines. So, we're basing our judgment of these key  
17 technical issues on these three factors.

18 MR. THOMPSON: But as I understand it, we went  
19 through the process of identifying all the technical  
20 uncertainties that we were aware of, licensing uncertainties  
21 and technical uncertainties. For each of those, evaluating  
22 the difficulties that a meeting of the Part 60 licensing  
23 criteria would present and the state of the knowledge and  
24 the programs, and for those that seemed to have the most  
25 difficulty, those were the ones which were selected as the

1 key technical ones. Then that's checked against your  
2 performance assessment approach that the staff uses.

3 MS. FEDERLINE: That's correct.

4 MR. THOMPSON: And that's the way we did it.

5 MS. FEDERLINE: With everything good comes some  
6 weaknesses. I've identified a few of those on this slide  
7 here.

8 [Slide.]

9 MS. FEDERLINE: The focus on key issues means that  
10 some aspects of DOE's program will not be as rigorously  
11 reviewed during prelicensing. That may seem like a  
12 vulnerability, but many of the aspects that fall into that  
13 category, like preclosure radiation safety and surface  
14 processes, are things that are really well understood, are  
15 understood for operating facilities at this point in time  
16 and we believe that we will be able to conduct a rigorous  
17 licensing review without spending a lot of time during the  
18 prelicensing process. Also, some application review plans  
19 will not be complete until the year 2001.

20 The third item is both a strength and a weakness.  
21 High-level findings which are related to key technical  
22 issues will receive the most robust review. For instance,  
23 geohydrology and transport will receive a significant review  
24 as well as post-closure tectonics, including volcanism.  
25 Those will all receive very rigorous reviews. For instance,

1 preclosure radiation safety will not receive as rigorous a  
2 review because we believe that those issues are well known  
3 and can be reviewed during the licensing process.

4 I've touched upon the last bullet.

5 COMMISSIONER ROGERS: Just on that, I think you've  
6 kind of assured me on it because of your mention of the  
7 performance assessment approach to continue to bridge across  
8 these key technical issues. Just a little concerned that  
9 the research efforts don't get focused entirely on the key  
10 issues, that somehow that also is there to support the  
11 performance assessment approach, the systematic approach  
12 that could turn up something else.

13 MS. FEDERLINE: Right.

14 COMMISSIONER ROGERS: Some little bit of research  
15 has to be left open --

16 MS. FEDERLINE: Right.

17 COMMISSIONER ROGERS: -- for that kind of a  
18 possibility.

19 MS. FEDERLINE: One good aspect, as Hugh  
20 mentioned, our research has been focused to date on those  
21 issues where the least is known, the least knowledge is  
22 available and we will continue those programs. We will not  
23 disrupt that.

24 MR. GREEVES: These vertical slice approaches, in  
25 fact, could reveal something for us that we need to pass

1 onto Research. I think that was one of the plans that you  
2 had included in the program.

3 MS. FEDERLINE: Next slide, please.

4 [Slide.]

5 MS. FEDERLINE: Let me just walk through a couple  
6 of these quickly to give you an idea of how we will be  
7 conducting these vertical slice reviews.

8 As I mentioned, we're going to be developing  
9 vertical slice implementation plans and this will cover the  
10 activities from now until the time of licensing. But we  
11 also plan to conduct intense windows of review in a six to  
12 nine month period when a particularly significant activity  
13 is occurring at DOE. We're in the middle of a vertical  
14 slice review for volcanism right now and there are two key  
15 aspects. The expert elicitation which I discussed earlier  
16 is ongoing and that's a critical aspect, as well as DOE is  
17 just about to come out with a report that summarizes the  
18 last 12 to 14 years of volcanic research and we need to  
19 review that in depth to see how our comments have been  
20 addressed. So those are some of the issues that drive this  
21 six to nine month intense review. At the end of that point,  
22 we will provide a review to DOE which will be publicly  
23 available and we will be conducting interactions so DOE  
24 understands our view.

25 Of course you can see on this slide we're also

1 planning to emphasize our in-field work. The center will be  
2 conducting some ground magmatics at Crater Flats. We're  
3 going to be -- one of the most interesting things that has  
4 happened recently was a site visit where DOE, NRC, the  
5 center, DOE contractors and the states and counties were all  
6 in the field at the volcanic site at the same time and they  
7 were able to discuss some of their differences regarding the  
8 volcanic features and we hope that more of that can go on.

9 Again, IPA will play an important part of this.  
10 We'll be able to review DOE's TSPA and, as I mentioned,  
11 we'll provide feedback to DOE and other parties.

12 COMMISSIONER de PLANQUE: Margaret, before you go  
13 on, when Dr. Dreyfus was here in December on the subject of  
14 expert elicitation he said that a policy paper on that was  
15 to come forward early this year. Did that happen? Do you  
16 know?

17 MS. FEDERLINE: No, it is still under development  
18 and we are -- as a matter of fact, we've spoken with DOE  
19 several times since the management meeting and are trying to  
20 arrange a technical discussion that would bring out some of  
21 the elements of that before it gets cast in stone.

22 We're finding on groundwater travel time that it's  
23 important to have scientific dialogues, not necessarily a  
24 decision-making meeting but at the technical level, and  
25 that's what we would hope to do before that gets cast in

1 stone as well.

2 Let me just touch on our vertical slice for waste  
3 package. This is another example. Our intense window for  
4 waste package, we believe, probably would be best spent  
5 around the receipt of the waste package advanced conceptual  
6 design. That means before we get into Title I and Title II  
7 design DOE will understand our issues with the advanced  
8 conceptual design and that will be in late '95 or early '96,  
9 so we will plan sort of an intense window of review around  
10 that period of time.

11 We're going to be reviewing DOE's lab and field  
12 tests, as I've noticed on this slide. One thing that we're  
13 concerned about is that they are looking at five year data  
14 for predicting cracking, corrosion cracking, and the center  
15 is concerned about that and we need to have some technical  
16 interactions on that.

17 We're also developing an independent understanding  
18 of near-field environment and, Commissioner Rogers, this is  
19 where your suggestion, a very good one, we have developed an  
20 integrated near-field research project which focuses on the  
21 integration of thermal hydrology, geochemistry, microbial  
22 degradation as well as waste package issues because they're  
23 all interdependent and we need to examine them together, so  
24 we are developing an independent understanding there.

