

UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

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BRIEFING ON NRC RESEARCH PROGRAM ON
LOW-LEVEL WASTE

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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BRIEFING ON NRC RESEARCH PROGRAM
ON LOW-LEVEL WASTE

- - - -

PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Monday, January 10, 1994

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

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission
KENNETH C. ROGERS, Commissioner
FORREST J. REMICK, Commissioner
E. GAIL de PLANQUE, Commissioner

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STAFF SEATED AT THE COMMISSION TABLE:

WILLIAM C. PARLER, General Counsel

JOHN HOYLE, Assistant Secretary

HUGH THOMPSON, Deputy Executive Director for Nuclear
Materials Safety, Safeguards and Operations Support

ROBERT BERNERO, Director, NMSS

RICHARD BANGART, Director, Office of State Programs

DR. MICHAEL BELL, Chief, Low-Level Waste Management
Branch, NMSS

DR. FRANK COSTANZI, Deputy Director, Division of
Regulatory Applications, RES

MELVIN SILBERBERG, Chief, Waste Management Branch, RES

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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.

Today we're to receive a briefing from the staff on the Low-Level Radioactive Waste Research Program.

The NRC conducts low-level waste disposal research in order to support our regulatory licensing process to provide the technical basis for review of license applications, provide the basis for review of topical reports on the waste form, and to assess licensee compliance with requirements. We do this for a number of reasons, a large one of which is to establish new low-level waste disposal facilities under the tight time frame of the Low-Level Radioactive Waste Policy Amendments Act, and also in face of the need to provide technical support to the sites and to examine other disposal methods chosen by the states to meet the requirements of this act.

We really look forward to hearing what's going on in this area and particularly to get some results and to draw some connections between the results and the regulatory problems that give rise to research.

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1 Commissioners?

2 COMMISSIONER REMICK: I'd just like to
3 welcome Mike Bell back after, what, a several year
4 stint at IAEA.

5 DOCTOR BELL: Thank you.

6 CHAIRMAN SELIN: Mr. Thompson?

7 MR. THOMPSON: Thank you, Mr. Chairman,
8 Commissioners.

9 Last October we briefed the Commission on
10 the status of the High-Level Waste Radioactive
11 Research Program and at that time we promised to come
12 back and give you a briefing on the Low-Level
13 Radioactive Waste Disposal Research Program and that's
14 why we're here today.

15 We thought it would be helpful if we asked
16 the program office to provide some overall perspective
17 and background of where we are today with respect to
18 the low-level waste rules and regulations that we have
19 and then go into a little more detail on the Low-Level
20 Waste Research Program. Doctor Mike Bell, who is the
21 Chief of the Low-Level Waste Management Branch in
22 NMSS, who has just joined us here from IAEA, will
23 conduct that briefing. Then Doctor Frank Costanzi,
24 who is the Deputy Director of the Division of
25 Regulatory Applications in Research, will conduct the

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1 discussions with respect to the research program.

2 The first part of the program will be
3 Doctor Bell.

4 DOCTOR BELL: Thank you, Mr. Thompson.

5 Chairman Selin, Commissioners, I'll try to
6 briefly give you some of the background and the
7 historical perspective on the present situation and
8 the rationale behind the staff's low-level waste
9 research program as it presently exists and some feel
10 for where it might be heading in the near future.

11 (Slide) Could I have slide 1, historical
12 perspective, please?

13 During the 1970s, there were six
14 commercial sites operating in the United States.
15 There will be a later slide where we'll talk about
16 these in more detail. Basically these six sites were
17 all licensed before the Commission had detailed low-
18 level waste disposal regulations in place. They were
19 licensed under very general provisions in Part 20 that
20 basically were procedural and gave the overall
21 performance standard.

22 Problems developed during the 1970s with
23 a number of these sites, generally those in the
24 eastern humid climates and problems with water
25 accumulation in trenches, trench subsidence. There

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1 were a number of violations having to do with the
2 improper packaging of the waste that was being
3 transported to the site. Generally record keeping of
4 the wastes that were being shipped to the site was not
5 adequate and in compliance with the regulations or the
6 applicable agreement state regulations since most of
7 these sites were, in fact, in agreement states and not
8 licensed by the NRC directly.

9 Three of the sites closed prematurely due
10 to these problems, even though no significant health
11 and safety problems actually arose. There were no
12 over exposures of individuals off-site or excessive
13 concentrations off-site. It's just that there were
14 disillusionment that the sites were not performing as
15 designed and not living up to expectations and the
16 concern that there might be a future problem.

17 As a result of the situation, two things
18 happened. In the late 1970s, the Commission began
19 working on a specific regulation for disposal of low-
20 level radioactive waste which was finally promulgated
21 in 1982 as 10 CFR Part 61. As the result of the fact
22 that only three sites were now receiving all of the
23 waste from all over the country, political pressures
24 were brought to bear that resulted in legislation
25 being passed in Congress.

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1 (Slide) In 1980, the Low-Level Waste
2 Policy Act was passed which was very brief and simply
3 stated, one, that the states were responsible for the
4 low-level waste capacity and that the states could
5 discharge this responsibility by forming regional
6 compacts. A number of compacts were formed following
7 the passage of the Low-Level Radioactive Waste Policy
8 Act. However, not much progress beyond that was made.
9 As a result, increased pressure from the three host
10 states resulted in the Low-Level Waste Policy
11 Amendments Act being promulgated in 1985 that
12 contained a series of milestones, a system of
13 surcharges, financial penalties and other mechanisms
14 to try to force progress for the unsited states and
15 compacts to develop new disposal sites.

16 (Slide) Now, on the third slide,
17 basically just a brief summary of those six sites that
18 had operated. The sites at Maxey Flats, Kentucky,
19 West Valley and Sheffield, Illinois were all closed
20 prematurely. The site at Beatty, Nevada closed only
21 a year ago under a process that was set up by the Low-
22 Level Waste Policy Amendments Act where the three
23 sited states were given the ability to close their
24 sites at the end of 1992 and the Beatty -- well,
25 essentially the governor of Nevada decided to exercise

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1 that option and close the Beatty site, leaving only
2 two full commercial low-level waste sites in operation
3 at the present time with the Barnwell site in South
4 Carolina receiving waste from a good portion of the
5 site and that being scheduled to close at the end of
6 1995.

7 Now, I might mention there is one other
8 low-level waste site near Clive, Utah, operated by the
9 Envirocare Company, but it is limited in the kinds of
10 low-level waste that it can accept. It accepts under
11 state authority naturally occurring radioactive
12 materials and then it also accepts Atomic Energy Act
13 material in very low concentrations and diffuse form,
14 such as dirt from clean-up of contaminated sites or
15 decommissioning sites. It cannot accept the full
16 spectrum of waste saved from medical or the utility
17 instruments.

18 COMMISSIONER REMICK: I'd just like to
19 make a personal comment. I visited the Beatty site
20 some time within the past year and I thought it was
21 unfortunate that that site was closed and the
22 perspective for which I come is -- you mentioned some
23 of the earlier sites. About 30 years ago for the
24 Secretary of Commerce in my home state, I headed up an
25 effort to look at whether there was a need in that

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1 state for low-level waste burial site and visited two
2 of the sites that have subsequently been closed down,
3 came back and recommended against both the need and
4 the suitability of that state for a site of the type
5 that I saw at that time. I thought -- what I must
6 call fairly sloppy operations.

7 But when I visited the Beatty site, I was
8 quite impressed with, based on my visit there and so
9 forth, the professional nature of that operation and
10 the apparent suitability of a very arid, dry site and
11 so forth for that type of thing. I don't question the
12 authority of the state to do that, but I thought it
13 was most unfortunate, particularly when 100 yards away
14 there's another site that I can categorize in the same
15 manner as I would categorize the low-level waste site.

16 Just a personal observation.

17 DOCTOR BELL: Thank you.

18 The situation we have at present is that
19 the Richland site in Washington State accepts waste
20 only from the Northwest and Rocky Mountain compacts.
21 At present, the Barnwell site is accepting waste from
22 most of the other states in the country, but is
23 scheduled to close out of compact states in July of
24 1994.

25 (Slide) So, on slide 5, I have a figure --

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1 the next one, please. Could I have the next one with
2 the figure?

3 That shows the present situation as far as
4 the compacts that have been formed and three states
5 are darkened in. Those are Michigan, New Hampshire
6 and Rhode Island, which are presently denied access to
7 the Barnwell site, as is the Commonwealth of Puerto
8 Rico, for not making adequate progress in developing
9 a new site. So, basically, the states in the
10 Northwest and the three states in the Rocky Mountain
11 compact, Nevada, Colorado, New Mexico, ship to
12 Hanford. All the other states that are not darkened
13 in right now have access to Barnwell. But in July of
14 this year, the situation is expected to change
15 significantly when the Barnwell site will close to out
16 of compact waste, will only accept waste from the
17 states in the Southeast Region and 31 states, the
18 District of Columbia and the Commonwealth of Puerto
19 Rico will be denied access to the two operating sites
20 until some new sites are developed and become
21 available.

22 So, this is an important situation that's
23 affecting the staff's planning and activities in the
24 coming months.

25 (Slide) Another important piece of

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1 information that is background to our research program
2 is on the third figure, which shows states where by
3 state law shallow land burial is banned. As you know,
4 all six sites that have operated commercial have been
5 some form of shallow land burial. As we've gained
6 experience, especially post Part 61, shallow land
7 burial techniques have been improved and enhanced.
8 But basically we're talking about disposal in earthen
9 trenches in the ground.

10 The new site that's been developed at Ord
11 Valley in California is also an improved form of
12 shallow land burial. However, every site that is
13 planned after that, Texas, North Carolina, Illinois,
14 Nebraska, even the states further down the road, Ohio,
15 Pennsylvania, have all banned shallow land burial as
16 its currently practiced and are looking toward a more
17 engineered form of disposal with concrete lined
18 trenches, concrete covers, in some case specially
19 engineered packages, even for Class A waste, to get
20 much higher certainty and the predictability of
21 performance of these new sites that are being
22 developed.

23 (Slide) The next slide shows the status
24 of the applications that are under consideration by
25 agreement states and planned by other states and

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1 compacts. California actually, that application is
2 not under review. The license has been granted by the
3 state licensing authority, but the operation of the
4 site is being delayed because of the need for this
5 land to be transferred from the Department of Interior
6 to the state. Several lawsuits have been filed and
7 the Department of Interior has decided it does not
8 want to proceed until these lawsuits have been
9 settled.

10 Applications are under review in Texas,
11 North Carolina and Nebraska for sites there. In
12 addition, there are seven sites being developed where
13 applications could potentially be submitted during the
14 second half of this decade. Of these, two of these
15 would be in non-agreement states as we presently
16 foresee it. Those in Connecticut and New Jersey would
17 be reviewed by the NRC. The remainder would be in
18 agreement states and reviewed by the agreement state
19 regulatory authority.

20 At the present time, Michigan, New
21 Hampshire, Rhode Island and the Commonwealth of Puerto
22 Rico have no site under development and it's unclear
23 what their future plans are.

24 All of this assumes that the compact that
25 is in the process of being formed by Texas, Vermont

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1 and Maine will, in fact, be formed and receive
2 congressional approval. In earlier times, Maine and
3 Vermont were also unaffiliated in developing their own
4 sites.

5 (Slide) Now, with that background, let's
6 turn to the Low-Level Waste Research Program.
7 Essentially before 1977, the AEC, then succeeded by
8 the NRC, did not have a specific low-level waste
9 research program. When problems started to develop at
10 the operating sites, the first research programs that
11 we initiated were essentially reactive programs,
12 focused on on-site studies, primarily at Maxey Flats
13 and West Valley, to try to understand what the
14 problems were and to gain by this information to
15 improve future performance, to provide some of the
16 basis for promulgating Part 61, which occurred during
17 this time frame.

18 Then, in 1985, with the passage of the
19 Low-Level Waste Policy Amendments Act, we made a major
20 change in our program, in part because the Act placed
21 an obligation on the licensing bodies, either the NRC
22 in a non-agreement state or the state regulatory body
23 in an agreement state, to review a license application
24 in 15 months. This schedule that was imposed led to
25 an -- NRC to adopt a very proactive program where we

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1 developed standard review plans, standard format and
2 content guide, a number of branch technical positions
3 on various technical issues, and to accelerate our
4 research work into some of the concepts that the
5 states were considering, like the more engineered type
6 designs. But basically it was a reactive program.

7 (Slide) In 1988, the licensing staff
8 formulated a more carefully thought out program and
9 developed a user need letter which it provided to the
10 Office of Research which basically has been the focus
11 for the research program as it has evolved today.
12 There we identified a number of areas that needed
13 research. The research program, or the Research
14 Office, reacted by putting together a program plan and
15 basically that is the program that's in place today
16 that Mr. Costanzi will be describing in a lot more
17 detail shortly.

