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Depleted Uranium

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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 PUBLIC WORKSHOP 1 ON UNIQUE WASTE STREAMS - DEPLETED

5 URANIUM

6 + + + + +

7 WEDNESDAY

8 SEPTEMBER 2, 2009

9 + + + + +

10 BETHESDA, MARYLAND

11 + + + + +

12 The Public Workshop convened at the Hyatt
13 Regency Bethesda, One Bethesda Metro Center, 7400
14 Wisconsin Avenue, at 8:30 a.m., Chip Cameron,
15 Facilitator, presiding.

16 PANELISTS:

17 CHIP CAMERON, Facilitator

18 CHRISTINE GELLES, US Department of Energy

19 GREG KOMP, US Army Safety Office

20 RICHARD A. HAYNES, SC Department of Health and

21 Environmental Control

22 MARK YEAGER, SC Department of Health and

23 Environmental Control

24 ARJUN MAKHIJANI, Institute for Energy and

25 Environmental Research

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PANELISTS: (CONT.)

DIANE D'ARRIGO, Nuclear Information and Resource
Service

THOMAS E. MAGETTE, Energy Solutions

WILLIAM DORNSIFE, Waste Control Specialists

FELIX M. KILLAR, Nuclear Energy Institute

MICHAEL T. RYAN, NRC Advisory Committee on
Reactor Safeguards

STEPHEN WEBB, Sandia National Laboratories

PETER C. BURNS, University of Notre Dame

GREGORY SUBER, US Nuclear Regulatory Commission

DAVID ESH, US Nuclear Regulatory Commission

JAMES KENNEDY, US Nuclear Regulatory Commission

ALSO PRESENT:

LARRY CAMPER, US Nuclear Regulatory Commission

EDWARD REGNIER, US Department of Energy

JANET SCHLUETER, Nuclear Energy Institute

ANDREW CARRERA, US Nuclear Regulatory Commission

GARY COMFORT, US Nuclear Regulatory Commission

JOHN GREEVES, Talisman Associates

S.Y. CHEN, Argonne National Laboratories

KAREN PINKSTON, US Nuclear Regulatory Commission

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Adjourn

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

8:34 a.m.

FACILITATOR CAMERON: On the record. Good morning, everyone. My name is Chip Cameron and I work for the Executive Director for Operations at the Nuclear Regulatory Commission, the NRC. And it's going to be my pleasure to serve as your facilitator over the next two days.

This meeting is about the NRC rulemaking that is kicking off now to establish site-specific criteria for the disposal of depleted uranium and other unique waste streams and I'd just like to spend a couple of minutes on the some meeting process items before we go to introductions around the table. Then I'll do an agenda check with you and then we'll get into the substantive part of the meeting.

In terms of the format for the meeting, we're using a roundtable, so-called roundtable setting in contrast to the town hall meeting type of format. And the objective of the roundtable format is to promote a dialogue on the issues again in contrast to the town hall meeting where there's usually just a one-way communication between one person and the agency.

We have representatives of the effected

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1 and concerned interests around the table and there
2 will be other people joining us at the table who are a
3 little bit late. But we not only want to hear what
4 your perspectives are on these issues, but we want to
5 get your reaction to what other people's perspectives
6 are on the issues. So, in other words, we want to try
7 to have a discussion on the issue and it's a modest
8 attempt to try to develop a richer, a different sort
9 of data for the NRC to kick off the development of the
10 regulatory basis for this rulemaking.

11 In terms of ground rules, very simple.
12 The first one is you all have a name tent in front of
13 you. If you want to make a comment, questions,
14 whatever, if you could just turn this up and then I'll
15 know that you want to say something and you won't have
16 to worry about jumping into the conversation or
17 continuously raising your hand and I'll ignore --
18 Thank you for that. Thank you.

19 (Laughter.)

20 I was worried that you wouldn't know how
21 to do that. But now I know. Now I know. Thanks,
22 Bill.

23 But we'll use that. We won't rigidly
24 adhere to it. But if we could do that, that would be
25 helpful. And I would ask that only one person speak

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1 at a time. We are taking a transcript of the meeting.

2 Charles is our stenographer here and if only one
3 person is speaking at a time not only can we give them
4 our full attention, but Charles will know who to list
5 for that speech so to speak on the transcript.