25 I'd also on this slide emphasize we want to

1 consider reactor and other engineering experiences and  
2 there's long-term experience from pressure vessels.  
3 Although the fluence is higher certainly in reactors, you  
4 have a long time history for thermal effects in the  
5 repository so we want to look and see if there's any  
6 feedback that we can gain from that program.

7 CHAIRMAN SELIN: Ms. Federline, what I'm missing  
8 is whether this is a first of a kind analysis or DOE will be  
9 doing comparable analyses themselves, because it would seem  
10 to me that as part of the design evaluation licensing and  
11 all licensing that the same type of work would have to be  
12 done.

13 MS. FEDERLINE: Yes. Yes, DOE is doing the same  
14 type of near-field work.

15 CHAIRMAN SELIN: I meant the whole vertical slice.

16 MS. FEDERLINE: I'm sorry.

17 CHAIRMAN SELIN: The same issues that you say are  
18 licensing issues are issues that address the design and  
19 suitability of the -- well, the suitability of the design,  
20 so wouldn't they be doing the same vertical slice work?

21 MS. FEDERLINE: They have in fact identified what  
22 they're calling key issues and they've presented those. I  
23 saw them at the ACNW meeting and they largely overlap the  
24 issues that we're talking about here today.

25 As a matter of fact, I think there have been six

1 major performance assessments conducted by various  
2 organizations and all those performance assessments have  
3 showed that the same issues are key.

4 MR. GREEVES: Let me try. You're asking --

5 CHAIRMAN SELIN: You're not going to like the next  
6 question, so you better give a good answer to this one.

7 MR. GREEVES: -- is DOE doing the vertical slices  
8 like we are, is what your question was.

9 CHAIRMAN SELIN: Right. That's basically it.

10 MR. GREEVES: My impression is no, that they  
11 aren't. They've got people working on projects and they  
12 have reorganized the M&O so that all of the other  
13 organizations report now to the M&O, so whether the M&O will  
14 be conducting what we call vertical slices I don't know, but  
15 I haven't seen them in the past. Margaret may --

16 CHAIRMAN SELIN: It seems to me that we better  
17 find this out because we're talking about a huge amount of  
18 work here. And if what we're doing is auditing their own  
19 vertical slice work we have one approach and if what we're  
20 doing is original work then the question comes why don't we  
21 require this work instead of doing it ourselves and go more  
22 to a -- not a reactive thing. I mean, I believe that even  
23 if you did no further you've done an enormous job by  
24 indicating what are the slices that have to be analyzed and  
25 what are the criteria for doing the analyses, but I don't



1 see why we have to do all this analysis.

2 I don't see why we can't say that "we tell you now  
3 five years in advance or six years in advance that part of  
4 the license application will be -- you will have to submit  
5 these analyses to us. We'd like to keep with you as they go  
6 along and do more of an audit and less of original work." I  
7 just have the impression there's too much original work  
8 going on here.

9 MS. FEDERLINE: Well, perhaps it's limitations in  
10 the way I'm describing it. That's really what we're  
11 planning to do. As I indicated, what is triggering our  
12 vertical slice are key activities in DOE's program, so we  
13 will in fact be looking at their data collection. We will  
14 be reviewing their reports.

15 CHAIRMAN SELIN: That doesn't answer the -- I  
16 mean, clearly we're not going to do independent data  
17 collection. I mean, you know, at no point do we do this.  
18 But what we need to have and what the Commission needs to  
19 have before we get too far along is a clearer understanding,  
20 and you've already done something that's very valuable which  
21 is you've shaped some of the questions that we'll have for  
22 DOE, but one of the questions I will have for them and I  
23 hope you'll transmit it to them is, "Are you doing something  
24 comparable to the vertical slices? And if so, what is it  
25 appropriate that we do? And if not, why not?"

1           This is also an iterative educational process, but  
2   it just sounds from the presentation that, A, it's a  
3   terrific set of things to do, B, it's the right kind of  
4   things to do, but, C, why are we doing them rather than  
5   specifying them and -- I mean, it's as if we're doing the  
6   basic safety analysis rather than having a reactor licensee  
7   doing the analysis and then ours doing the review, the  
8   evaluation.

9           MR. THOMPSON: I think this does -- is an attempt  
10   to do in a parallel of what we do with the reactor licensees  
11   where they do lots of the technical work and then we take a-  
12   -

13          CHAIRMAN SELIN: Slice, yes.

14          MR. THOMPSON: -- hard look at one area of it as  
15   deeply as we can to have assurance that the context of it is  
16   tied together because we have fairly limited resources,  
17   certainly, compared to what DOE is applying to this. This  
18   is the first time we've kind of put this all together.

19          CHAIRMAN SELIN: I think this is terrific. I  
20   really do. But the next question comes, if it's so terrific  
21   why are we doing it and why aren't they? I mean, we don't  
22   do a safety evaluation until we have a full safety analysis  
23   on the reactor side. Is that the right model? Or, in  
24   effect, are they going to do a whole lot of things and then  
25   we're going to do some cross checks that go across them?

1 And that's really what I'm missing and I don't expect to get  
2 that out of one briefing or one paper, but the basic  
3 question is what's the proper balance between what we  
4 require of DOE and what we do ourselves? Where does the  
5 confirmatory analysis stop and the supplementary analysis -  
6 -

7 MR. THOMPSON: This is somewhat different. As you  
8 know, this is the first time we've had a Yucca Mountain and  
9 Congress did ask us to have consultation.

10 CHAIRMAN SELIN: Right.

11 MR. THOMPSON: It's a slightly different role than  
12 we've had in --

13 CHAIRMAN SELIN: It's a very different role, I  
14 agree.

15 MS. FEDERLINE: We'd be happy to talk to DOE about  
16 this. I think your idea is -- we've been encouraging  
17 integration in this program and this will push --

18 CHAIRMAN SELIN: Well, we can do more than  
19 encourage it. There are two separate pieces. One is what's  
20 the work that has to be done? I think you've done a  
21 terrific job in saying this is an approach to it. Then the  
22 second is what's the proper division of labor in having this  
23 work done? Or another way is given that DOE does "the right  
24 thing," how much do we have to reproduce to be comfortable  
25 that the results are right?