18 However, you should be aware that just
19 last month the staff has completed an updating and a
20 review of its research needs in the Low-Level Waste
21 Program area and has sent a revised user need letter
22 to the Office of Research that updates our priorities
23 and shifts the focus somewhat. In our present
24 program, in the work that's been going on for the last
25 five years, there was a lot of emphasis on trying to

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1 understand the source term, looking at engineered
2 barriers and these kinds of technical issues. The
3 updated user need letter places much more emphasis on
4 the low-level waste performance assessment area and
5 we're trying to move in the direction of taking some
6 of the performance assessment capability that we have
7 developed up to this point and apply it to some real
8 sites. Since we don't actually have a low-level waste
9 application in hand, our thought is to try to use it
10 to help out with some of the evaluations that have to
11 be done under the SDMP program. The staff provides to
12 the Commission an annual update on the status of the
13 performance assessment work and we'll be giving you
14 much more detail on where we stand on development of
15 performance assessment capability and on these ideas
16 on how we might accelerate the application of the
17 methodology by applying it to some of these
18 decommissioning sites in our next update of the
19 Performance Assessment Program, which is due to come
20 to the Commission about the end of next month.

21 So, with that background now, I'll turn it
22 over to Mr. Costanzi, who will describe in more detail
23 the objectives and the current status of our research
24 program.

25 COMMISSIONER REMICK: Mike, before doing

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1 that, I know from what I've heard from IAEA you made
2 many contributions during your tenure there and I'd
3 like to take advantage of the fact that you have been
4 involved in this activity from an international
5 standpoint. Are there things that you would care to
6 share with us about lessons learned or are people
7 doing things we're not? Are we doing things that
8 others aren't? How do things look from an
9 international perspective based on your years at IAEA?

10 I'll have another one then. It's more
11 personal and it's up to you whether you'll make it.
12 Do you have any personal comments of a senior staff
13 member of the NRC going off for several years on an
14 international organization and participating? What
15 are the pros and cons of that?

16 DOCTOR BELL: Well, it's difficult to
17 compare the situation because what you have in
18 virtually every Western European country and Japan,
19 the industrialized nations who are all able to make
20 good progress, is essentially a single national
21 authority and a single national site. It's a much
22 more focused environment. Basically they can focus
23 all their attention on -- and it's much easier to
24 integrate the source of the waste from the waste
25 generators through the packaging, the transportation

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1 to the disposal if you have an ANDRA who just has
2 overall national responsibility. It's a much
3 different and I'd say a much simpler system. But
4 basically the more complex situation that we have is
5 the tradeoff for the national policy that the country
6 has adopted giving states a lot more say and
7 responsibility in the low-level waste management.

8 COMMISSIONER REMICK: How about from a
9 technical standpoint. That's more institutional, I
10 assume. Are there things there going that we should
11 know about?

12 DOCTOR BELL: Well, frankly, I think we
13 know about them. I think it's probably recognized
14 that most other countries are focusing on more highly
15 engineered methods, either very highly engineered near
16 surface facilities, as in France and Spain, or
17 underground caverns, as is done in Sweden, Finland,
18 being considered in Germany.

19 COMMISSIONER REMICK: Shallow land burial,
20 Mike, right?

21 DOCTOR BELL: Excuse me?

22 COMMISSIONER REMICK: Is Japan's plans for
23 shallow land burial?

24 DOCTOR BELL: Japan, again, is an
25 engineered vault concept.

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1 COMMISSIONER REMICK: It is?

2 DOCTOR BELL: Yes.

3 Another thing you'll find in almost every
4 case is their waste sites are co-located with the
5 disposal sites. I think the Center de Lob is the only
6 exception to that. But the old Lamont site was co-
7 located in a major processing facility. The Finnish
8 and Swedish sites are located at reactor sites. The
9 Japanese site is at a major nuclear center. The
10 Spanish site is at a former uranium mine and the
11 facilities have been used to store waste and will also
12 have a major processing receiving center there. So,
13 again, things are much more centralized and
14 integrated.

15 COMMISSIONER REMICK: How about on the
16 more personal side? Do you want to make any comment
17 or do you have any on the wisdom of a senior staff
18 member going off on what some considered a boondoggle?

19 DOCTOR BELL: Well, while it was --

20 COMMISSIONER REMICK: I'm not insinuating,
21 believe me.

22 DOCTOR BELL: Well, it was very
23 interesting. It was not a boondoggle. I worked hard.
24 I learned a lot. I made a lot of contacts. Met a
25 number of people all over the world. I think it was

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1 a valuable experience. It's, I guess, still an open
2 question as to how well I'll be able to apply it back
3 in this system just because some of these
4 institutional situations -- I mean here I'm in a
5 situation where I have a lot of information about how
6 things are done around the world and what -- in a
7 situation where really all these kinds of decisions
8 aren't even being made within NRC, but in various
9 state organizations.

10 COMMISSIONER REMICK: Well, thank you very
11 much.

12 MR. THOMPSON: Frank?

13 DOCTOR COSTANZI: Thank you.

14 Mr. Chairman, Commissioners.

15 As Doctor Bell explained, the present Low-
16 Level Waste Research Program has been formulated in
17 response to a 1988 user need letter from the Office of
18 Nuclear Material Safety and Safeguards. That research
19 program plan was published in November of 1989. It
20 had received the benefit of public comment prior to
21 being finalized, and it has been essentially the basis
22 for the research which has been conducted in this area
23 for the last four years.

24 I might point out that this program was
25 not constructed nor conducted in isolation, however.

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1 We have ongoing communication with the Department of
2 Energy and their low-level waste program, and with
3 individual states, primarily through something called
4 the Technical Coordinating Committee, which we are
5 members. It's an informal group of representatives
6 from a number of states and the Department of Energy,
7 as well as ourselves. We meet periodically to discuss
8 low-level waste research progress, needs, questions,
9 issues, the like.

10 (Slide) May I have the first slide,
11 please?

12 What I plan to do this afternoon is give
13 you the presentation of this program broken down into
14 discussion of five areas: the technical issues, which
15 the program is focusing on; something which, for lack
16 of a better term, I called issues resolved, which is
17 really the things that we have learned along the way,
18 the results of the research which we have been able to
19 package up and say, "Well, we've gone this far, now we
20 can put this aside and move on to other things;" the
21 current research that is being conducted, what issues
22 we're addressing; and the products, what we expect to
23 get out of that research; and finally, and perhaps
24 most essentially, the use, what we intend to do with
25 the results of the research, how they're going to be

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1 useful in the regulatory program.

2 (Slide) Next slide, please.

3 The objective of this program is to
4 provide performance assessment tools and data to
5 support development of regulatory guidance for use by
6 the states and by the NRC in licensing, regulation and
7 closure of low-level waste disposal facilities. As in
8 the High-Level Waste Program, the performance
9 assessment is again the linchpin of this whole
10 operation. Everything that we're doing in one way or
11 another factors in or can be covered under the
12 umbrella of performance assessment because that is, of
13 course, ultimately the method by which the compliance
14 with the regulation, performance objectives in Part 61
15 are tested.

16 COMMISSIONER REMICK: Frank, do any of the
17 states conduct research in the low-level waste area
18 and, if they do, how do we coordinate that and do we
19 share our research results with them and vice versa?

20 DOCTOR COSTANZI: We certainly do share
21 research results with them. As I mentioned, the
22 Technical Coordinating Committee is probably the most
23 frequently used vehicle, since we meet with them
24 periodically. They have through that organization, as
25 well as -- is it the Southern states that have an

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1 energy board? We have received the results of that.
2 We've discussed them across the table with the states.
3 Their research program is, of course, not very large.
4 It's generally focused on particular questions,
5 whereas ours, of course, tries to cover the spectrum
6 of issues.

7 The Department of Energy, as I mentioned,
8 does have some work ongoing. We are coordinating with
9 them as well.

10 MR. THOMPSON: We are working with the
11 agreement states on developing, I guess, a better
12 understanding of their user needs as we develop our
13 own program, so that we try to coordinate the user
14 needs as we would see the roles and applications, but
15 we're also trying to input into the agreement states
16 their concerns of what we're developing and how that
17 would be utilized, as well as issues on timing and
18 those types of things, which they're very sensitive
19 on, since they have certain license applications
20 currently under review.

21 DOCTOR COSTANZI: I might elaborate on
22 that a bit. As Doctor Bell mentioned, we now have a
23 revised new user need letter. That has been sent out
24 to the states for their review and comments. It was
25 done at the end of last month and comments are

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1 requested by the end of February. In the meantime,
2 we're of course looking at that new user need letter,
3 seeing where changes to our current program would be
4 appropriate. Before we completely formulate that, we
5 will receive the input back from the states. We
6 intend to then revise the program plan, send that back
7 out to the states and let them take a look at it
8 before finalizing the research program.

9 COMMISSIONER REMICK: How safe is it to
10 assume that if a state is conducting research in this
11 area that we would know of it, that they would have
12 informed us?

13 DOCTOR COSTANZI: I think it's pretty
14 safe.

15 COMMISSIONER REMICK: good.

16 DOCTOR COSTANZI: (Slide) The current
17 research direction, as I mentioned performance
18 assessment is really kind of the name of the game.
19 I've broken it down for today's presentation to five
20 areas. Models. This is basically the architecture of
21 the method by which we're going to do performance
22 assessment. The various components, source term, the
23 site, the waste form and the effects of enhancement.
24 I intend to identify the technical issues for each of
25 these areas, what we've done and what we've learned

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1 and what we're doing today, the research, what we plan
2 to get out of it or hope to get out of it now and how
3 we're going to use it.

4 (Slide) Next slide, please.

5 Under modeling, there were, I think, three
6 general, three fundamental issues in which we're
7 exploring. First of all, of course, what is an
8 appropriate low-level waste performance assessment
9 modeling strategy. What sorts of things do you need
10 to consider, what are important, what are key to
11 assessing performance? Then there's some particular
12 things that we've learned in trying to develop and
13 apply performance assessment. One of those things has
14 to do with infiltration. Obviously, water is the
15 primary carrier of the waste out of the facility and
16 infiltration into the disposing of it becomes a key
17 question.

18 The second issue, how should the
19 variability of geochemical properties be treated in
20 performance assessment also is critical because of
21 certainly the sites. Obviously a site is generally
22 fairly heterogenous and the chemical properties vary
23 both spatially and with time as well. But in
24 addition, the fact that there's a mix of stuff that
25 goes into a low-level waste disposal facility, all

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1 sorts of chemical constituents, as well as physically
2 different constituents, that it makes the chemistry
3 very difficult, very complex. What we're trying to do
4 in this area is sift through all that so that we, as
5 I'll explain a little bit more later, develop or have
6 at hand for doing performance assessment models which
7 are sufficiently realistic so that we can take care
8 and be certain that we've gotten all the important
9 components and we understand and have accounted for
10 what is the driving processes, but not so complex that
11 you can never get the data to run the models or, even
12 if you could, that you would never find a machine big
13 enough or enough time on it to run the models.

14 Some of the geochemical codes that have
15 been developed in particular are extremely complex and
16 take a very long time and they're just not practical.

17 COMMISSIONER REMICK: Are the performance
18 assessments generally probabilistic or not?

19 DOCTOR COSTANZI: The performance
20 assessments have started out being pretty much
21 deterministic. But we have been using the lessons
22 that were learned from the high-level waste
23 performance methodologies, performance assessment
24 methodologies developed by Sandia to try and take a
25 more probabilistic approach. It's not a PRA type

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1 approach and probably will not be since this is
2 basically a passive system. But it is probabilistic
3 in the sense that you do a systematic sampling of the
4 variability of parameters based on the likelihood of
5 their occurrence, how often you find that particular
6 value in a particular parameter.

7 COMMISSIONER de PLANQUE: I assume the
8 models take into account the various types of disposal
9 structures. Is that true?

10 DOCTOR COSTANZI: That certainly -- when
11 we're finished, they will. We're still learning to
12 kind of walk before we can run and we have some
13 rudimentary characterization and structures in some of
14 the models. We've developed some models for the
15 physical stability in the long-term of structures,
16 particularly concrete structures. We are now
17 proceeding to look at the ways of modeling the
18 degradation of those structures over time and in
19 particular what effect on the local chemistry the
20 degradation products of concrete would have.

21 COMMISSIONER de PLANQUE: And this would
22 include modeling the infiltration into the existing --

23 DOCTOR COSTANZI: This would include
24 modeling the infiltration, yes.

25 (Slide) Next slide, please.