6 And I would just urge everybody to be
7 constructive. You may have some critical comments for
8 the NRC, but just try to be constructive about it and
9 let's do some introductions around the table and let's
10 start over here with Larry Camper and if you could not
11 only introduce yourself but just give us a couple
12 sentences on what your expectations are for this
13 particular meeting or for the NRC rulemaking.

14 Larry.

15 MR. CAMPER: (Inaudible.)

16 (Off the record comments.)

17 Good to go. Thank you very much.

18 Good morning. Larry Camper, Director of
19 the Division of Waste Management and Environmental
20 Protection. My staff had the lead in developing the
21 SECY that discussed unique waste streams and included
22 the depleted uranium and the development of the
23 technical analysis.

24 In terms of expectations, we are here to
25 listen. We very much appreciate the time of the

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1 panelists. We know that you're all very busy. We
2 have interesting stakeholders here. We have experts
3 here.

4 As part of the rulemaking process, we want
5 to listen. We want to factor all the things we hear
6 over the next couple of days in the rulemaking that
7 we'll be working on over the next couple of years and
8 I thank you for taking part.

9 MR. KENNEDY: My name is Jim Kennedy. I'm
10 a Senior Project Manager in the Low Level Waste Branch
11 of NRC. I work for Gregory Suber and Patty Bubar and
12 Larry and my expectations I guess are just to
13 understand all the different points of view. This
14 rulemaking is extremely complex and I know there are
15 lots of different points of view out there about how
16 to manage risk and all the different parameters and so
17 forth. And I think my personal goal is to just
18 understand what those are.

19 MR. ESH: I am David Esh. I'm a Senior
20 Systems Performance Analyst in the Performance
21 Assessment Branch at NRC. You'll hear a lot from me
22 today on the technical analysis we did and some of the
23 key inputs or key issues with respect to the
24 rulemaking process going forward.

25 And my expectations are that I get a lot

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1 of input from all the stakeholders on their views of
2 the policy and/or technical subjects so that when we
3 move into our rulemaking process we can hit the target
4 pretty good the first time through so that when you
5 see it in the public comment process you're at least
6 moderately pleased if not -- You're not totally
7 unhappy with it. We realize we won't be able to make
8 everyone happy. But we strive to be objective and
9 fair and, if we get all your views, then that will
10 help us do that.

11 MR. SUBER: My name is Gregory Sube.r. I
12 am the Chief of the Low Level Waste Branch and my
13 expectation for today is just to have a very candid,
14 but courteous, exchange of ideas between all the
15 various stakeholders here so that we could do the best
16 job that we can and as David says that we could make
17 most of the reasonable requests and things happy. All
18 right.

19 MR. MAGETTE: My name is Tom Magette. I'm
20 with Energy Solutions and what I would hope to see
21 come out of this meeting is some distinction between
22 what most appropriately belongs in the rule as opposed
23 to what belongs in the guidance that will accompany
24 the rule.

25 MR. DORNSIFE: I am Bill Dornsife,

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1 Executive VP for Licencing for Waste Control
2 Specialists. My expectations are that we can come to
3 some conclusions that we can develop an efficient,
4 timely process for solving this issue and solving it
5 in a way that provides a cost effective and safe
6 solution.

7 MS. GELLES: Good morning. I'm Christine
8 Gelles. I'm the Director of the Office of Disposal
9 Operations at the Department of Energy's Environmental
10 Management Program and, while my office is not the
11 only office within the Department that has a stake in
12 this issue, I'm happy to represent us and thank you
13 for having us here at the table.

14 Our interests in this workshop today are
15 twofold, both as a generator of unique waste streams
16 including depleted uranium streams that may ultimately
17 be disposed of at facilities that are subject to this
18 limited rulemaking but also because we have decades of
19 experience doing site-specific performance assessments
20 at our own DOE facilities and we're happy to offer
21 that experience as it is needed in this dialogue.

22 Thank you.

23 MR. HAYNES: I am Richard Haynes, South
24 Carolina DHEC. I'm the Director of the Division of
25 Waste Management. We have the Barnwell facility, rad

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1 waste facility and part of the SRS facility for the
2 RCRA component.

3 From our standpoint, I guess we're looking
4 to make sure we have a clear path forward on the site-
5 specific performance assessment and the guidance
6 documents and how that will be implemented.