1 MS. FEDERLINE: Yes.

2 CHAIRMAN SELIN: But then it's not just the  
3 division of labor. It seems to me that -- first of all, I  
4 think we have to do a fair amount of what you're talking  
5 about before we're able to say, "These are the right issues  
6 and this is the right piece." But it seems to me that we  
7 need to signal far in advance what we expect in a license  
8 application. If we want vertical slice analyses done as  
9 part of that license application so that we can audit them  
10 or reproduce them, we need to know that in the next year or  
11 so, not in 1999 to go back. Maybe you need to do everything  
12 you're doing just to get to that point. But I'm  
13 uncomfortable that this presentation is so unmoored to what  
14 DOE is doing other than collecting data and doing good  
15 piece-wise analysis. I'm uncomfortable. Mr. Greeves says  
16 he doesn't know whether DOE is doing this or not. Maybe  
17 it's okay that we don't know this now, but it's not okay  
18 that we not know this for very long. I assume we'll have an  
19 effect on what they do.

20 MS. FEDERLINE: Yes.

21 CHAIRMAN SELIN: It's not just an independent  
22 thing.

23 MR. GREEVES: DOE right now is focusing on the  
24 site suitability issue. They're preparing these technical  
25 baseline reports that one of you asked for and they're

1 building pieces of the annotated outline and the progress  
2 reports. I don't see the vertical slice process associated  
3 with that.

4 Margaret or Mal, if you do, let me know.

5 DR. KNAPP: I don't think they have a vertical  
6 slice at this point, but I think it's important to think  
7 about what John and Margaret are really achieving here.  
8 Maybe a year ago, two years ago we had a lengthy and I think  
9 a reasonably sound approach in taking a look at the license  
10 application review plan and looking uniformly at what DOE  
11 was doing. There was a faith, if you like, that if we  
12 continued in that process that the important technical  
13 issues would surface and we would be able to handle them.  
14 What they've accomplished is a departure from that. Based  
15 on their computer work with the performance assessment and  
16 so forth, they've identified these technical issues which  
17 really do demand our attention, which are the ones that are,  
18 if you like, the potential show stoppers.

19 CHAIRMAN SELIN: Right.

20 DR. KNAPP: I see that as the achievement and  
21 within the NRC staff at least devoting less attention to the  
22 issues which may be interesting technically which aren't  
23 critical.

24 CHAIRMAN SELIN: That's all terrific and I think  
25 it is terrific.

1 DR. KNAPP: Give me one second.

2 CHAIRMAN SELIN: Yes.

3 DR. KNAPP: What I see us doing with this vertical  
4 slice is looking at what DOE is doing. If they are going at  
5 the same level we are and they're ahead of us and they're  
6 getting the data, great. If they're not, I see us as  
7 driving them in that direction to make that happen and I see  
8 us doing that now as a part of the higher level findings.

9 CHAIRMAN SELIN: I think that's terrific also, but  
10 what I don't want us to do is say, "Somebody has got to do  
11 these and if you won't, we will." What I want us to do is  
12 say, "We've done the sensitivity analyses and the safety  
13 analysis is critically sensitive to these issues." Then  
14 we've done a structure and said, "In order to do the  
15 volcanism issue, here are all the different pieces that have  
16 to be done. Are you collecting the data?" But then I want  
17 us to go to the next step in most cases and say years in  
18 advance, "We think these are the five major issues and the  
19 slice is in it and we require as part of your application  
20 that you do these vertical slices."

21 MS. FEDERLINE: Right.

22 CHAIRMAN SELIN: So, I agree with everything you  
23 said, Dr. Knapp. We couldn't have done this last year or  
24 the year before. We were just sort of taking them as they  
25 come. We've set some priorities. We've said, "These are

1 the most important things." That's all very, very good.  
2 But I just want to make sure that we don't end up doing  
3 DOE's job.

4 MS. FEDERLINE: Yes. Yes.

5 CHAIRMAN SELIN: Nor do we end up sandbagging them  
6 and not telling them what we expect of them until it's too  
7 late for them to do it.

8 DR. KNAPP: I agree entirely and where I see the  
9 vertical slice coming in -- in I think one or two  
10 presentations to you, I mentioned that we were going to get  
11 very actively involved in the higher level findings from the  
12 perspective of, "Okay, it may serve you for site  
13 suitability, but we're looking at it from a license  
14 application in 2001 and will it serve us." I see the  
15 vertical slice as bringing a focus to that interaction --

16 CHAIRMAN SELIN: Absolutely.

17 DR. KNAPP: -- and driving such things as our  
18 interaction with the National Academy of Science as they  
19 look at the technical basis documents.

20 CHAIRMAN SELIN: I'm very leery of leaving the  
21 staff with the last word, but why don't we continue?

22 COMMISSIONER de PLANQUE: Well, I have a question.  
23 I'll save the situation.

24 CHAIRMAN SELIN: Thank you.

25 COMMISSIONER de PLANQUE: In a similar vein, I

1 keep seeing development of independent models. It's not  
2 quite clear to me why we need to go as far as developing  
3 truly independent models. Is that necessary? What do we  
4 really hope to gain from that as opposed to auditing or  
5 checking their models and what happens when we differ?

6 MS. FEDERLINE: There are a small number of  
7 issues, the key technical issues. There are only eight of  
8 over a hundred and some. But we have identified in those  
9 issues an area where there's such a lack of understanding  
10 and I mentioned to you the model that the center came up  
11 with of the thin film on the waste package, increased  
12 corrosion potential. Some of these ideas are non-intuitive.  
13 In other words, you cannot sit at your desk and review  
14 these. So, our independent model development is not  
15 directed at developing a tool, but more or less developing  
16 the understanding of the individuals as they construct the  
17 model so that they are able to review what DOE is doing.

18 COMMISSIONER de PLANQUE: So this is a different  
19 sense or use of the word "model" here?

20 MS. FEDERLINE: Yes, that's correct.

21 COMMISSIONER ROGERS: Well, I'm not going to let  
22 you have the last word either because I think the point that  
23 you've just made is an extremely important one. I agree  
24 with the Chairman that we should not be doing DOE's work for  
25 them, but unless we have bought in ourself to developing a



1 kind of expertise that there's only one way to get it, I  
2 mean you don't learn how to judge whether a heart surgeon  
3 does a heart surgery correct by just looking at a textbook.  
4 You've got to somehow buy into that to be able to make  
5 judgments and that's the tricky thing here. The question is  
6 how far do we have to go to develop enough expertise to be  
7 able to exercise critical judgments and not go beyond that  
8 in doing their work for them?