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1 What we've accomplished so far in modeling
2 is we've evaluated a number of codes that have been
3 developed for flow and transport and tried to
4 determine whether or not they're going to do the sorts
5 of things that we think we need to have done when we
6 do a performance assessment. These were not codes
7 developed for low-level waste performance assessment,
8 they were codes that were developed for other
9 purposes. What we're trying to do in this whole
10 program is not reinvent anything. If there are
11 existing models or codes on the shelf and we can use
12 them directly, that's terrific. If we have to tweak
13 them a little, that's okay too. But we don't really
14 want to spend a lot of effort and resources developing
15 a code that's a very resource-intensive and a
16 protracted enterprise and we're rather not do that if
17 something is available.

18 We have developed a code though because
19 there are some things which didn't exist and that's
20 the next item, which is the -- I'm sorry. I'm getting
21 ahead of myself. That's coming up. Which is the code
22 for the source term called the breach, leach and
23 transport code, which I'll talk about a bit later.

24 We've developed a low-level waste
25 performance assessment methodology and the branch

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1 technical position will be published shortly on that.
2 This is the phase 1 of the performance assessment
3 methodology which we've spoken to you about before and
4 I'll talk a bit more about that later.

5 We've also developed a methodology for
6 infiltration into basically very simple sorts of
7 shallow land burial facilities. Nothing as complex
8 as a vault, but just an enhanced shallow land burial
9 which is consistent with Part 61. It's not the old
10 shallow land burial, but a Part 61 type facility.

11 COMMISSIONER REMICK: Frank, as I sit and
12 listen, if I didn't know this was on low-level
13 research, terms like model, source term, site, waste
14 form, performance assessment, I might think it was
15 high-level waste. What's the relationship for a
16 coordination between a high-level waste area efforts
17 and our low-level research effort? It seems to me at
18 least many of the terms are the same.

19 DOCTOR COSTANZI: Many of the people are
20 the same as well in the research area. There is a lot
21 of exchange of information and ideas and techniques
22 between the two areas and that's certainly facilitated
23 within the Office of Research by many of the same
24 people working on problems. The problems, of course,
25 are very similar. The media is different and the

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1 nature of the engineering is different, but what you
2 have to deal with, and in particular what kinds of
3 questions the performance assessment needs to be able
4 to address, are quite similar.

5 COMMISSIONER REMICK: I'll bring up a
6 question later when you get into the center. The
7 question is do we use the center at all for any of our
8 low-level waste research.

9 DOCTOR COSTANZI: No.

10 MR. BERNERO: No, only on high-level
11 because that's the way they're set up. We looked at
12 the possibility of using them on low-level as well and
13 it was just too cumbersome, mechanically cumbersome in
14 contract phase to do that.

15 But to go back to your original question,
16 there is great similarity. We are pleased that the
17 Office of Research has people with the talent to work
18 both sides of it and we rely on that a great deal.
19 We're giving more attention ourselves to that
20 commonality of purpose.

21 COMMISSIONER REMICK: If it's
22 cumbersomeness of contractual nature, it seems to me
23 that's a challenge for managers to try to solve that,
24 if that's the real reason.

25 MR. BERNERO: Yes. We have a paper before

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1 you about the difficulties of doing work for others
2 that is other than the high-level waste program in the
3 center, it can be difficult, yes. But I think working
4 within the confines of the NRC staff, we are getting
5 and will continue to get great benefit from the
6 sharing of work, the same people.

7 COMMISSIONER de PLANQUE: So far I've
8 heard a lot about sharing information with DOE and the
9 states. A question I will ask now rather than later
10 is how much advantage are we taking of the research
11 done by other countries who, in fact, are more
12 advanced in terms of using engineered structures or
13 more highly engineered structures? You don't need to
14 answer that right now, but you might sprinkle in any
15 tidbits as we go along.

16 DOCTOR COSTANZI: Okay. I'll try and
17 remember not to forget that. But we are interacting
18 with other countries in a number of programs.

19 (Slide) Modeling issues is the next
20 slide. The first issue is what is an appropriate low-
21 level waste performance assessment modeling strategy.
22 The research we're doing here is a systematic
23 examination of existing hydrologic and geochemical
24 codes against benchmark calculations and field data.
25 this is both the NRC staff doing this, as well as

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1 contractors. What we're trying to do now is define
2 the range of applicability of these codes which do
3 address the same sorts of things we've already
4 discovered are appropriate.

5 The product, of course, will be the low-
6 level waste performance assessment methodology, as I
7 mentioned, the branch technical position, which will
8 then be followed by a regulatory guide. The current
9 schedule was that the regulatory guide would be
10 available in draft form about a year after the branch
11 technical position, which would be about 18 months
12 from now. But this schedule is going to change
13 because the phase 2, which is going to be essentially
14 developing the reg. guide, the application of the
15 methodology to some test cases is going to be changed
16 to focus on some of the SD&P sites as mentioned
17 earlier, and you will hear more about this in a paper
18 to the Commission I think in February, is when it's
19 due.

20 COMMISSIONER REMICK: You mentioned
21 contractors as appropriate. It would be helpful if
22 you'd give us some examples of the type of research
23 providers we are using in this area.

24 DOCTOR COSTANZI: Sandia --

25 MR. SILBERBERG: Sandia, Pacific Northwest

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1 Laboratories, INEL, Idaho, PG&G, Brookhaven.

2 COMMISSIONER REMICK: All national labs?

3 MR. SILBERBERG: Yes.

4 COMMISSIONER REMICK: Any other?

5 DOCTOR COSTANZI: University of Arizona.

6 MR. SILBERBERG: We have universities,
7 MIT, the University of Arizona, and we've also done
8 work with the National Institutes of Science and
9 Technology right nearby and we're also working with
10 other agencies. We're working closely with USGS,
11 Department of Agriculture, a site there.

12 DOCTOR COSTANZI: University of
13 California.

14 MR. SILBERBERG: University of California.

15 DOCTOR COSTANZI: We basically go where
16 there is talent and capability to do the work that we
17 need to get done. The program is very much spread
18 around in that regard.

19 COMMISSIONER REMICK: Okay.

20 DOCTOR COSTANZI: The use, of course, is
21 obvious, guidance to the states and licensing support.

22 (Slide) The next issue, as I mentioned
23 earlier, was water infiltration. We, as I mentioned,
24 had developed an infiltration methodology. We're now
25 applying that and refining it. You had asked the

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1 question, "Where there not any that dealt with
2 structures?" Initially it was very simple and dealt
3 with covers, engineered covers. We're now further
4 developing that model to deal with structures, things
5 like vaults and bunkers, which makes the problem much
6 more complex.

7 In very simple terms, if you're dealing
8 simply with a cover and a trench, even a lined trench
9 of some sort where the wastes are put in, you can get
10 away with the one conventional infiltration model.
11 When you start putting in structures and vaults and
12 the like and perhaps monoliths or something of that
13 sort, now you're at least in the realm of 2D, probably
14 3D. That makes the calculation much more difficult.

15 What we'll get, of course, is a product
16 for evaluating water infiltration in the performance
17 assessment methodology. This will, of course, be part
18 of the guidance that we will provide.

19 (Slide) Well, the last modeling issues is
20 in terms of the geochemistry. As I mentioned before,
21 the existing geochemical models tend to be on two
22 extremes. Either their very simple in order to be
23 able to run the calculations -- but those give us
24 difficulty because they're not -- one is forced to be
25 conservative, but you're never really sure that you

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1 are because of the simplifying assumptions that you're
2 forced to make, mainly because of the local chemistry
3 as well as the properties of the site change both with
4 time and space.

5 Or, you can go to very complex chemical
6 codes where you really mechanistically dial in the
7 chemical interactions amongst all the species that are
8 participating, but the hope of getting enough data to
9 ever really feed that code is slim. And even if you
10 could, it would take an inordinate and impractical
11 amount of time to run it.

12 So the objective here is to try and take
13 existing codes to the extent that we can and fashion
14 them in a way that we can have some confidence that
15 we're treating the dominant processes, we're treating
16 them in a fairly realistic way, and yet there will be
17 data available to run the codes. It will be a
18 Herculean task to get that data and they'll take a lot
19 of time. It could be done reasonably.

20 (Slide) The next slide, the source term--

21 COMMISSIONER REMICK: Am I correct that
22 the center is looking at the very same issue of the
23 effect of concrete on the local geochemistry in the
24 high-level waste area?

25 MR. SILBERBERG: -- on the type of

1 minerals that are at the Yucca Mountain site, some of
2 the equivalent of ion exchange materials. They
3 actually focus on that because the Yucca Mountain site
4 is, in fact -- predominates with that type of mineral.
5 Whereas in a low-level waste we're talking about clay,
6 soils and concrete. The center's work per se doesn't
7 deal with concrete except to the extent that it might
8 come into the engineering construction. But at this
9 point, they're focused on mineral content of Yucca
10 Mountain.

11 COMMISSIONER REMICK: Bore hole sealing
12 and so forth.

13 MR. SILBERBERG: Well, certainly in
14 sealing, that aspect of it, yes, certainly that's
15 concrete. But they have not yet done much on the
16 chemistry of -- mostly on bore sealing, it's been, as
17 was explained in a previous briefing, was dealing with
18 the techniques on sealing properly. That was the work
19 that we had described that was being done outside the
20 center. But the chemistry at this point in concrete
21 is not an issue.

22 COMMISSIONER ROGERS: Just before you
23 leave the modeling issues, I'd just like to explore a
24 thought here. You mentioned that, of course, you're
25 trying to use as much as possible codes that already

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1 exist, that are on the shelf and so on and so forth.
2 Presumably they were developed for another purpose.

3 MR. SILBERBERG: Yes.

4 DOCTOR COSTANZI: Some of them. Not all
5 of them, but most of them.

6 COMMISSIONER ROGERS: Yes. Well, some of
7 them anyhow. When you put all these together and use
8 them in some way, you in essence are creating a model.
9 The question then is not simply benchmarking the
10 codes, but validating the model. They're not quite
11 the same thing. I wonder to what extent you've been
12 wrestling with that particular aspect of this.

13 DOCTOR COSTANZI: Well, we have been
14 writing the codes using -- you mentioned actual data
15 that we've obtained through other work and also the
16 literature. And the phase 2 of the performance
17 assessment methodology development was to try and
18 apply these codes and see how they worked. Again,
19 that would be against real data. So, there would be
20 some measure of validation, something that would give
21 us confidence that we've got the modeling right. We
22 still intend to do that, but as I mentioned we're
23 going to be applying to some of the SDMP sites. But
24 that's still part of the plans.

25 COMMISSIONER ROGERS: Well, the concern I

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1 have, and it's really just a general concern because
2 I really don't know exactly how you're doing this, but
3 if you start out with a collection of codes that deal
4 with certain aspects of a situation, you can benchmark
5 those codes individually, but how you use them and in
6 principle questions of interaction of variables that
7 are being treated in one code and another code come
8 up, and these can be very complex issues.

9 I was just wondering to what extent
10 that -- you don't want to get bogged down in it
11 totally, but on the other hand you don't want to come
12 up with a collection of tools which you simply are
13 applying, you are benchmarking them to some extent.
14 I don't know exactly what you mean by benchmarking,
15 but generally one interprets this to mean not a full
16 validation of the code but really to sort of pick some
17 points that calibrate the code in a certain sense for
18 a particular kind of calculation.

19 DOCTOR COSTANZI: Well, yes. Ultimately,
20 of course, what one would love to do is to be able to
21 run a series of field experiments and make predictions
22 of the code and observations of the results and
23 compare the two. But that's very difficult to do.

24 COMMISSIONER ROGERS: It would take a long
25 time.

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1 DOCTOR COSTANZI: Yes. But what we have
2 done is we've taken advantage of not only laboratory
3 work and particular lysimeter work in which wastes
4 have been placed in a soil environments and then
5 water, a control rate percolated through the
6 environment and look at the leachability. But we've
7 also taken advantage of the fact that there have been
8 some disposal sites, particularly those at the Chalk
9 River Laboratories in Canada, where the source term,
10 the radionuclides that went in are very well known,
11 very well characterized. The site is very well
12 characterized and we've run comparison calculations of
13 how we would think the waste would move with our
14 various codes and looked at how they actually have
15 moved.

16 The results are very encouraging. We're
17 pretty confident we know how to do that. Again, we're
18 trying to become a bit more sophisticated and easier
19 to use at the same time. But we're encouraged that
20 we're on the right track.

21 COMMISSIONER ROGERS: Thank you.

22 DOCTOR COSTANZI: (Slide) The next area
23 is the source term. Questions here are what are the
24 dominant chemical, physical and radiologic properties
25 of the waste itself, how do the presence of chelating

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1 agents affect the performance of disposal? This is
2 going to become particularly critical as facilities
3 become decommissioned, since chelating agents are used
4 commonly in the decontaminating solutions. And the
5 last one deals with some radionuclides which are
6 particularly difficult to measure, which right now are
7 estimated by limits of observation. But we have
8 reason to believe that those estimates could be one or
9 several orders of magnitude too great and that
10 particular things like iodine and carbon technetium
11 would tend to swamp the dose calculations when the
12 amount present is really not as great as what is now
13 going into performance assessments.