7 MR. YEAGER: I am Mark Yeager. I'm with
8 the South Carolina Department of Health and
9 Environmental Control. I work for Richard. I'm the
10 Senior Inspector in the program and we regulate the
11 Barnwell facility. I'm here to provide any comments
12 and perspectives from the folks that deal with the
13 public, face-to-face, so to speak, stakeholders and
14 also take away from the meeting ideas and concepts
15 that I can share with fellow members of the E5
16 Committee on CRCPD and also other states that might be
17 affected by this in the future.

18 FACILITATOR CAMERON: Great. Thanks.
19 Thanks for that perspective, Mark.

20 Felix.

21 MR. KILLAR: I am Felix Killar. I'm with
22 the Nuclear Energy Institute. My takeaway for this
23 meeting is similar to Bill's and Tom's in that we're
24 interested in what ends up in the rulemaking versus
25 what ends up in the guidance.

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1 One of the things in particular I'm
2 interested in seeing is what is the definition of a
3 unique waste stream. Because when you look at a waste
4 facility, you're looking at the waste going in there.

5 So you're not looking at the waste streams. You're
6 looking at the specific waste. And if you say that
7 depleted uranium is unique waste, what else are you
8 identifying as a unique waste? So I hope to get
9 better clarification on that.

10 MR. KOMP: I am Greg Komp. I'm the
11 Director of Army Radiation Safety. I'm here
12 representing DoD. I'm also Chair of the DoD Advisory
13 Committee on Low Level Radiation Waste.

14 I guess my perspective here or interest
15 here is to fully understand the NRC perspectives, both
16 in the terms as mentioned earlier with what's going in
17 the rulemaking, also within the guidance and also to
18 make sure or provide the understanding of what the DoD
19 waste stream is in terms of DU.

20 MR. BURNS: My name is Peter Burns. I'm
21 Professor of Civil Engineering and Geologic Sciences
22 as well as Chemistry and Biochemistry at the
23 University of Notre Dame. I'm also the Director of
24 the Energy Frontier Research Center on Actinide
25 Materials. My expertise are in actinide chemistry and

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1 geochemistry and mineralogy.

2 I've done a lot of research related to
3 mobility of uranium in the environment. So I have no
4 stake in this other than providing an expert view on
5 factors that will impact uranium mobility in the
6 environment. But, of course, being a professor, I
7 hope to learn a great deal here that I can carry back
8 to my students, both the process as well as the
9 science and engineering that's associated with it.

10 MR. RYAN: My name is Mike Ryan. I'm a
11 member of the Advisory Committee on Reactor Safeguards
12 and formerly I was the Chair of the Advisory Committee
13 on Nuclear Waste at the NRC which is now a
14 subcommittee of the ACRS.

15 What I hope to learn today particularly
16 from the staff is their approach to performance
17 assessment. I think since the last rule was written
18 in the late '70s and finished in the early '80s
19 performance assessment has dramatically improved. You
20 know, a TRS-80 was the best computer we had back in
21 those earlier days and now we can really risk inform I
22 think with a site-specific eye how to assess the dose
23 consequences or other risks that you might want to
24 assess and I think the staff is well-positioned and
25 prepared to begin thinking in a site-specific way.

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1 You know, it's interesting to think about
2 the question that was raised by our colleague from
3 Energy Solutions of what will be in the rule and what
4 will be in guidance and the third leg of that I would
5 add is what would be a license-specific condition
6 rather than a generic requirement.

7 So there's a real opportunity here I think
8 to risk inform for site-specific cases how to deal
9 with uranium and even perhaps other radionuclides that
10 will be showing up in low-level waste. I'll be
11 curious to hear how the staff plans to think that
12 challenge through.

13 Thank you.

14 MR. WEBB: Yes. My name is Stephen Webb
15 from Sandia National Labs. My expertise is gas
16 transport in porous media. Also I've worked on WIPP
17 and also Yucca Mountain by doing the PA work. So I
18 have what I think is an overall technical perspective.

19 FACILITATOR CAMERON: Okay. Thank you all
20 and, in terms of the agenda, I just want to do an
21 agenda check with you to make sure that everybody is
22 on board about what's going to be covered, when and
23 what we're going to be trying to do and we're going to
24 start with some context for you, three presentations
25 by the NRC to give you some background on what the NRC

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1 is doing to aid in not only our discussions around the
2 table over the next two days but also for any written
3 comments that you may want to submit to expand on
4 anything that you've heard here at this particular
5 meeting.