9 MS. FEDERLINE: Correct.

10 COMMISSIONER ROGERS: That's the tricky point.  
11 But I do think there is an expense and a big expense in  
12 buying into developing an in-house expertise to be able to  
13 make those judgments and to raise those questions. I don't  
14 think there's any way around that. I don't think you can do  
15 it by the seat of your pants. I think that somehow you've  
16 got to participate and you've got to go through a certain  
17 number of exercises here to develop the muscle to be able to  
18 be the regulator and to make the judgments. I think the  
19 Chairman's point is a very important point, but I do think  
20 that we have to recognize there is an expense, there is a  
21 learning process, if you want to call it that, that we have  
22 to go through in order to get to the point to be able to  
23 say, "We can make a judgment that this is a good result or  
24 it isn't a good result." Otherwise we're just walking off  
25 the top of our heads.

1           CHAIRMAN SELIN: I agree with that. We need to do  
2 the homework. We need to understand. We need to be able to  
3 recreate a sample. We can't just passively react to  
4 somebody who would come in and say, "Oh, I think I see a  
5 programming error or an arithmetic error." That's not the -  
6 - I'll save the rest of my remarks for the wrap-up, but I  
7 just want to make sure we're in surgery and not just become  
8 the patient.

9           MS. FEDERLINE: Yes. We're very sensitive to what  
10 you say.

11           Before I close, I just wanted to briefly discuss  
12 our role in the MPC disposal issues. We will be  
13 participating in the prelicensing process to review the MPC  
14 design. Based on the approach in the February 15th letter,  
15 we will review available information and we will raise any  
16 objections that we see early on, but the ultimate approval  
17 of the MPC and the waste package will come through the  
18 repository licensing for disposal. We'll do our Part 60  
19 reviews --

20           CHAIRMAN SELIN: For the disposal aspect.

21           MS. FEDERLINE: Only for the disposal.

22           CHAIRMAN SELIN: Storage and transport will be  
23 done well before that.

24           MS. FEDERLINE: That's correct. That's correct.

25           CHAIRMAN SELIN: I mean we would actually license

1 this as a dual purpose canister in advance or not? Are they  
2 asking for a dual purpose license or are they just asking  
3 for the full multipurpose?

4 MR. THOMPSON: It's a certification in the  
5 licensing process and we need to marry those two. I believe  
6 it will be looked at as a licensing for the dual purpose,  
7 but I don't know that we have finalized precisely how that's  
8 going to be accomplished right now.

9 CHAIRMAN SELIN: Dr. Knapp?

10 DR. KNAPP: We will provide certification for  
11 transportation, I want to make sure I have my terms right,  
12 and licensing for storage consistent with those parts of  
13 what we do with respect to disposal. What I anticipate we  
14 will do is to provide DOE with a letter which, although we  
15 can say more until licensing, that at this point we see no  
16 fatal flaws and no reason why it wouldn't work.

17 CHAIRMAN SELIN: If Ms. Federline will excuse me  
18 just for a second, do we have problems between the two Part  
19 71 and 72 in reconciling the storage and the transportation?  
20 Can we do the same analysis to cover these two points or are  
21 there any inconsistencies between our two rules that we're  
22 going to have to reconcile to deal with the dual purpose  
23 aspect?

24 DR. KNAPP: I'm aware of no difficulties because  
25 we already have a couple of -- we've looked at systems like

1 this. Now, again, recognize that this multipurpose canister  
2 is --

3 CHAIRMAN SELIN: I understand that --

4 DR. KNAPP: -- in pieces.

5 CHAIRMAN SELIN: -- disposal is a joker. It's a  
6 wild card for us at this point, but at least the two  
7 purposes, we don't have any problem in reviewing the single  
8 design for those two purposes.

9 DR. KNAPP: I'm aware of no difficulties at this  
10 time.

11 MR. THOMPSON: And we are currently conducting a  
12 review for, I guess, the Rancho Seco cask right now. So,  
13 we're proceeding on that.

14 MS. FEDERLINE: Only one last point I wanted to  
15 make. We're working closely with Bill Travers and Charlie  
16 Haughney in the Proposed Spent Fuel Project Office to try  
17 and see what aspects of the regulatory infrastructure can be  
18 used by them to get up and running very quickly, like our  
19 advanced computer review system and our open item tracking  
20 system.

21 So, in summary, the three points that I wanted to  
22 leave you with is that we feel that the vertical slice will  
23 allow us to focus on the most important licensing issues in  
24 a time frame when we can raise them when site  
25 characterization data can still be collected and they can be

1 discussed as the site suitability findings are made.

2 That completes my briefing.

3 CHAIRMAN SELIN: Commissioner Rogers?

4 COMMISSIONER ROGERS: I just wanted to say that I  
5 thought it was a superb briefing and I thought it was really  
6 excellent and that the approach appears to be really well  
7 thought out. There are some important questions that are -  
8 - I think it was very helpful to hear from you today. Some  
9 of the questions that have been raised, I think the  
10 Chairman's question was very important, but I just want to  
11 say that I think you're doing a superb job. It's a tough  
12 problem that you've been handed here in some ways because  
13 you don't know everything you'd like to know. But I think  
14 it is important though to keep coming back to us. I think  
15 issues such as those that we've discussed today are  
16 important to return to to make sure that we are doing what  
17 we have to do, but we're not doing a lot beyond that. It is  
18 very important that our resources be used in a most  
19 effective way and we can't afford to squander them. But on  
20 the other hand, we have to recognize that there is a price  
21 to getting into the game. In this case I think it's a  
22 fairly high price, but it shouldn't be any higher than  
23 necessary.

24 I'd just like to compliment the staff on an  
25 excellent presentation and what appears to me a very well

1 thought out program.

2 MS. FEDERLINE: Thank you.

3 CHAIRMAN SELIN: Commissioner de Planque?

4 COMMISSIONER de PLANQUE: I would agree with that  
5 and I have no further questions.

6 CHAIRMAN SELIN: I'd like to say this. I think  
7 this is a terrific presentation. In fact, were it not for  
8 the amazing progress that's been made the question I've  
9 asked could not be asked. Furthermore, I full heartedly  
10 agree with both of Commissioner Rogers' remarks, his closing  
11 remarks and remarks he made about you have to put up the  
12 ante if you're going to be in the game. We can't just be  
13 passively going on. Furthermore, I do appreciate that --  
14 it's much better that we have both the analytical tools and  
15 get going on the work so that we can identify the important  
16 issues ourselves and not only important issues but the  
17 things that are going to drive them rather than just sort of  
18 waiting for that stuff to come in. We do have to get way  
19 out in front and tell the licensed applicant what we expect  
20 in the license piece.