14 We have developed a source term model.
15 This is the breach, leach and transport code that was
16 developed by Brookhaven. We are testing it now on
17 actual low-level waste and we hope to further refine
18 and improve the code. This is some of the validation
19 sorts of things that we are doing because, again, it's
20 done against not only other calculations but actually
21 observations, laboratory and field observations.

22 COMMISSIONER REMICK: Has the low-level
23 waste manifest assisted in determining source term, or
24 will it?

25 DOCTOR COSTANZI: The information that

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1 would be in the uniform manifest is no different than
2 the information which already exists out there. But
3 what it will do is make that information much more
4 conveniently accessible so that right now in order to
5 get all the -- to get an adequate characterization of
6 the ways to do suitable performance assessment, we
7 have to go back to the disposer as well as the
8 producer of the waste, compare records and then
9 extract all that out. It's essentially a manual
10 process. Whereas with the uniform manifest, all that
11 will be available will be available electronically.
12 The information will be all in one place and readily
13 accessible. So, it will really speed things up, make
14 things much more improved.

15 COMMISSIONER REMICK: What's the status of
16 the uniform manifest?

17 DOCTOR COSTANZI: We are waiting right now
18 for the Department of Transportation to come back to
19 us. We had sent them a letter asking a number of
20 questions as to what they felt their needs were in
21 terms of safety of the transport, since that's their
22 responsibility. We're waiting to get back from them.
23 We're also waiting for them to publish their own
24 rulemaking in this area. We anticipate hearing from
25 them in about three or four months. But I have to say

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1 that their schedule has been slipping. So, it's just
2 on hold.

3 COMMISSIONER de PLANQUE: Is there a
4 particular hang-up, or is it just a matter of
5 priorities for them?

6 DOCTOR COSTANZI: It's a matter of
7 priorities, as I understand it. The system is safe
8 now. So this is a --

9 (Slide) Okay. The research that we're
10 doing is laboratory and lysimeter tests on a range of
11 actual low-level waste. The product is
12 characterization. One product we tend to get in the
13 near-term, which is next year, is characterization of
14 Class A wastes by waste streams. This is the chemical
15 properties of Class A waste.

16 COMMISSIONER REMICK: Is there any work
17 being done by the State of Illinois at the Sheffield
18 site along this line?

19 DOCTOR COSTANZI: I'm not aware of it.

20 MR. SILBERBERG: Not that I'm aware of.

21 DOCTOR COSTANZI: Okay. The use of this
22 information, of course, is the development of
23 realistic source terms and the selection of
24 appropriate models.

25 (Slide) The next question deals with the

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1 complex chelating agents in low-level waste. Again,
2 this is an experimental program looking at the effects
3 of chelating agents on low-level waste chemical
4 stability. We will ultimately modify the leaching and
5 transport codes to accommodate the excess of chelating
6 agents which is found in decontamination fluids.
7 Again, the use is realistic source terms. But we want
8 to make sure that the source terms that are going in
9 the performance assessments are driven by what's in
10 the disposal unit and by not something that's just
11 hypothetical.

12 (Slide) The last issue deals with some of
13 the hard to measure radionuclides. Again, it's
14 laboratory work on samples of low-level waste. the
15 objective here is to try and develop correlations
16 between the quantities of some of these very difficult
17 to measure radionuclides with more commonly occurring
18 and more easily measured radionuclides, so that rather
19 than putting down a limit of detection as the amount
20 of carbon-14 or iodine-129, you can scale it from
21 something else which is more easily measured and you
22 know that these always occur in a particular waste
23 stream in the same ratios.

24 (Slide) I'd like to turn now to the
25 issues related to the site. As you might gather by

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1 now, chemistry plays a very large part because we're
2 back here at chemistry.

3 The first issue here is how should the
4 effects of organic complexants and microparticulates
5 occurring naturally in the soil be treated. These
6 have the property of being able to mobilize
7 radionuclide and make them move faster than one would
8 first estimate. They also have the property, in some
9 cases, of capturing them and inhibiting their motion.
10 They need to be addressed and put into the
11 assessments.

12 And what are the elements of appropriate
13 unsaturated zone performance monitoring program? This
14 work is something we haven't started yet. We plan to
15 begin. But it will look at how would you monitor the
16 unsaturated area around the disposal area, since they
17 need to be, according to Part 61, built above the
18 water table, either to confirm that everything is okay
19 or, if something isn't okay, to provide an early
20 warning so that some sort of interdiction could take
21 place.

22 COMMISSIONER REMICK: Both of those
23 bullets seem to be questions you'd ask in the high-
24 level waste repository also.

25 DOCTOR COSTANZI: Yes.

1 COMMISSIONER REMICK: Is research being
2 done there on those topics?

3 DOCTOR COSTANZI: Yes. As a matter of
4 fact, the work in terms of is everything okay in
5 properties of the site characterization also in the
6 materials areas, where looking at possible ways of
7 monitoring the condition of the waste packages over
8 time. For metallic containers you could look at
9 corrosion noise, electronic noise created by
10 corrosion, to see if things are okay, if the potential
11 has changed.

12 COMMISSIONER REMICK: Do we have two
13 different efforts going on or are they related or
14 coordinated or --

15 DOCTOR COSTANZI: We're not looking at any
16 of the kinds of materials questions in the low-level
17 waste than we are in the high-level waste. So, they
18 are separate. They're not really --

19 COMMISSIONER REMICK: Every site would be
20 different generally, right?

21 DOCTOR COSTANZI: Every site would be
22 different.

23 COMMISSIONER REMICK: But questions on
24 monitoring it seems would be applicable to either one.

25 DOCTOR COSTANZI: Well, in terms of the

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1 monitoring of the water, yes, with the exception, of
2 course, of Yucca Mountain's fractured rock. All the
3 low-level waste facilities I know of have different
4 types of soils, but soils.

5 MR. BERNERO: It should be kept in mind
6 that it would take a truly catastrophic failure of
7 thousand year packages to be able to monitor something
8 in a few centuries for the high-level waste site. So,
9 there are substantive differences there. The waste
10 form is also much more specialized in high-level
11 waste.

12 MR. SILBERBERG: And the form is in the
13 rule.

14 MR. BERNERO: Yes.

15 DOCTOR COSTANZI: The source term in the
16 high-level waste is a much easier problem to --

17 COMMISSIONER REMICK: The answer is you're
18 not doing monitoring research for high-level waste.
19 Is that right?

20 DOCTOR COSTANZI: Not of this nature, no.

21 COMMISSIONER REMICK: Okay.

22 DOCTOR COSTANZI: (Slide) Okay. The site
23 issues, we have demonstrated through our work that one
24 dimensional modeling of flow of transport is not
25 always conservative. In fact, it usually isn't by the

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1 way it's done. People basically take an average of
2 the properties of the site and what happens is that
3 ignores the real possibility and in fact the real
4 occurrence of particularly high conductivity channels,
5 like sand lenses and the sort, and tends to
6 underestimate the amount of radionuclides which could
7 migrate from the site over time.

8 We've also demonstrated the feasibility of
9 developing a site characterization program for low-
10 level waste. This is some work that we again did up
11 at Chalk River where we did sort of a blind test,
12 where we asked the contractor to go out and take a
13 look at the lay of the land and figure out where you
14 would put your wells and your bore holes to
15 characterize the site and then look at the wells and
16 the borings that ACEL did at Chalk River, compare the
17 two and run your calculations and tell us how things
18 are migrating. Then look at the data from the actual
19 monitoring wells and make that comparison. It turned
20 out to be very good.

21 As would be expected, the predicted
22 migration -- migration was predicted to disperse a lot
23 more than is actually observed because the dispersion
24 is kind of a measure of uncertainty in the whole
25 process. But the concentrations and the extent of the

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1 migration were very close. So, we felt very good
2 about that. We felt that it was a good
3 accomplishment.

4 (Slide) Site issues. How should the
5 effects of organic complexants -- what we're doing is
6 field observations, again at Chalk River, and
7 companion laboratory experiments are identifying the
8 controlling organic processes and compounds. We will
9 use these in performance assessment models.

10 (Slide) Next site issue, page 19, what
11 are the elements of appropriate unsaturated zone
12 performance program? Again, this will be hydrologic
13 field observations, identification of appropriate
14 elements for performance monitoring to make sure
15 everything is going okay. Or if it's not, get some
16 early warning. We ultimately provide some guidance to
17 states and ourselves to sites which we would license.

18 (Slide) I'd like to turn now to the waste
19 form, issues related to the mechanical stability of
20 the waste form. A simple question, how stable are
21 they? The Part 61, of course, has as the fundamental
22 tenet that the Class B and C waste which contain the
23 bulk of the radioactivity must be stable. There have
24 been branch technical positions published on the
25 stability of waste form and this work is designed to

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1 assure that indeed the methods that are being used to
2 stabilize low-level waste by the industry are working.

3 (Slide) And, in fact, on the next page
4 you see that one of the things that we've done is
5 we've actually tested, solidified low-level waste and
6 the result of those tests has led to improved industry
7 practice. We've assessed the stability of
8 decontamination waste and we've published a report on
9 that and have developed a database for testing source
10 term codes.

11 We're still --

12 COMMISSIONER REMICK: Excuse me for
13 interrupting, but up until now I got the impression
14 that most of the things you were talking about were
15 questions that are still out there and being worked
16 on. Now, I see these are -- you're actually giving
17 some examples of results and use. Are these the -- am
18 I wrong in my impression that most of what you talked
19 about up to this point are outstanding questions that
20 are being worked on or are there other examples in
21 those areas that we just covered?

22 DOCTOR COSTANZI: No, there are examples
23 of results as well. We certainly have a lot of
24 questions which we're still working on, but we have,
25 I think, made a good deal of progress. For example,

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1 we have identified a set of transport -- flow and
2 transport codes which we know will be useful in doing
3 performance assessment. The work we're doing now is
4 fixing the range, what are the limits of the
5 applicability, what particular properties and what
6 kind of a site will they address, what kind of a site
7 will they not address. There are different codes and
8 they were developed for different purposes.

9 Similarly, we have some idea now of the
10 degree of sophistication that we need in terms of
11 treating the chemical properties. We're pretty
12 confident that we now can treat them realistic --
13 treat the chemistry of the low-level waste disposal
14 realistically, but without demanding an inordinate
15 amount of data or an impractical amount of time.

16 We have developed methods of assessing the
17 performance of engineered structures in terms of their
18 stability over the long-term. We've developed codes
19 for that. We're now exploring the chemistry of the
20 degradation products, how they degrade, how long will
21 that take in terms of how that will affect the local
22 chemistry since the products of degradation will act
23 as -- well, essentially swamp the chemistry in a local
24 area.

25 (Slide) We have done a lot of work on

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1 covers. One of the things that we found out is that
2 no matter what kind of a low-level waste disposal
3 engineering you want to do, if you throw some dirt on
4 top of it, you've improved it. Putting a cover on a
5 disposal facility, a vault or a bunker or the like,
6 has the effect of keeping water out of it. If you
7 keep water out of where you put the wastes, you're
8 obviously ahead of the game. So, we've learned how to
9 do that and how to evaluate them. So, these are some
10 of the successes that we've had in this program.

11 Before I do forget, I mentioned that we
12 have done this in cooperation and cognizance of what's
13 going on in the rest of the world. We are cooperating
14 with European countries and Japan in such projects as
15 Intraval, which was not just high-level waste but is
16 also low-level waste problems. We are also
17 cooperating in the International OKLO effort. That is
18 of particular use to us because some of the natural
19 reactors occurred in bitumen and nothing moves in
20 bitumen. Everything seems to have been held up very
21 well. So, we've learned a lot of information from
22 that about, again, the local chemistry and, in fact,
23 about some of the things that you might do to further
24 enhance the isolation of the waste from the
25 environment or by adding materials to the disposal

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1 unit.

2 The waste form. As I said, we're looking
3 at laboratory tests, including the effect of microbes,
4 since they're ubiquitous, on the actual waste, largely
5 decontamination waste, since that's the next big
6 question in low-level waste disposal. We will use the
7 data that is going to result from this and the
8 guidance in treating waste forms.

9 Enhancements, I've briefly talked about
10 just a moment ago, has to do with cover designs and
11 also with the degradation of concrete structures.

12 (Slide) Page 24 indicates that we've
13 demonstrated that bioengineered and multiple layered
14 covers can be effective at preventing water
15 infiltration into low-level waste disposal units and
16 also bioengineered covers can effectively remediate
17 water infiltration. Essentially the plants will suck
18 the water right out.

19 COMMISSIONER ROGERS: But bioengineered,
20 is it something --

21 DOCTOR COSTANZI: You grow a plant on it,
22 yes.

23 COMMISSIONER ROGERS: Okay.

24 DOCTOR COSTANZI: But I think -- were they
25 junipers? Is that what we're using? But they're very

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1 effective at dewatering trenches. We have this
2 demonstration facility out here in Beltsville. It's
3 very interesting to visit. Not much is happening, but
4 you can see the lay of the land and how these trenches
5 are covered.