6 The first is going to be a welcome and
7 overview by Larry Camper and then we're going to hear
8 from Andrew Carrera of the NRC staff who's going to
9 give you some background on the rulemaking process and
10 finally we're going to hear from Dave Esh who's going
11 to talk about some of the issues that were looked at
12 in the technical analysis that the NRC did.

13 Now after all three of these
14 presentations, we're going to open it up for
15 clarifying questions from all of you on the panel and
16 for any topics, any problem-solving, any discussion,
17 we'll save that until we get to the discussion issues
18 which the first of which is the 11:00 a.m. Significant
19 Quantities of Depleted Uranium issue. And although
20 the focus of the discussion is at the table here, we
21 will be going out to those of you in the audience
22 periodically to see if you have any comments on the
23 issues that were being discussed around the table.

24 So you can see from the agenda that
25 there's a number of discussion issues, significant

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1 quantities, period of performance, exposure scenarios
2 and source term and then tomorrow modeling, both of
3 geochemistry and radon, the issue of unique waste
4 streams, Felix already referred to that, a discussion
5 of Agreement State compatibility -- in other words,
6 what will the NRC Agreement States be required to do
7 under an NRC rulemaking on this issue -- and then the
8 long-term rulemaking that the NRC is going to do after
9 the conclusion of this and other considerations such
10 as what happens in the interim between now and when
11 the NRC develops a rule and the Agreement States
12 implement the rule.

13 So we have a full set of issues and I
14 would thank Tom for raising the rule versus guidance.

15 We want to hear not only your comments on these
16 specific issues but your view on whether a particular
17 item should be addressed in the rulemaking text itself
18 or whether it should be developed more in the
19 regulatory guidance that the NRC is using. And for
20 each of these discussion items we're going to have the
21 NRC staff do a short tee-up for you to sort of give
22 you a prospective on that particular issue.

23 Any questions on the agenda at this point?

24 Yes, Bill.

25 MR. DORNSIFE: Are we going to expect our

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1 esteemed colleagues to show up or are they boycotting?

2 FACILITATOR CAMERON: There's been no
3 indication that they were not going to be here. So I
4 anticipate that they will be. I know that Diane
5 D'Arrigo is attending another NRC meeting this
6 morning. So she'll be here and hopefully Arjun will
7 show up. Bob Alvarez, representing the Yakamas, may
8 be here. They're interested, but I haven't had any
9 confirmation from them over the next two weeks. So
10 hopefully they will show up.

11 Thanks, Bill. Anybody else on any meeting
12 process issues agenda?

13 (No verbal response.)

14 Okay. There was a -- I guess I'll just
15 close with something that I read in the *New York Times*
16 on Sunday. They were talking about the town hall
17 meetings on health care that we're all familiar with
18 what's been going at those town hall meetings.

19 Oh good. Before I do that, Arjun is here
20 and we'll give him time to get settled and then we'll
21 have Arjun introduce himself to us and, Arjun, I've
22 been asking everybody to not only introduce themselves
23 but also give a couple of sentences on what their
24 expectations are for the meeting. And as I mentioned
25 at the beginning of my overview for the meeting, the

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1 idea here is dialogue, discussion among all of you and
2 we'll be trying to follow discussion threads on that.

3 So I may not take the cards in the order they're
4 turned up.

5 The *New York Times* article was talking
6 about the town hall meetings and they reached the
7 conclusion that dialogue is dead during the Internet
8 Age. But I thought they had an interesting quote
9 which is "If you're looking for thoughtful dialogue
10 you might as well hold your next meeting on the stern
11 of a Somali pirate ship." So I'm hoping that we can
12 do better than that. That's our standard so to speak.

13 (Laughter.)

14 But, Arjun, could you just introduce
15 yourself to your colleagues around the table?

16 MR. MAKHIJANI: You know, Chip, I have a
17 lot of respect for you and I hope that you haven't
18 dropped the bar down there because you always hold a
19 good public meeting. And I really appreciate that and
20 you're one of the reasons I'm here.

21 I'm Arjun Makhijani. I'm President of the
22 Institute for Energy and Environmental Research. I've
23 done expert work for interveners on depleted uranium
24 in the two uranium enrichment license applications and
25 I've been a proponent of the idea that depleted

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1 uranium is akin to Greater-Than-Class-C waste and I
2 have been a critic of some of some very bad scientific
3 work that's been done.