21 I'm not going to repeat what I said about the  
22 importance of saying that this is really important how much  
23 of this are we going to require. However, I do want to come  
24 back to something you said. I can't find the chart right  
25 now, but the one that says that we might miss something and

1     you can't count on the audits.

2             MS. FEDERLINE:   Yes.

3             CHAIRMAN SELIN:   Which chart is that?

4             MS. FEDERLINE:   Yes.   That is slide 16.

5             COMMISSIONER ROGERS:   Yes, the weaknesses.

6             CHAIRMAN SELIN:   Yes.   Okay.   Now, this is just  
7     saying life is dangerous and risky and you can't do  
8     everything.   That's fine.   But if this chart is meant  
9     seriously, not just we might but it's likely we're going to  
10    not be ready in 2001 or we're going to -- if you're just  
11    saying you can't rule out that some issue comes up that  
12    won't be settled until later, that's fine.   But if you're  
13    saying there's so many issues we really can't get to all of  
14    them, you can't mean exactly what this slide says without  
15    coming back and asking for more resources or something else.  
16    The plain reading of this slide is not acceptable.   So, make  
17    sure you mean that we can't guarantee that if we look harder  
18    at A that B might not come up and bite us.   I understand  
19    that.   But if you mean more than that, you need to redesign  
20    your program to make sure that you have the resources in  
21    hand.

22            DR. KNAPP:   At this time what we mean is it's your  
23    earlier term.   It's a recognition that there is a risk we  
24    might miss something.   We don't expect that we will, but  
25    it's possible.

1 CHAIRMAN SELIN: Fair enough. Okay.

2 Look, it's a wonderful job. I can't tell you how  
3 pleased I am to see an approach where you're sort of doing  
4 an analysis of what are the dependencies, what I would call  
5 the contingent probabilities and conditional probabilities  
6 and therefore focusing the work. It's really a performance  
7 orientation towards repository licensing that really makes a  
8 great deal of sense. I think my caveat is exactly the right  
9 caveat. I don't want that to undercut the satisfaction and  
10 the huge successes that you've taken to get us this far.

11 So, I thank you very much for this presentation.  
12 I hope that these questions will be transmitted formally to  
13 DOE before they come in. What do they think of the vertical  
14 slice? What are they doing in this area? Does it look as  
15 if we're going to have to produce this work or will we be in  
16 a position to audit their work and if we're going to require  
17 vertical slices in the application, when do we have to tell  
18 them what we mean by that in order for them to be timely  
19 with their application? While we're at it, you might ask  
20 them are there any other things that they're afraid we're  
21 going to sandbag them on in the application because that's  
22 really -- you know, your cooperative work with them has been  
23 too good for that to happen. So, we ought to make sure none  
24 of that happens.

25 MR. THOMPSON: We'll do that.



1 CHAIRMAN SELIN: Thank you very much.

2 MS. FEDERLINE: Thank you.

3 MR. THOMPSON: Thank you.

4 [Whereupon, at 3:12 p.m., the meeting was  
5 concluded.]

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CERTIFICATE

This is to certify that the attached description of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING ON NRC STATUS OF HIGH-LEVEL  
WASTE MANAGEMENT PROGRAM - PUBLIC  
MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Tuesday, April 25, 1995

was held as herein appears, is a true and accurate record of the meeting, and that this is the original transcript thereof taken stenographically by me, thereafter reduced to typewriting by me or under the direction of the court reporting company

Transcriber: Carol Lynch

Reporter: Peter Lynch



*United States*  
*Nuclear Regulatory Commission*

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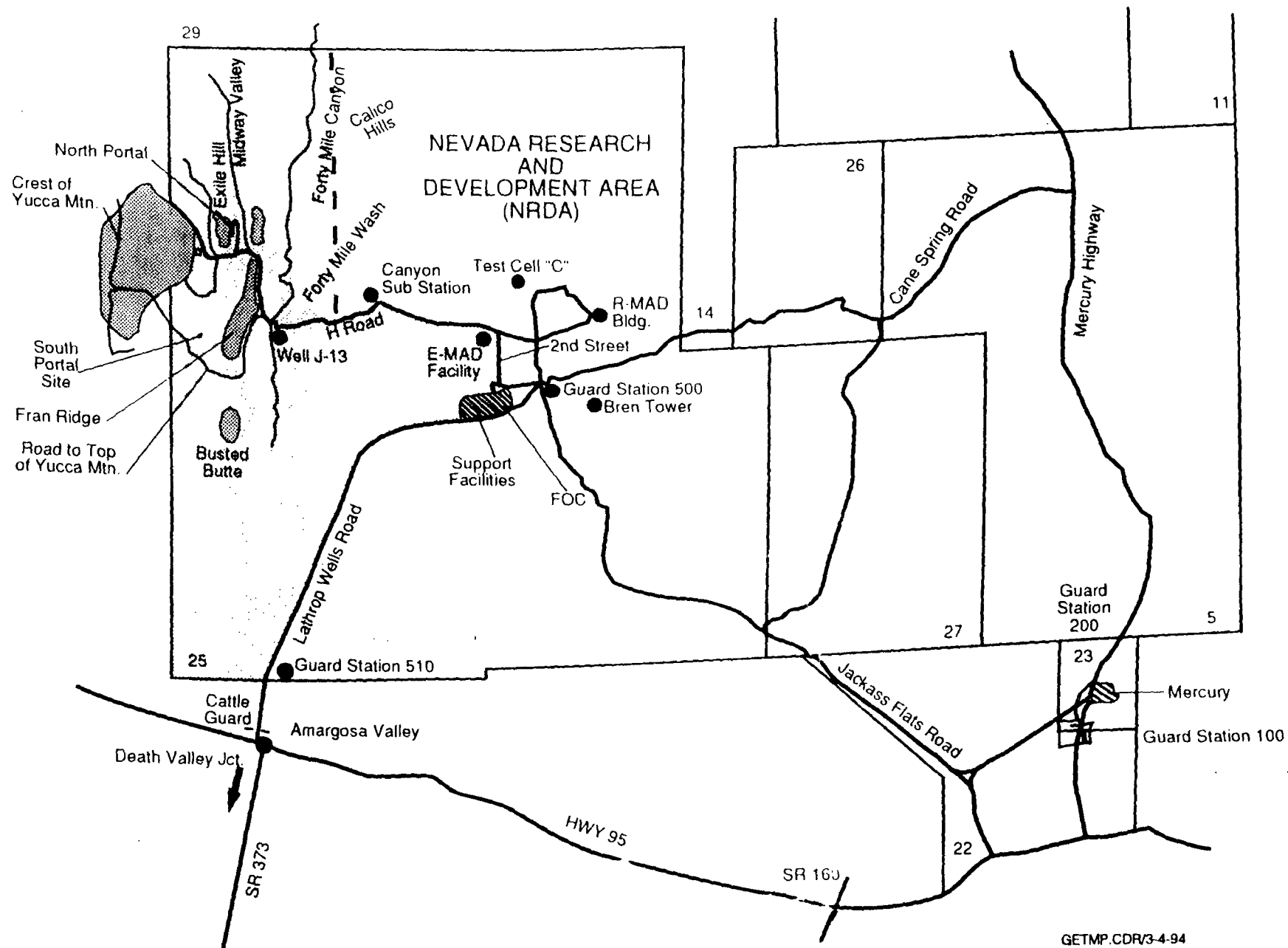
# **NRC STRATEGY FOR REVIEW OF DOE HIGH-LEVEL WASTE PROGRAM APPROACH**