6 COMMISSIONER REMICK: Too, successful
7 people must be attempted to cut it for biomass if it
8 grows.

9 DOCTOR COSTANZI: I guess. Take the
10 berries and make jam, I don't know.

11 We've also demonstrated the feasibility of
12 using chemical barriers in natural soils to retard the
13 migration of the nuclides.

14 (Slide) We developed a model, page 25,
15 for predicting the long-term service of concrete
16 structures and developed a model for evaluating
17 radionuclide transport through concrete.

18 (Slide) The issues that we're still
19 exploring, what cover designs will be effective
20 controlling water. We haven't finished evaluating all
21 the cover designs, but this project is winding up and
22 we'll be finished by the end of calendar year '95.

23 With regard to the degradation of concrete
24 structures, we're now testing the durability and rate
25 of degradation under expected disposal conditions.

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1 We'll identify the processes, also the chemistry, and
2 that will be used again in performance assessments.

3 MR. SILBERBERG: And the concrete
4 workshop. Do you want me to mention that, the
5 concrete workshop?

6 DOCTOR COSTANZI: Go ahead.

7 MR. SILBERBERG: Yes. Commissioner de
8 Planque, you mentioned about taking advantage of
9 international experience in the area of enhanced low-
10 level waste disposal. We have reached a juncture now
11 in our work on concrete at the NIST that we have, in
12 cooperation with the NIST, have set up a major
13 workshop at the end of January, the 31st, February 1st
14 and 2nd, where we have invited not only those people
15 who have done research and actual engineering in low-
16 level waste facilities in the United States, but we
17 have invited people from France, Sweden, Spain and
18 Japan to participate also in a well-focused workshop
19 on getting input from across the world on how they see
20 the current state of technology in the use of concrete
21 in these facilities. We're going to take advantage of
22 that and that input to evaluate how we might refocus
23 our own program and, using experience from there,
24 determine how we might use their information as well
25 as enhance our own program by doing something that

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1 would not necessarily be duplicative of what they've
2 done.

3 So, we think that's a major milestone for
4 the program in order to bring this experience to bear.

5 MR. THOMPSON: Mr. Chairman, that
6 completes our presentation. We'd please to respond to
7 any questions the Commission has.

8 CHAIRMAN SELIN: Commissioner Rogers?

9 COMMISSIONER ROGERS: Well, just following
10 up a little bit along that line, have you folks
11 thought about some specific criteria that we might
12 apply to deciding on how we make a decision on the
13 pursuit of any particular kind of research in this
14 area? I think I'm a bit uncomfortable to some extent
15 with some of the areas, not that they aren't important
16 things to do, but the question of who's doing them.
17 When we start looking at cover research, I think we
18 certainly have to have an expertise in-house and be
19 able to tap an expertise in judging what our planned
20 cover program might be. But where you draw the line
21 between doing the kind of work that the owner of the
22 site should be doing versus the kind of work that we
23 need to do to be able to judge the validity of a
24 proposal.

25 DOCTOR COSTANZI: Well, the particular

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1 work that you mentioned, the covers, had its origin in
2 the perceived failures of earlier low-level waste
3 disposal, the fact that waste had subsided and the
4 covers collapsed and the disposal units filled with
5 water. We started looking at that because it was
6 obviously a problem. There wasn't really anyone else
7 around to look at it at the time. This was in the
8 Low-Level Waste Policy Act and the Policy Amendment
9 Act days, and it was a long-term project. It turned
10 out to be something which was very useful and the
11 states expressed continued interest, so we just
12 continued the work.

13 As I mentioned earlier, we now have the
14 new user need letter just circulating to the states
15 for their comments. Is it responsive to what they
16 need as well, since under the Low-Level Waste Policy
17 Act NRC does have some obligation to provide guidance
18 to the state according to the act? We will
19 accordingly modify the research that we're doing to be
20 consistent with those needs. So, we feel that the
21 research we've done to date has certainly been
22 responded to positively by the states. They seem to
23 be using it and certainly we've tried to do those
24 sorts of things that would be appropriate for us to
25 do, we thought would be appropriate for us to do and

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1 were also useful to the states and we will continue
2 that.

3 COMMISSIONER ROGERS: Well, I have no
4 doubt that they would find the work useful to them.
5 I guess the concern I have is one that we touched on
6 this morning in our agreement state program briefing
7 and that is that if more and more states become
8 agreement states, and I suppose in the limit they
9 almost all are agreement states, they still would have
10 this great interest and yet the fees would not be
11 coming in to support it. I think that somehow one has
12 to begin to take that into account in some way. I
13 don't know how, but I have no doubt the states will be
14 interested in using the results of this work. The
15 question is whether they shouldn't be supporting some
16 of it themselves and, in fact, maybe actually doing it
17 themselves. If we're out there ready and willing to
18 do it, that's fine. No need for them to come to grips
19 with it. But if a state decides to take over a low-
20 level waste disposal program but really plans to use
21 the results that we're developing to help them, but
22 isn't assisting in paying for it, I'm a bit
23 uncomfortable with that. It's an issue that I think
24 we need to watch and characterize in some way and at
25 the same time continually ask ourselves what is the

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1 basis for our deciding to take on a particular kind of
2 research or a piece of research.

3 MR. SILBERBERG: Let me just note,
4 Commissioner Rogers, that some of that support in the
5 area of what you might call research for the states
6 might also come from the DOE commercial low-level
7 waste program and, in fact, we have had many
8 discussions with them over a number of years on trying
9 to encourage them to participate in this. It is my
10 understanding now, as you may know, that the
11 Department of Energy now is looking rather seriously
12 at research and development that they might be able to
13 carry out or that even in a limit might even be
14 carried out cooperatively with us. They're looking at
15 number of initiatives and we're actually in touch with
16 them as to what some of this work might be.

17 So, the Department of Energy, in their
18 responsibilities in the 1985 Act, going back and
19 trying to determine how either from their own low-
20 level waste program or from broadly across DOE how
21 they might be able to support work for the states.

22 Back in the case of the cover work, it
23 wasn't so much that -- and I admit that there's always
24 a concern about a fine line between who should be
25 doing it. There, because of the experiences on why

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1 covers were subsiding or failing, what have you,
2 within the context of our advice from our user office
3 as well as from the Office of Research, the concern
4 that we had was why are they failing? What is it that
5 makes a bad design? What should they be avoiding?
6 How should they -- what are, if you will, designs or
7 design approaches of fundamental understanding that
8 might get a cover into trouble, might get a site into
9 trouble?

10 So, there it was a matter of let's stand
11 back and understand the safety significance of what
12 they're trying to do. In that context, I think one
13 might say that our work would have justification.

14 MR. THOMPSON: Commissioner Rogers, a lot
15 of this work was kind of started before the 100
16 percent fee issue became a problem, obviously.

17 COMMISSIONER ROGERS: Oh, I know. I know.

18 MR. THOMPSON: As we go through and update
19 our user need and working with the states, we'll keep
20 that aspect in mind and be very careful that we think
21 the appropriate balance is drawn between what we're
22 doing and what NRR licensees are going to be obviously
23 footing the bill for and what we can work with DOE and
24 others to get that done.

25 COMMISSIONER ROGERS: And at the same

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1 time, it seems that when making that kind of a
2 judgment, you also have to recognize that we must have
3 our own independent capability --

4 MR. SILBERBERG: Yes, that's correct.
5 That's correct.

6 COMMISSIONER ROGERS: -- of making
7 decisions on that. That has to be there. But I think
8 these are issues that just have to be continually
9 returned to. I don't think you can settle them once
10 and for all on any particular issue. You have to keep
11 going back and looking at it and see where it is
12 today.

13 MR. THOMPSON: Does it make sense to
14 continue and what's the benefit going to be and what's
15 the cost going to be.

16 COMMISSIONER ROGERS: Right.

17 DOCTOR COSTANZI: There's also the charge
18 in the Low-Level Waste Policy Act to NRC to provide
19 guidance to the state in these matters. So, it's
20 continual reexamining --

21 COMMISSIONER ROGERS: When the Congress
22 passed that, they wouldn't pass the 100 percent Fee
23 Recovery Act at the same time either. So, these
24 things impact each other and I just think that we have
25 to continually examine and publicly examine what the

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1 impact of the 100 percent fee is on everything we do.
2 We have to live within that and we can't use that, it
3 seems to me, to pay for things that somebody else
4 really should be doing because that's what it's coming
5 back to.

6 Now, the other point about the
7 presentation, I thought it was a very interesting
8 presentation, but I would personally like to have seen
9 something about time lines on some of these programs.
10 Just where do they stand? Do you have any
11 expectations for completion of something? Not a hard
12 and fast thing, but some idea of the magnitude of the
13 research, how many people are involved in the
14 individual projects and how many dollars are involved.
15 It all looks very nice, but the question is what's the
16 price tag on this and how long is it going to take?
17 Of course, to some extent I can always go back and
18 look at our budgets to find that, but it is nice to
19 have it in the context of a presentation of this sort,
20 just to have a feeling about what we're talking about
21 here.

22 So, I'd like to see perhaps -- perhaps you
23 could supply us with a little accompanying chart.

24 MR. THOMPSON: We'll supply that.

25 COMMISSIONER ROGERS: In terms of the work

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1 that was presented today, how many FTEs are involved,
2 how many dollars involved, how many contract dollars
3 outside of NRC are involved?

4 MR. THOMPSON: I'm sure we have that
5 information and we'll be pleased to provide it.

6 COMMISSIONER ROGERS: Thank you very much.

7 CHAIRMAN SELIN: Commissioner Remick?

8 COMMISSIONER REMICK: Going to the
9 research you have on the cover designs, there
10 certainly are sites in existence in France, in the
11 U.S., like Sheffield. I assume there are some EPA 30
12 year disposal sites that have been established that
13 are supposedly designed to keep out water and collect
14 water if it does go in. Are you incorporating and
15 looking at past experience in this research of sites
16 that are already in existence?

17 MR. SILBERBERG: Very definitely.

18 COMMISSIONER REMICK: Okay. Good.

19 I must admit -- I guess I look at Mr.
20 Bernero and Mr. Thompson here -- some questions, I
21 guess, about should the Center for Nuclear Waste
22 Regulatory Analysis be involved in low-level waste
23 research.

24 And I realize that it's not a question of
25 conflict of interest in the area of low-level waste

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1 that the Commission faced in the high-level waste area
2 and I certainly support the idea of diverse research
3 providers and so forth, not putting all your eggs in
4 one basket, but, at the same time, I know certainly
5 within a couple years ago we were concerned because of
6 the slowing down of the high-level waste area whether
7 we could put enough resources in to have that critical
8 mass of expertise at the Center.

9 I think you agree that many of these
10 issues could easily relate to high-level or low-level
11 waste. I wonder if we have adequately considered the
12 pros and cons, because I honestly don't know where one
13 should come out on it, but I hope that the con isn't
14 that the Center is a high-level waste initiative and
15 the low-level people feel that they want to have their
16 own things that they manage and not have to go through
17 the high-level. I have no indication if that's it or
18 not, but I hope that's not the case.

19 MR. THOMPSON: That's not the case from
20 the staff's perspective. It clearly is an issue with
21 respect to the basic foundation and the justification
22 for having an FFRDC for which we went through, and so
23 it has to be a fairly narrow-scoped and focused issue.

24 Bob, maybe you have a little more on this?

25 MR. BERNERO: Yes. We have spoken to the

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1 Commission before in a variety of papers.

2 There is an activity at the Center now,
3 for instance, to cooperate with or support the
4 radiation protection group in Sweden in the
5 environmental impact of high-level waste.

6 We have sent to the Commission and urged
7 you to consent to the possibility of the Center
8 providing technical assistance to EPA for high-
9 level -- it's really transuranic waste performance
10 assessment and similar activities associated with
11 WIPP.

12 We previously tried to structure some of
13 the low-level waste research program out to the
14 Center. That, as I indicated a little earlier, got to
15 be a contractual difficulty with an FFRDC.

16 We still want to get as much advantage as
17 we can for the interests of the American public, you
18 know, the synergism that one gets with this common
19 agenda. We do have the benefit of the staff being
20 common in the high-level and low-level waste programs
21 to a fairly great extent, and the more we can do of
22 that the better off we are.

23 I would be very happy to edge into the
24 Center with some of this work insofar as we can within
25 the contractual constraints and legal constraints on

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1 what we do at the Center.

2 COMMISSIONER REMICK: I've had some past
3 experience with FFRDCs, so I know that they can be
4 flexible. In other words, the flexibility we're
5 talking about here with a single sponsor, the NRC, to
6 me is minor compared to the questions of multiple
7 sponsors, some government, some non-government, many
8 FFRDCs, the arena in which they work.