4 My expectation of this is at a minimum
5 this just can't be a listening session. If I tell you
6 that the waste site in Utah has at its foundational
7 technical document a number that said they're going to
8 dispose of more depleted uranium than the weight of
9 the earth and that is an unacceptable basis for having
10 licensed a low-level waste site and the NRC isn't
11 exercising its jurisdiction and responsibilities
12 properly as I have said in formal testimony, I expect
13 that it won't just be heard. But you'll do something
14 about it. Verify it. If I'm wrong, let me know.
15 I'll publish a correction.

16 But if I'm right, the minimum technical
17 standard. There should be a minimum technical
18 standard that public agencies follow. And if you hold
19 hearings to invite people who are familiar with the
20 technical and regulatory aspects of the matters that
21 we're considering, as I told you when you invited me,
22 that I expect that you'll do something about it and
23 that you as the convener of the meeting will report
24 back to us on the list of items and I'll certainly
25 give you my list that we expect a response from the

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1 NRC that's substantive, not just punting. So this is
2 my expectation of this meeting. Otherwise I shall
3 consider it a failure. I've said this before and
4 received no satisfaction. Normally, it's just heard
5 and that's the end.

6 This is not about you. You know, I deeply
7 respect you. You always hold a truly open meeting
8 and, you know, I always feel comfortable saying things
9 like this and you still invite me again. So I think
10 that we should be able to work together so the minimum
11 scientific standard is met. We may disagree on the
12 policy, but what has been happening on depleted
13 uranium is unacceptable technically and it hasn't
14 registered at the NRC and I've devoted two days of
15 time to come here with the real hope that I'll be able
16 to make it stick.

17 Thank you.

18 FACILITATOR CAMERON: All right. Thank
19 you. Thank you very much, Arjun, for those important
20 comments and positive suggestions also.

21 So let's get started with Larry Camper's
22 presentation. Again, these are context presentations
23 and we'll go for questions to you after they're done
24 and, at least, as far as Larry's and Andrew's
25 presentations, if you could just let them get through

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1 that presentation and then we'll go for questions.
2 Dave Esh's presentation because of its length, we did
3 break it into three parts so that we can go for -- You
4 won't have to sit there until the end of it and wait
5 to ask questions.

6 It's my pleasure to introduce Larry
7 Camper.

8 MR. CAMPER: Thank you, Chip. Good
9 morning, everybody, and thanks for being here. And
10 again let me thank all the panelists especially for
11 the effort that you're going to devote to this
12 rulemaking at issue over the next couple of days.

13 We greatly respect your views. We invited
14 each of you for different reasons in terms of
15 technical expertise or diversity of views and that's
16 the value of this type of workshop. So we do look
17 forward to the input that you will provide us.

18 I'm going to do something in my
19 presentation I don't normally like to do and I'm going
20 to read some prepared remarks that my staff has
21 prepared for me. I don't normally like to do that.
22 I've always liked to say I don't give the same
23 presentation twice when I do them back to back.

24 But in this particular instance, the issue
25 that we're dealing with is indeed very complex and,

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1 yes, it is controversial. And there's a lot of
2 context that I want to make sure that we share with
3 you and we share the exact same information in the
4 State of Utah where we'll be meeting in a couple of
5 weeks.

6 So I ask you indulgence. As I read my
7 remarks, I'll try to be as animated as I can be. But,
8 nonetheless, I'll be reading prepared remarks and it's
9 important that we do that for consistency, for context
10 and there's a great deal of information to share with
11 you and let you have some understanding of the staff's
12 thinking and some of the issues that went into the
13 rulemaking that we're going to be working on.

14 First of all, this is the first of two
15 public meetings that we're going to hold on this
16 particular topic to solicit input on the proposed
17 rulemaking for unique waste streams and, yes, Felix,
18 we do hope to spend a lot of time talking about unique
19 waste streams. We, too, are seeking a definition for
20 that.

21 We are here today because we want to
22 gather information on key technical issues associated
23 with the disposal of significant quantities of unique
24 waste streams and, in particular, DU or depleted
25 uranium. We want to focus on DU for a good portion of

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1 the workshop, but we also want to think about other
2 potential waste streams that could be considered
3 unique and could be included in this proposed
4 rulemaking which will be broader than just depleted
5 uranium. We do look forward to a collaborative
6 discussion. We look forward to your input and we
7 welcome all the ideas that you will share with us.