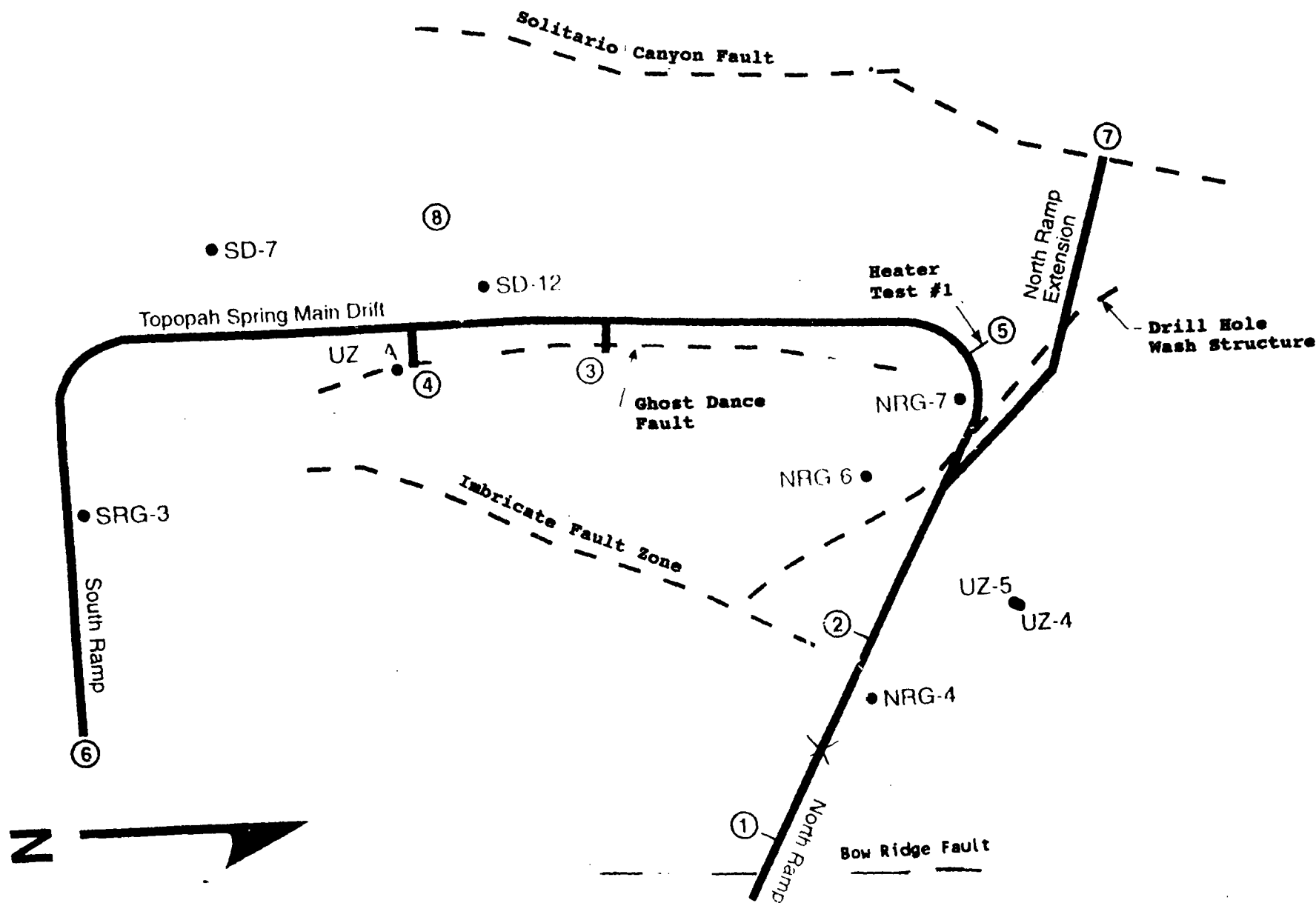
**DIVISION OF WASTE MANAGEMENT**

**APRIL 25, 1995**

## **OVERVIEW**

- **ESF Status**
- **DOE's Implementation of Program Approach**
- **NRC Key Technical Issues for Licensing**
- **NRC Strategy to Review Implementation of Program Approach**
- **Summary**