9 But I'm not arguing one way or the other.
10 I just want to make sure that we have given careful
11 thought to the pros and cons, particularly if it is a
12 question of maintaining the critical mass of expertise
13 needed to make the Center function the way we want it
14 to and all indications are the way it's functioning
15 now, so I just throw that out.

16 COMMISSIONER ROGERS: Could I --

17 COMMISSIONER REMICK: Yes, please.

18 COMMISSIONER ROGERS: It's something we
19 all know, but I would remind you that scientific
20 problems don't come with labels on them that say
21 "high-level waste" or "low-level waste," and there's
22 much commonality in the basic underlying principles
23 that are applicable to these two. And I think that,
24 if you can cast your work, formulate your work in such
25 a way that you're looking at some kind of a basic

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1 question that happens to cross both boundaries, then
2 it seems to me that there's ample justification for
3 carrying that on at the Center without having a label
4 on it that says "low-level waste," because it's
5 important for both.

6 DOCTOR COSTANZI: We have been doing that.

7 MR. SILBERBERG: Yes.

8 DOCTOR COSTANZI: In fact, to give you two
9 examples, one is the work that we did at Las Cruces,
10 New Mexico, which was ostensibly a low-level waste
11 project but the data was used for exercising some
12 high-level waste models of unsaturated zones; and also
13 a workshop that we had recently on geochemistry in
14 which we had both our low-level and high-level waste
15 geochemists, including the Center, represented. And
16 so, there would be this cross-fertilization because we
17 recognize that these are -- you know, chemistry is
18 still chemistry is still chemistry.

19 MR. THOMPSON: The staff will go and
20 look -- I'll take a look at the issue one more time
21 because I know that that was the approach that we took
22 before, that things such as performance assessment
23 would seem to have those elements that would make it
24 reasonable to assume that the Center could do it. I
25 just don't remember precisely the reason that we

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1 didn't go forward at that time. It may be okay to go
2 forward now. My memory was that it was in the midst
3 of renewing the contract and there were some clear
4 reasons not to go too far afield when we had other
5 opportunities such as the EPA or the Swedish to expand
6 the Center's expertise and work load at that time, but
7 we'll come back to the Commission with that.

8 COMMISSIONER REMICK: Good.

9 Just one other thing I don't know if you
10 want or are prepared to respond to, but, did you all
11 know that a year or so ago the Commission proposed a
12 rule in the low-level waste area which I perceived as
13 identification of what our licensees should expect
14 come January 1, 1996, in the low-level waste area?

15 Now, the staff has sent up in SECY-93-323
16 a recommendation that that rule not go forward. It's
17 a very well-written document. The primary argument
18 seems to be that it does not provide substantial
19 incentive for licensees to dispose of low-level waste
20 versus storage, and in my mind that was not
21 necessarily the intent.

22 There were things in there that they were
23 to explore, reasonable alternatives, and document that
24 they had, and in that way certainly encouraged that
25 they look at disposal possibilities from a

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1 reasonably standpoint, but in my mind I thought
2 the advantage of that was to put on the record for our
3 licensees what our expectations were come January 1,
4 1996, because I don't know how otherwise they know.

5 Would you care to respond to it or would
6 you prefer not to?

7 MR. BERNERO: Yes. Let me speak to it
8 briefly here. That rulemaking really at its core is
9 or was an attempt to press or to push or to encourage
10 generators of waste to take whatever measures they
11 could to find alternatives, including measures that
12 would provoke the state in question to proceed with
13 their low-level waste site development and licensing
14 and so forth. As you could see from the analysis with
15 the paper, there's very little that we can do more
16 than we are doing to accomplish that.

17 I don't think there's anything unique
18 about 1996, that milestone, other than some further
19 admonitions or frowns from us. If you look at what we
20 have now, there are states which have been denied
21 access now, Michigan, for more than three years. 1996
22 came three years ago for Michigan, and what the
23 generators in that state can expect I can't tell them.

24 The process, the national process for
25 developing low-level waste, is not under our direct

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1 control. So, what we're recommending to the
2 Commission is don't go forward with that rulemaking.
3 Do what we can to assist the process, to promote the
4 process. Cope with the interim storage situation as
5 best we can.

6 But there's really -- I just don't see any
7 regulatory benefit to doing the rulemaking.

8 COMMISSIONER REMICK: I'm certainly not
9 for rulemaking that is not necessary, but, as I say,
10 I really saw it as a way of telling people where the
11 NRC stands come January 1, 1996. How do they know
12 otherwise what our actions are going to be, if we
13 don't put something out? Maybe it shouldn't be a
14 rule. Maybe it should be something else.

15 But I agree that there was that secondary
16 effect of getting generators to look, put some
17 pressure on the states in trying to find alternatives.
18 We very carefully put in the word "reasonable"
19 alternatives. I know some people interpreted that the
20 staff was going to insist that, if there was any
21 alternative, that they had to follow, but I don't
22 think that was the Commission's intent.

23 But I guess I'm still concerned that
24 what -- what do people know where the NRC stands comes
25 January 1, 1996. It tells them, if I recall, that

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1 they should look at the safety of on-site storage if
2 they have to store. There were some things there and
3 that's not new, I agree --

4 MR. BERNERO: No, no. We've already told
5 them that and there is nothing that we can say about
6 1996 about any alternative that is meaningful to them.

7 We're not going to say "stop instantly
8 storing waste."

9 We're not going to say "we refuse to let
10 you generate any more."

11 We're not going to say "the state loses
12 its compact." We don't have the authority to do that.

13 We can focus on the safety, which we have
14 already done.

15 We can focus on encouraging and assisting
16 the states to complete the development of their sites.

17 COMMISSIONER REMICK: Would you see in
18 anything that goes out which withdrew that proposed
19 rulemaking or that proposed rule that we would point
20 those things out so they knew that they aren't
21 guessing what we are going to do and what we haven't
22 said and what we might say? You say we're not going
23 to do these things, but do the licensees and the
24 states know that we are or are not going to do them?

25 MR. THOMPSON: Well, certainly whatever we

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1 put out we would obviously want to do that, but we've
2 put out generic letters clearly indicating our
3 preference for disposal when that option is available.
4 We could reiterate those. I would see no problem with
5 reiterating.

6 COMMISSIONER REMICK: Well, there is a lot
7 of confusion, of course, over the existing generic
8 letter that's out there for power reactors in this
9 area on the question of whether that is a requirement
10 or what it is, but I understand that you are planning
11 to withdraw that generic letter. Is that correct?

12 DOCTOR BELL: Modify it.

13 MR. BERNERO: Modify it.

14 COMMISSIONER REMICK: Okay.

15 CHAIRMAN SELIN: Replace it with a blank
16 sheet of paper.

17 COMMISSIONER REMICK: Thank you very much
18 for the presentation. I also found it helpful.

19 CHAIRMAN SELIN: Commissioner de Planque?

20 COMMISSIONER de PLANQUE: I have a couple
21 of questions. I realize it's running late, so, if you
22 want to answer these in some other form, that's okay
23 too.

24 There is a current agreement being
25 negotiated between the United States and Russia on

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1 some cooperative programs and some of them involve
2 looking at sites like Chelyabinsk in Russia. And I
3 know a modeler's delight is always to find a site
4 where you can validate your model as you've done it at
5 Chalk River and I realize that some of DOE's interests
6 in this particular agreement have to do with their
7 validation of models and determination of transport
8 underground and so forth.

9 Are you aware of this and are you involved
10 in any way in discussing what DOE might be doing under
11 this agreement?

12 MR. SILBERBERG: Not too much, no.

13 COMMISSIONER de PLANQUE: Okay.

14 MR. SILBERBERG: I do know that as part of
15 a, I guess, training program or cooperative program
16 some representatives from the Ukraine were in this
17 summer and talked to various branches of the Office of
18 Research and we spent several days with those
19 representatives in the waste management area.

20 COMMISSIONER de PLANQUE: Okay.

21 MR. SILBERBERG: But beyond that, I don't
22 think we have done --

23 COMMISSIONER de PLANQUE: The interest in
24 this particular area is with Assistant Secretary
25 Grumbly's group.

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1 DOCTOR BELL: Commissioner de Planque, in
2 addition to sending the user need letter to the
3 states, we have also sent it to DOE and EPA to solicit
4 any information they may have that's relevant to the
5 user needs we've identified and we would hope that
6 things like this would come out of that.

7 COMMISSIONER de PLANQUE: Okay.

8 One of the interesting things about a
9 research program is its results and you've had a
10 focused program for five years. I didn't get a lot of
11 feel for some of the results from the past. A lot of
12 this had to do with what is coming up in the future
13 and what we expect. I'm sure you have a long laundry
14 list of the successes, but sometimes the more
15 interesting parts of a research program are the
16 negatives that come out of it, the surprises that come
17 out of it, the assumptions that have been disproved
18 and the "ah-hahs" that come out of it. Is there
19 anything along those lines you'd care to just talk
20 about in a minute or two?

21 DOCTOR COSTANZI: I think perhaps a couple
22 of the biggest things are the fact that the one-
23 dimensional modeling isn't conservative and that two
24 and perhaps three-dimensional modeling for flow and
25 transport is going to be necessary to get a realistic

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1 picture.

2 I think the chemistry, that again the more
3 simplified modeling of chemistry using partition
4 coefficients has turned out to be not adequate, even
5 though that had been common practice for years and
6 years and years. That's how people did it. It just
7 doesn't work and one does need to do a certain amount
8 of mechanistic modeling in the geochemical codes if
9 you want to truly represent the processes that are
10 ongoing.

11 So, I think those are the two that come to
12 mind.

13 Anything that you --

14 MR. SILBERBERG: Yes. I think, if you
15 actually bring all of those things together and
16 integrate all of those thoughts, that, depending on
17 the complexity of the site, one of the important
18 things that we've learned and that has been coming
19 through in messages and will continue to come through
20 in this guidance on performance assessment is that
21 some of the more simplistic methodologies and
22 assumptions of the past, and I mean '70s, early '80s,
23 will in fact not be acceptable, won't get you there.
24 And I think the guidance that will come out in the
25 BTP, forthcoming BTP, is going to give that message.

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1 The test cases we're doing and the
2 research that we have in a number of volumes that will
3 back up the BTP and ultimately the regulatory guide
4 will in fact give that message that you just may not
5 be able to get by with some of the more simplistic
6 methodologies of the past and that one will have to
7 work a little harder because of the complexities and
8 because of the fact that we have a greater
9 understanding of the interaction of the processes
10 taking place at a site.

11 So, if I were to use your words and say
12 "is there some negative coming out?" -- and I don't
13 think it's a negative, I think that's progress -- I
14 think that the fact that we'll probably have to work
15 harder in many cases, using these things we've learned
16 and the methodologies in an integrated fashion.

17 DOCTOR COSTANZI: I think the lesson to be
18 learned here is that you have to be careful in making
19 sure that the model that you chose is appropriate to
20 the site that you're dealing with or the facility
21 you're dealing with and that that's the care that
22 really needs to be taken. It's not so much that the
23 state of modeling isn't any good or that we don't know
24 what we're doing or nobody knows what they're doing.
25 It's just that I don't think that we had realized

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1 before the care that needs to be taken to make sure
2 that the models are appropriate to the problem that
3 you're trying to address, particularly the parameters
4 of the site.

5 COMMISSIONER de PLANQUE: Okay.

6 Just one more area. You've been
7 concentrating today on the research associated with
8 Part 61 problems. What about the low-level liquid
9 releases? I understand there are some problems in
10 that area with respect to Part 20. Are you prepared
11 at all to talk about --

12 DOCTOR COSTANZI: Speaking of sewer
13 disposal and things like that?

14 COMMISSIONER de PLANQUE: Yes.

15 DOCTOR COSTANZI: No.

16 COMMISSIONER de PLANQUE: Okay.

17 MR. THOMPSON: We are preparing an ANPR,
18 advanced notice of proposed rulemaking, that will come
19 up and hopefully focus the Commission's request for
20 public input into that area and that should be up
21 fairly soon to the Commission.

22 COMMISSIONER de PLANQUE: Okay. Thank
23 you.

24 CHAIRMAN SELIN: Thank you.

25 I thought you did a pretty good job of

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1 mixing up results and objectives. I would like to
2 attach myself to Commissioner Rogers' remarks about
3 just how much is appropriate, because clearly we have
4 in effect a client who is not paying for the service
5 that he's getting. Most of our clients pay for
6 services they're not getting, so there's something of
7 a conflict there. In this case, what is the
8 appropriate amount and what questions should we be
9 answering and what's the extent?

10 As each of you pointed out in your
11 answers, you did it more in a defensive fashion, but
12 you basically pointed out that all this guidance about
13 the support we're supposed to be doing was before we
14 got into the 100 percent fee recovery area.