## KEY ESF MILESTONES

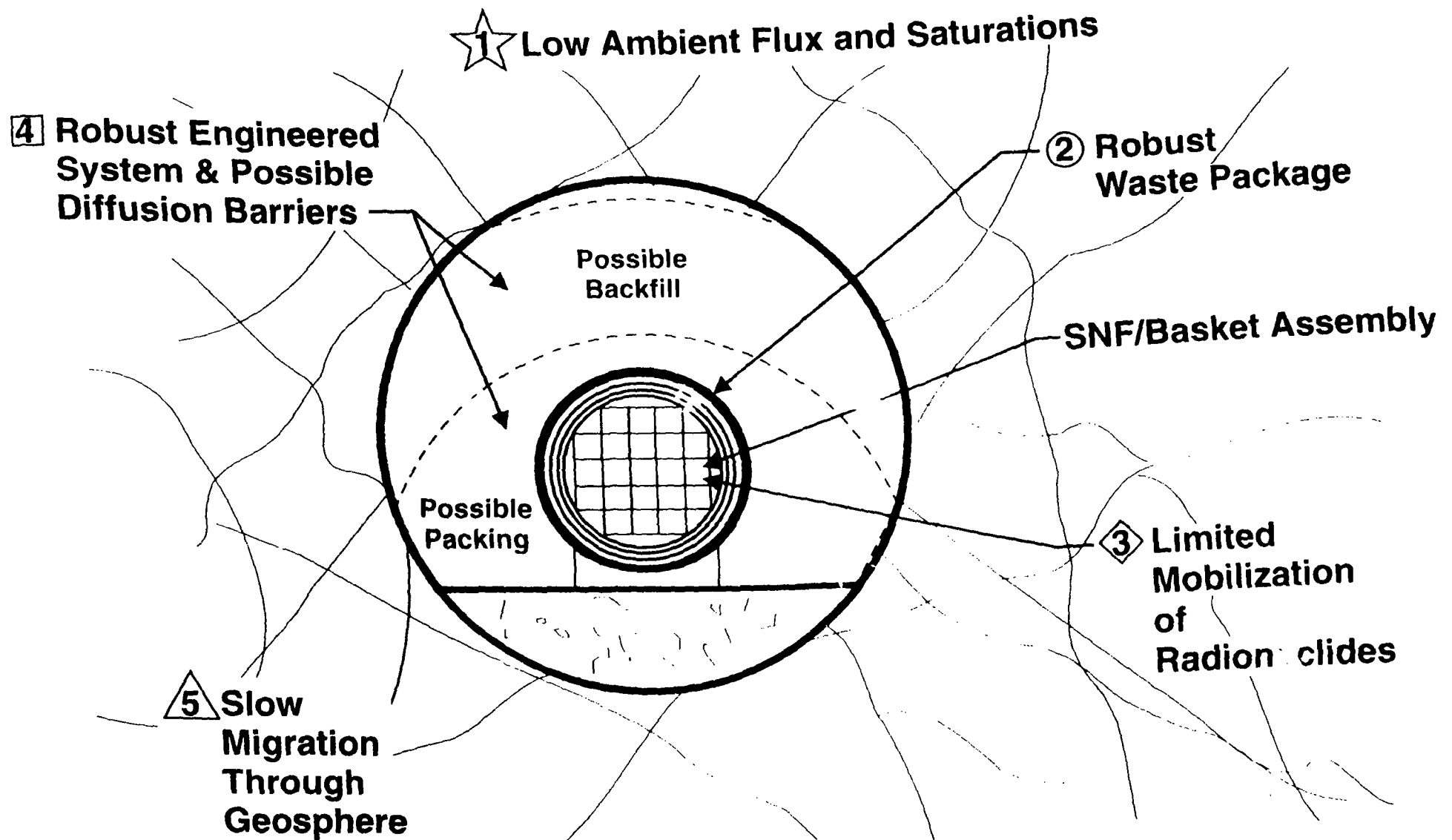
# **DOE's Implementation of Program Approach**

## **DOE'S IMPLEMENTATION OF THE PROGRAM APPROACH**

- **Current Emphasis on Scientific and Engineering Activities for Site Suitability Decision**
- **Sequential Evaluation of Compliance With DOE Siting Guidelines**
- **External Review of Technical Basis Reports by National Academy of Sciences**
- **In Parallel, NRC Will Review Sufficiency for Licensing**
- **If Site is Technically Suitable, Focus Will Turn to License Application After 1998**
- **Performance Confirmation Will Continue Through Construction and Operation**



# Top-Level Strategy for Waste Isolation



## **SUMMARY OF MAJOR NRC STAFF VIEWS ON DOE PROGRAM APPROACH**

- **A Clearer Definition of Technical Site Suitability is Needed Including its Relationship to Licensing**
- **Streamlining Site Characterization Will Result in Additional Uncertainty at Time of License Application**
- **DOE Isolation Demonstration Strategy Does Not Provide a Level of Detail to Evaluate the Integration and Sufficiency of the Program Approach and Underlying Assumptions Must be Supported**
- **DOE Findings Related to Site Suitability Need to be Made in Context of Total System; Sequencing of Individual Findings May Preclude This**
- **A Reasonably Complete Reference Repository Design and Thermal Loading Strategy are Needed to Evaluate Site Suitability in the Context of Performance**

# **Key Technical Issues for Licensing**

## **KEY TECHNICAL ISSUES**

- **Include Uncertainties Which Pose a High-Risk of Non-Compliance With 10 CFR Part 60 Performance Objectives**
- **Rationale for Choosing Top Technical Issues:**
  - **Include Uncertainties Identified Through Systematic Regulatory Analysis and Performance Assessment**
  - **Strong Relationship to Repository Performance**
  - **Identified as a Result of Prelicensing Staff Interactions as Issues of Particular Importance**

## **KEY TECHNICAL ISSUES UNDER CONSIDERATION**

- **Volcanism Probability and Consequences**
- **Location and Characterization of Structural Features Which Affect Water and Vapor Movement**
- **Thermal, Hydrologic, Mechanical and Chemical Coupled Processes**
- **Thermal Effects and Redistribution of Moisture**
- **Waste Package Degradation Processes**
- **Geochemical Effects on Radionuclide Transport Within and Beyond the Thermally Altered Zone**
- **Evolution of Groundwater in the Near-Field Environment**
- **Scenario Selection and Calculation of Consequences**

**EXAMPLE KEY TECHNICAL ISSUE:  
VOLCANISM PROBABILITY AND CONSEQUENCES**

- **At Least 5 Volcanoes Younger Than 1 Million Years Within 12 Miles of the Candidate Repository Site**
- **Additional Buried Volcanic Features May Exist Undetected in the Vicinity**
- **Ages of Volcanoes and Number of Volcanic Episodes are Uncertain**
- **Ranges of Consequences are Broad**
- **Indirect Consequences to the Repository System Due to Heating and Degassing are Poorly Understood**

## **CURRENT DOE APPROACH: VOLCANISM PROBABILITY AND CONSEQUENCES**

- **Continuing Exploration and Mapping of Volcanic Centers**
- **Limited use of Geophysics Planned to Investigate Subsurface Volcanic Features**
- **Conducting Geochemical Analyses to Understand Volcanic Genesis and Mechanisms**
- **Investigating Potential Entrainment of Material in Magma**
- **Conducting Expert Elicitation as Basis for Probability Estimates**
- **Reflecting the Significance of Volcanism Through Iterative Performance Assessment**

## **NRC STAFF CONCERNS VOLCANISM PROBABILITY AND CONSEQUENCES**

- **Experts Differ on Interpretation of Basic Volcanic Features**
- **Volcanic and Structural Investigations are Not Well Integrated**
- **Additional Geophysics Techniques Should be Used in the Near Term to Explore Structural Relationships and Investigate Previously Undetected Igneous Features**
- **Large Uncertainties in Volcanic Ages, Locations, and Volumes Make Rates and Trends Difficult to Estimate**
- **Performance Assessments do Not Bound Full Range of Probabilities and Consequences**



## **EXAMPLE KEY TECHNICAL ISSUE WASTE PACKAGE DEGRADATION PROCESSES**

- **Evaluation of the Engineered Barrier System, Including the Waste Package, is Dependent on Repository Design**
- **Methods for Predicting the Near-Field Environment Over Long Time Periods and Large Spatial Scales are Highly Uncertain**
- **Techniques for Extrapolating Short-Term Data to Long Time Frames of Interest Have Not Been Tested**
- **Performance Models for Corrosion and Materials Stability Have Significant Uncertainties for the Periods of Regulatory Interest**

## **CURRENT DOE APPROACH WASTE PACKAGE DEGRADATION PROCESSES**

- **Using a Systematic Process for Material Selection**
- **Robust Waste Package Design Using Multiple and Diverse Elements**
- **Planning and Conducting Laboratory and Field Tests to Reduce Uncertainty and Provide Bounding Values for Waste Package Performance Analyses**

## **NRC STAFF CONCERNS WASTE PACKAGE DEGRADATION PROCESSES**

- **Thermal Loading Will Not be Established Until late in the Licensing Process Which Will Raise Issues Related to the Near-Field Environment**
- **Further Justification of the "Bounding" Environments for DOE's Isolation Demonstration Strategy is Required**
- **Approach for Rating Alternative Materials is Subjective and Does Not Consider Coupled Performance Factors**
- **Waste Package Materials Stability Issues Should be Addressed More Thoroughly**
- **Increased Emphasis on Developing a Mechanistic Understanding of Degradation Processes is Needed to Support Long-Term Performance Assessment**

# **Vertical Slice Approach to Review DOE Implementation of Program Approach**

## **WHAT IS THE VERTICAL SLICE APPROACH**

- **Focus Prelicensing Reviews on Key Technical Issues for Licensing, ESF Design, and MPC Disposal Issues**
- **Conduct Vertical Slice Audits for Key Technical Issues Including QA Activities, In-Field Verifications, Site Visits, and Data Review to Obtain Real-Time Information**
- **Focus Research and Technical Assessment Method Development on Key Technical Issues**
- **Develop Necessary Review Plans and Guidance for Key Technical Issues in Appropriate Time Frame**
- **Continue Iterative Performance Assessment to Confirm Focus**
- **Evaluate Whether Program Approach Process Will Result in Necessary Information for a Complete License Application; Provide Feedback to the Commission, DOE, and Other Parties**

# **VERTICAL SLICE APPROACH**

- **Strengths**

- **Provides In-Depth, Integrated Review of the Most Complex Licensing Issues in a Time Frame Consistent With DOE's Schedule**
- **Provides Real-Time Feedback to DOE in the Face of an Accelerated Program**
- **Efficiently Evaluates DOE's Program Approach as it Relates to Licensing**
- **Facilitates Integration of NRC Proactive and Reactive Activities**
- **Focuses Prioritization of NRC HLW Activities in the Face of Level or Declining Budgets**
- **Focuses Research, Technical Assessments, and Prelicensing Reviews on Key Technical Issues**

# **VERTICAL SLICE APPROACH**

- **Weaknesses**
  - **Focus on Key Issues Means Some Aspects of DOE's Program Will Not be Reviewed During Prelicensing**
  - **Some License Application Review Plan Sections Will Not be Complete Until 2001**
  - **High-Level Findings Which are Related to Key Technical Issues Will Receive Most Robust Review**
  - **Risk That an Audit Approach Focusing on Key Technical Issues During Prelicensing May Overlook Vulnerabilities in Repository Performance**

## **VERTICAL SLICE: VOLCANISM**

- **Complete Pertinent Sections of License Application Review Plan**
- **Observe DOE Expert Elicitation on Volcanism**
- **Review Related DOE Documents and Pertinent Literature**
- **Conduct In-Field Verification and Site Visits at Yucca Mountain and LANL; Discuss Detailed Work**
- **Obtain and Evaluate Pertinent Data; Develop Independent Models of Probability and Consequences of Volcanism**
- **Evaluate the Significance of Volcanism to Overall System Performance Through Iterative Performance Assessment**
- **Provide Feedback to DOE and Other Parties**



## **VERTICAL SLICE WASTE PACKAGE**

- **Complete Pertinent Sections of License Application Review Plan**
- **Review DOE Concepts and Designs**
- **Review DOE's Lab and Field Test Plans and Results**
- **Develop an Independent Understanding of Near-Field Environment and Waste Package Degradation Modes**
- **Develop Independent Models for Waste Package Performance Prediction and Assess the Significance to Overall System and Subsystem Performance**
- **Consider Reactor and Other Engineering Experiences in Evaluating Materials Performance Issues**
- **Provide Feedback to DOE and Other Parties**

## **DWM REVIEW OF MPC DISPOSAL ISSUES**

- **Staff Will Participate in Prelicensing Process to Review MPC Design for Disposal**
- **Complete Part 60 Reviews Concurrently With the Completion of the Technical Reviews for Parts 71 and 72**
- **Approach Discussed in a February 15, 1995, Bernero/Rousso Letter**

## **SUMMARY**

- **Real Time Review of DOE Program Approach Provides Effective Feedback to Commission and DOE on Licensing Issues**
- **Timely Feedback is Essential in the Face of Streamlined Site Characterization**
- **Vertical Slice Approach Focuses on Most Important Licensing Issues, Provides Clear Technical Basis for Prioritization, Facilitates Integrated Reviews and Can be Accomplished Within Baseline Budget**
- **Iterative Performance Assessment Important to Licensing and Evaluating Significance of Licensing Issues**
- **Annotated Outline Provides Effective Tool to Document Prelicensing Reviews**