15 Thank you very much.

16 MR. THOMPSON: Thank you.

17 (Whereupon, at 3:51 p.m., the above-
18 entitled matter was adjourned.)
19
20
21
22
23
24
25

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This is to certify that the attached events of a meeting
of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING ON NRC RESEARCH PROGRAM ON
LOW-LEVEL WASTE

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: JANUARY 10, 1994

were transcribed by me. I further certify that said transcription
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**STAFF BRIEFING ON THE
LOW LEVEL RADIOACTIVE WASTE
RESEARCH PROGRAM**



**JANUARY, 10 1994
MICHAEL J. BELL, NMSS
FRANK A. COSTANZI, RES**

Michael Bell, NMSS

Background and Historical Perspective

HISTORICAL PERSPECTIVE

- **Six commercial sites operating in 1970's
(see separate slide)**
- **No systems approach taken (Pre 10 CFR Part 61)**
- **Problems developed for some SLB sites**
 - **Trench subsidence**
 - **Flooding trenches**
 - **Transportation violations**
 - **Poor record keeping**
- **Three sites closed due to problems**

HISTORICAL PERSPECTIVE CONTINUED

- **New LLW regulation - 1982 (10 CFR Part 61)**
- **LLW Policy and Amendments Acts - 1980, 1985**
 - **Compacts established (see separate slide)**
 - **Facility Planning/Scheduling (see separate slide)**

COMMERCIAL LLW DISPOSAL SITES

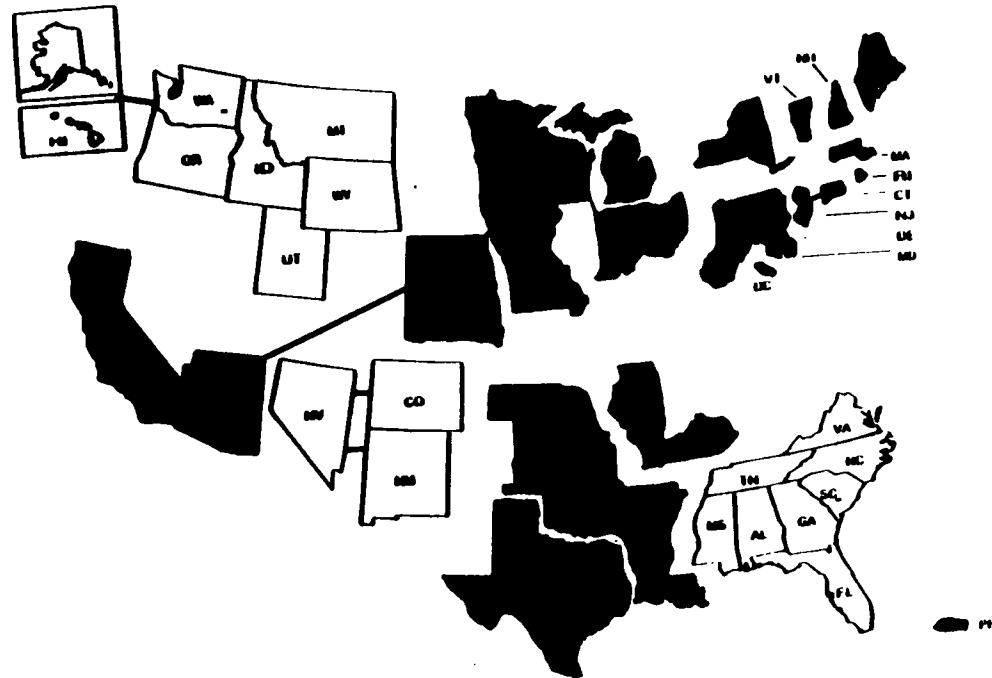
| Site | Licensed | Status |
|------------------------|-----------------|----------------------|
| Beatty, NV | 1962 | Closed - 1992 |
| Maxey Flats, KY | 1963 | Closed - 1977 |
| West Valley, NY | 1963 | Closed - 1975 |
| Richland, WA | 1965 | Operating |
| Sheffield, IL | 1967 | Closed - 1978 |
| Barnwell, SC | 1971 | Operating |

COMMERCIAL LLW DISPOSAL SITES

- **10 CFR Part 61 became effective Jan 26, 1983.**
- **Barnwell to close to out of compact States in mid 1994 and permanently in Dec 1995.**
- **Richland accepting waste only from Northwest and Rocky Mountain compacts as of Jan 1, 1993.**

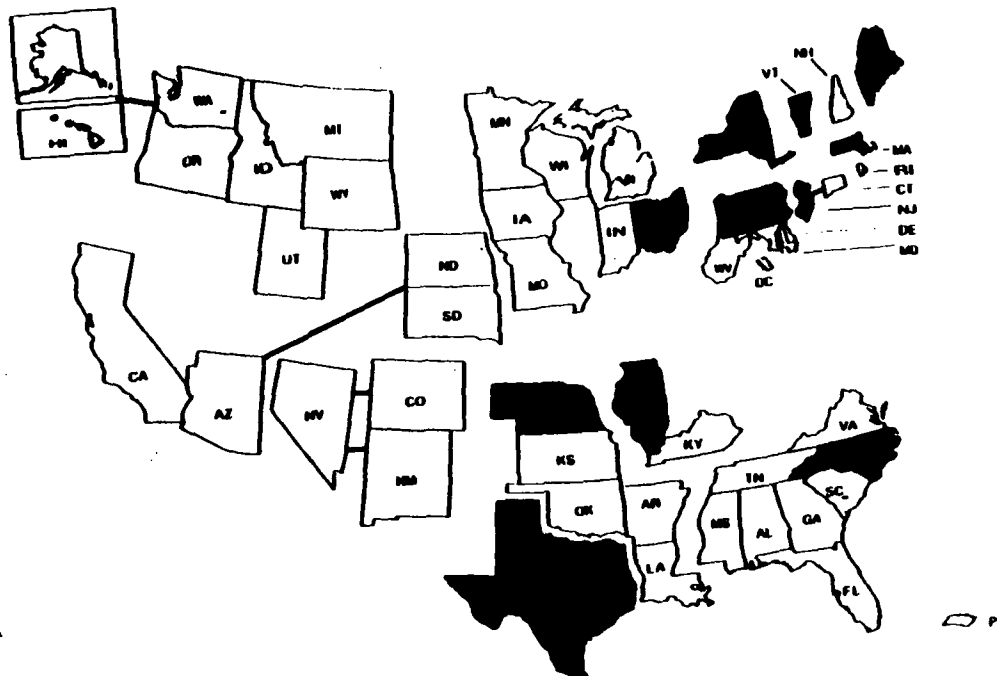
5

FUTURE DENIAL OF ACCESS



States Arranged By Compact

STATES WHERE SLB IS BANNED



States Arranged By Compact

STATUS AND FORECAST OF LLW LICENSE APPLICATIONS

- **Applications under review by Agreement States**
 - **CA, TX, NC, NE**
- **Seven potential applications 1996 - 2000***
 - **IL, OH, PA, CT, NJ, MA, NY**
- **No site under development**
 - **MI, NH, RI, PR**

*** Assumes ME and VT will join Texas compact.**

FOCUS OF LLW RESEARCH PROGRAM

- **Before 1977 → No specific LLW Program**
- **1977 - 1985 → Reactive program focused on problems at closed disposal sites**
- **1985 - 1988 → Ad hoc program focused on implementing LLWPAA**

FOCUS OF LLW RESEARCH PROGRAM CONTINUED

- **1988 - 1993** **Focused program responsive to
1988 User Need Letter**

- **Dec 1993** **New User Need Letter**
 - **Prioritization of Needs**
 - **Focus on LLW Performance
Assessment and
Decommissioning**
 - **Application of LLW PA to
Decommissioning Casework**

Frank Costanzi, RES

LLW Research Program

OUTLINE OF PRESENTATION LLW RESEARCH PROGRAM

- ▶ **TECHNICAL ISSUES OF REGULATORY
SIGNIFICANCE**
- ▶ **ISSUES RESOLVED**
- ▶ **RESEARCH ADDRESSING ISSUES**
- ▶ **PRODUCTS**
- ▶ **USE**

LOW LEVEL WASTE RESEARCH PROGRAM

OBJECTIVE

**PROVIDE PERFORMANCE ASSESSMENT TOOLS AND DATA
TO SUPPORT DEVELOPMENT OF REGULATORY GUIDANCE
FOR USE BY STATES AND NRC IN LICENSING,
REGULATION, AND CLOSURE OF LLW DISPOSAL
FACILITIES**

CURRENT RESEARCH DIRECTION

●PERFORMANCE ASSESSMENT

- MODELS**
- SOURCE TERM**
- SITE**
- WASTE FORM**
- EFFECTS OF ENHANCEMENTS**

MODELING

ISSUES RELATED TO THE DEVELOPMENT AND USE OF LLW PERFORMANCE ASSESSMENT MODELS

- **WHAT IS AN APPROPRIATE LLW PERFORMANCE ASSESSMENT MODELING STRATEGY?**
- **HOW SHOULD WATER INFILTRATION INTO LLW DISPOSAL UNITS BE TREATED BY PERFORMANCE ASSESSMENTS?**
- **HOW SHOULD THE VARIABILITY IN GEOCHEMICAL PROPERTIES BE TREATED BY PERFORMANCE ASSESSMENTS?**

MODELING ISSUES RESOLVED

**EVALUATION OF APPROACH AND APPLICABILITY OF
VARIOUS FLOW AND TRANSPORT CODES TO LLW
PERFORMANCE ASSESSMENT (NUREG/CR 5927,
1993)**

**DEVELOPED A LLW PERFORMANCE ASSESSMENT
METHODOLOGY (BRANCH TECHNICAL POSITION,
1994)**

**DEVELOPED A METHOD TO EVALUATE THE EFFECT
OF WATER INFILTRATION ON LLW DISPOSAL
PERFORMANCE (NUREG/CR 5523, 1990)**

MODELING ISSUES--WHAT IS AN APPROPRIATE LLW PERFORMANCE ASSESSMENT MODELING STRATEGY?

- RESEARCH SYSTEMATIC PROGRAM OF
EXAMINING EXISTING HYDROLOGIC
AND GEOCHEMICAL CODES AGAINST
BENCHMARK CALCULATIONS AND
FIELD DATA (NRC STAFF AND
CONTRACTORS)**
- PRODUCT LLW PERFORMANCE ASSESSMENT
METHODOLOGY--BRANCH TECHNICAL
POSITION TO BE FOLLOWED BY
REGULATORY GUIDE**
- USE GUIDANCE TO STATES AND
LICENSING SUPPORT**

**MODELING ISSUES--HOW SHOULD WATER
INFILTRATION INTO LLW DISPOSAL UNITS BE
TREATED BY PERFORMANCE ASSESSMENTS?**

- ▶ **RESEARCH** **ANALYTICAL STUDY EXAMINING
MECHANISMS AND CONSEQUENCES OF
WATER INFILTRATION INTO
DISPOSAL UNITS**
- ▶ **PRODUCT** **MODEL FOR TREATING WATER
INFILTRATION (CY 95)**
- ▶ **USE** **GUIDANCE FOR TREATING WATER
INFILTRATION IN PERFORMANCE
ASSESSMENTS**

**MODELING ISSUES--HOW SHOULD THE VARIABILITY
IN GEOCHEMICAL PROPERTIES BE TREATED BY
PERFORMANCE ASSESSMENTS?**

- ▶ **RESEARCH** **DEVELOPMENT OF GEOCHEMICAL
MODELS TO ACCOUNT FOR THE
HETEROGENEITY OF DISPOSAL
SITES, INCLUDING THE EFFECT OF
CONCRETE ON LOCAL GEOCHEMISTRY**
- ▶ **PRODUCT** **TRANSPORT MODELS AND
SUPPORTING DATA**
- ▶ **USE** **PERFORMANCE ASSESSMENT**

SOURCE TERM

ISSUES RELATED TO THE CHEMICAL AND RADIOLOGICAL PROPERTIES OF LOW LEVEL RADIOACTIVE WASTE

- **WHAT ARE THE DOMINANT CHEMICAL,
PHYSICAL, AND RADIOLOGIC PROPERTIES OF
LLW?**
- **HOW DOES THE PRESENCE OF CHELATING
AGENTS IN DECONTAMINATION WASTES AFFECT
LLW DISPOSAL?**
- **HOW SHOULD DIFFICULT TO MEASURE
RADIONUCLIDES IN LLW BE TREATED?**

SOURCE TERM ISSUE RESOLVED

**A LLW SOURCE TERM MODEL HAS BEEN DEVELOPED
(NUREG/CR 5681, 1991), AND IS BEING TESTED
AND IMPROVED USING DATA FROM TESTS ON
ACTUAL LLW (NUREG/CR 5943, 1993)**

**SOURCE TERM ISSUES--WHAT ARE THE DOMINANT
CHEMICAL, PHYSICAL, AND RADIOLOGIC
PROPERTIES OF LLW?**

- ▶ **RESEARCH** **LABORATORY AND LYSIMETER TESTS
OF A RANGE OF ACTUAL LLW**
- ▶ **PRODUCT** **CHARACTERIZATION, INCLUDING
LEACHABILITY AND STABILITY, OF
A VARIETY OF LLW WASTE FORMS
OVER A RANGE OF CONDITIONS
(CLASS 'A' WASTES CY 95)**

**SOURCE TERM ISSUES--WHAT ARE THE DOMINANT
CHEMICAL, PHYSICAL, AND RADIOLOGIC
PROPERTIES OF LLW?**

► USE

**DEVELOPMENT OF REALISTIC
"SOURCE TERMS" AND SELECTION
OF APPROPRIATE LEACHING AND
TRANSPORT MODELS FOR USE IN
PERFORMANCE ASSESSMENTS**

SOURCE TERM ISSUES--HOW DOES THE PRESENCE OF COMPLEXANTS IN THE WASTE DISPOSAL UNIT (E.G. EXCESS CHELATING AGENTS IN DECONTAMINATION WASTES) AFFECT LLW DISPOSAL?

- ▶ **RESEARCH** **EXPERIMENTAL PROGRAM EXAMINING THE EFFECT OF COMPLEXANTS ON LLW CHEMICAL STABILITY**

- ▶ **PRODUCT** **MODIFICATIONS TO WASTE LEACHING AND GEOCHEMICAL TRANSPORT MODELS TO ADDRESS PRESENCE OF CHELATING AGENTS (CY 95), AND BYPRODUCTS OF CONCRETE DEGRADATION (CY 96), IN LLW DISPOSAL UNITS**

**SOURCE TERM ISSUES--HOW DOES THE PRESENCE
OF COMPLEXANTS IN THE WASTE DISPOSAL UNIT
(E.G. EXCESS CHELATING AGENTS IN
DECONTAMINATION WASTES) AFFECT LLW
DISPOSAL? (CONTINUED)**

- **USE DEVELOPMENT OF REALISTIC
"SOURCE TERMS" FOR USE IN
PERFORMANCE ASSESSMENTS**

**SOURCE TERM ISSUES--HOW SHOULD DIFFICULT TO
MEASURE RADIONUCLIDES IN LLW BE TREATED?**

- ▶ **RESEARCH** **LABORATORY MEASUREMENTS OF
SAMPLES OF LLW**
- ▶ **PRODUCT** **DATA ASSOCIATING QUANTITIES OF
DIFFICULT TO MEASURE
RADIONUCLIDES PRESENT IN LLW
WITH QUANTITIES OF MORE EASILY
MEASURED RADIONUCLIDES (CY 95)**
- ▶ **USE** **REVIEW OF CURRENT GUIDANCE ON
WASTE CHARACTERIZATION**

SITE

ISSUES RELATED TO DETERMINING THE PERFORMANCE OF THE LLW DISPOSAL SITE

- **HOW SHOULD THE EFFECTS OF ORGANIC COMPLEXANTS AND MICROPARTICULATES OCCURRING NATURALLY IN SOIL BE TREATED BY PERFORMANCE ASSESSMENT MODELS?**
- **WHAT ARE THE ELEMENTS OF AN APPROPRIATE UNSATURATED ZONE PERFORMANCE MONITORING PROGRAM?**

SITE ISSUES RESOLVED

**DEMONSTRATED THAT ONE DIMENSIONAL FLOW AND
TRANSPORT MODELS ARE NOT ALWAYS
CONSERVATIVE (NUREG/CR 6063, IN PRESS)**

**DEMONSTRATED THE FEASIBILITY OF DEVELOPING
A SITE CHARACTERIZATION PROGRAM FOR LLW
DISPOSAL (NUREG/CR 4879, 1987)**

**SITE ISSUE--HOW SHOULD THE EFFECTS OF
ORGANIC COMPLEXANTS AND MICROPARTICULATES
OCCURRING NATURALLY IN SOIL BE TREATED BY
PERFORMANCE ASSESSMENT MODELS?**

- ▶ **RESEARCH** **FIELD OBSERVATION OF EXISTING
RADIONUCLIDE PLUMES AT CHALK
RIVER LABORATORIES, AND
COMPANION LABORATORY
EXPERIMENTS**
- ▶ **PRODUCT** **IDENTIFICATION OF CONTROLLING
ORGANIC COMPOUNDS AND
MICROPARTICULATES (CY 95)**
- ▶ **USE** **PERFORMANCE ASSESSMENT MODELS**

**SITE ISSUE--WHAT ARE THE ELEMENTS OF AN
APPROPRIATE UNSATURATED ZONE PERFORMANCE
MONITORING PROGRAM?**

- ▶ **RESEARCH** **HYDROLOGIC FIELD OBSERVATIONS
AND FIELD EXPERIMENTS IN THE
UNSATURATED ZONE**
- ▶ **PRODUCT** **IDENTIFICATION OF APPROPRIATE
ELEMENTS OF SITE PERFORMANCE
MONITORING PROGRAMS (CY 96)**
- ▶ **USE** **GUIDANCE TO LICENSEES, STATES,
AND LICENSE APPLICANTS**

WASTE FORM

ISSUES RELATED TO THE MECHANICAL STABILITY OF LLW WASTE FORMS AND WASTE CONTAINERS

- **HOW STABLE ARE LLW WASTE FORMS?**

WASTE FORM ISSUES RESOLVED

**TESTING OF ACTUAL SOLIDIFIED LLW LED TO
REVISION OF INDUSTRY PRACTICE AND IMPROVED
WASTE FORM PERFORMANCE (NUREG/CR 0103,
1989)**

**ASSESSMENT OF THE STABILITY OF
DECONTAMINATION WASTES (NUREG/CR 5224,
1989, AND NUREG/CR 5601, 1991)**

**DEVELOPMENT OF DATA BASE FOR TESTING SOURCE
TERM CODES (NUREG/CR 5229 AND 6073, 1993)**

WASTE FORM ISSUES--HOW STABLE ARE LLW WASTE FORMS?

- ▶ **RESEARCH** **LABORATORY TESTS, INCLUDING MICROBIAL DEGRADATION, OF ACTUAL WASTES (LARGELY DECONTAMINATION WASTES)**
- ▶ **PRODUCT** **DATA ON OBSERVED STABILITY OF A VARIETY OF WASTE FORMS (CY 94)**
- ▶ **USE** **GUIDANCE FOR TREATING WASTE FORMS IN PERFORMANCE ASSESSMENTS AND CONFIRMATION OF GUIDANCE OF WASTEFORM STABILITY**

ENHANCEMENTS

ISSUES RELATED TO THE PERFORMANCE OF ENHANCEMENTS

- **WHAT COVER DESIGNS WILL BE EFFECTIVE AT
CONTROLLING WATER INFILTRATION AT
EASTERN HUMID LLW DISPOSAL SITES?**
- **HOW WILL THE DEGRADATION OF CONCRETE
STRUCTURES (VAULTS, BUNKERS, ETC.)
AFFECT LLW DISPOSAL?**

ENHANCEMENT ISSUES RESOLVED

DEMONSTRATED THAT BOTH BIOENGINEERED AND MULTIPLE LAYER COVERS CAN BE EFFECTIVE AT PREVENTING WATER INFILTRATION INTO LLW DISPOSAL UNITS, AND THAT BIOENGINEERED COVERS CAN BE AN EFFECTIVE REMEDIATION AND DEWATERING TECHNIQUE FOR FLOODED LLW DISPOSAL TRENCHES (NUREG/CR 4918, 1992)

DEMONSTRATED FEASIBILITY OF USING CHEMICAL BARRIERS IN NATURAL SOILS TO RETARD MIGRATION OF ANIONIC FORMS OF Tc AND I (NUREG/CR 5464, 1991)

ENHANCEMENT ISSUES RESOLVED

**DEVELOPED A MODEL FOR PREDICTING LONG-TERM
SERVICE OF CONCRETE STRUCTURES (NUREG/CR
5466, 1989)**

**DEVELOPED A MODEL FOR EVALUATING
RADIONUCLIDE TRANSPORT THROUGH CONCRETE
(NUREG/CR 4269, 1990)**

**ENHANCEMENT ISSUES--WHAT COVER DESIGNS WILL
BE EFFECTIVE AT CONTROLLING WATER
INFILTRATION AT EASTERN HUMID LLW DISPOSAL
SITES?**

- ▶ **RESEARCH** **FIELD EXPERIMENTS IN THE
EASTERN US TO TEST A VARIETY
OF COVER DESIGNS**
- ▶ **PRODUCT** **IDENTIFICATION OF COVER
DESIGNS EFFECTIVE AT
CONTROLLING WATER INFILTRATION
INTO DISPOSAL UNITS (CY 95)**
- ▶ **USE** **GUIDANCE TO APPLICANTS AND
STATES, AND SUPPORT OF
LICENSE REVIEWS**

**ENHANCEMENT ISSUES--HOW WILL THE
DEGRADATION OF CONCRETE STRUCTURES (VAULTS,
BUNKERS, ETC.) AFFECT LLW DISPOSAL?**

- ▶ **RESEARCH** **TESTS OF THE DURABILITY AND
RATE OF DEGRADATION OF
CONCRETES UNDER EXPECTED
DISPOSAL CONDITIONS**
- ▶ **PRODUCT** **IDENTIFICATION PROCESSES
CONTROLLING CONCRETE
DEGRADATION (CY 95)**
- ▶ **USE** **INCORPORATING THE EFFECT OF
THE DEGRADATION OF CONCRETE
STRUCTURES INTO LLW
PERFORMANCE ASSESSMENT**

U N I T E D S T A T E S O F A M E R I C A
NUCLEAR REGULATORY COMMISSION

TITLE: **AFFIRMATION/DISCUSSION AND VOTE**

LOCATION: **ROCKVILLE, MARYLAND**

DATE: **JANUARY 19, 1994**

PAGES: **4 PAGES**

SECRETARIAT RECORD COPY

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

- - - -

AFFIRMATION/DISCUSSION AND VOTE

- - - -

PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Wednesday, January 19, 1994

The Commission met in open session, pursuant to notice,
at 11:30 a.m., Ivan Selin, Chairman, presiding.

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission
KENNETH C. ROGERS, Commissioner
FORREST J. REMICK, Commissioner

STAFF SEATED AT THE TABLE:

WILLIAM C. PARLER, General Counsel
JOHN C. HOYLE, Secretary

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

11:30 a.m.

CHAIRMAN SELIN: Good morning. We have an affirmation session this morning with two items before us. I will ask the Acting Secretary to lead us through the proceedings, please.

ACTING SECRETARY HOYLE: Mr. Chairman, there are two papers. The first of which is SECY-93-333. The title is "Final Amendments to 10 CFR Part 55 on Renewal of Licenses and Regualification Requirements for Licensed Operators." In this paper, the Commission is being asked to approve final amendments to 10 CFR Part 55 to delete the requirement that each licensed operator at power, test, and research reactors pass a comprehensive regualification written exam and an operating test conducted by the NRC during the term of the operator's six-year license. The final rule requires the licensees to have a regualification program reviewed and approved by the NRC.

All Commissioners have approved the final rule and the proposed *Federal Register* Notice with the changes that we circulated to you on the 14th. May I have you affirm your votes.

(Chorus of ayes.)

ACTING SECRETARY HOYLE: The second paper is SECY-93-352, "Proposed Export of Fort St. Vrain Unirradiated HEU Fuel Assemblies to France for Recovery and Down-Blending to LEU." In this paper, the Commission is being asked to act on an order responding to a petition to intervene and for a hearing by the

1 Nuclear Control Institute on the proposed export of certain
2 unirradiated HEU fuel to France for down-blending to LEU for
3 research in test reactors.

4 All Commissioners have approved an order denying the
5 petition. Also, by acting on this paper, the Commission has
6 authorized the issuance of an export license to Transnuclear,
7 Inc., for the action which I just described. May I have you
8 affirm your votes?

9 (Chorus of ayes.)

10 ACTING SECRETARY HOYLE: Thank you.

11 CHAIRMAN SELIN: Thank you very much.

12 (Whereupon, the foregoing proceedings were concluded at
13 11:36 o'clock, a.m.)
14

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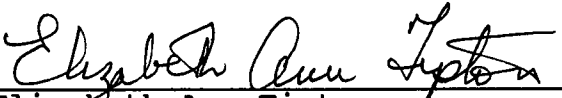
This is to certify that the attached events of a meeting of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: AFFIRMATION/DISCUSSION AND VOTE

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: JANUARY 19, 1994

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcription is a true and accurate record of the foregoing events.


Elizabeth Ann Tipton