8 In terms of background, we have developed
9 the term unique waste stream for significant
10 quantities of DU because it is different than typical
11 low-level waste. Foremost, it is a new waste stream
12 in the sense that there were no commercial entities
13 generating significant quantities of it when NRC's
14 regulations of Part 61 were developed. DOE was the
15 only entity operating enrichment facilities in the
16 United States at that time. As a result, only small
17 quantities of DU were considered in the environmental
18 documents associated with the regulation.

19 DU is also unique because if it behaves
20 differently than typical low-level waste. The hazards
21 from most commercial LLW decreases over time in
22 contrast to DU where not only does the hazard
23 increase. It persists for a much longer time frame
24 due to the ingrowth of long-lived daughter products.
25 However, the impacts from disposal of significant

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1 quantities of DU can be migrated, for example, by
2 increasing burial depth or through the use of a robust
3 radon barrier whose performance can be demonstrated
4 over a long time frame.

5 Continuing on background. Currently
6 Section 61.55(a)(6) determines any radionuclide not on
7 the classification tables to be Class A waste by
8 default. The statement was an attempt at the time the
9 regulation was promulgated to capture any waste
10 streams that had not been included in the final Part
11 61. It was envisioned that these other waste streams
12 would not be of significant quantity or concentration
13 to warrant a limit being specified in the table.

14 Approximately six metric tons of DU were
15 assumed to be Class A in the draft Environmental
16 Impact Statement. A draft concentration limit of 0.05
17 microcuries per cubic centimeter was determined. This
18 draft concentration limit was not adopted in the final
19 Environmental Impact Statement based on the Part 61
20 FEIS conclusion that "the types of uranium bearing
21 waste typically being disposed of by NRC licensees do
22 not present a sufficient hazard to warrant limitation
23 on the concentration of this naturally-occurring
24 material."

25 However, the specific activity of depleted

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1 uranium is 0.5 microcuries per cubic centimeter and
2 now the landscape for waste stream generation is
3 changing. So clearly NRC is entering new territory
4 not envisioned when Part 61 was initially developed.

5 In terms of the current situation,
6 commercial facilities generating large quantities of
7 DU and the Department of Energy is planning to dispose
8 of these large quantities of DU at sites regulated by
9 NRC agreement states. Commercial facilities have the
10 option of transferring their DU to the Department of
11 Energy under Section 31.13 of the 1996 USEC
12 Privatization Act or they can pursue commercial de-
13 conversion disposal options.

14 There are no licensed commercial de-
15 conversion facilities built at the present time. NRC
16 would license such plants. LES is expected to start
17 limited operations in the spring of 2010. GE-Hitachi
18 has filed an environmental report and license
19 application that are currently under NRC review for
20 the Global Laser Enrichment Facility to be located in
21 Wilmington, North Carolina. AREVA has filed a license
22 application including environmental report for the
23 Eagle Rock Enrichment Facility in Bonneville County,
24 Idaho that has been accepted for NRC review.

25 DOE has approximately 700,000 metric tons

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1 of DUF₆ which it has been storing onsite for decades at
2 its Paducah and Portsmouth Gaseous Diffusion plants.
3 It is currently building de-conversion facilities at
4 these sites to convert the DUF₆ to DU-308 for disposal
5 at a commercial disposal site. So the cylinders that
6 you see in this picture will be de-converted into an
7 oxide powder. This is the current situation at
8 Portsmouth and Paducah.

9 DOE has said they will need to begin
10 disposal shipments for the DUF₆ facilities in mid 2010.

11 More than one million metric tons of DU will need to
12 be disposed of.

13 Commission direction to the staff. The
14 Commission realized the uranium enrichment landscape
15 was drastically changing. So when during the hearings
16 for the LES facilities, Interveners filed contentions
17 regarding the impacts from DU disposal. The
18 Commission directed staff to evaluate these impacts
19 separate from the hearing process. The Commission
20 stressed in their order to the NRC staff to consider
21 the quantities of DU at issue and noted that these
22 large quantities were outside the bounds of the
23 evaluation conducted in the Part 61 rulemaking in the
24 early 1980s.

25 In the final analysis, the staff's

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1 response to the Commission direction was yes. The
2 staff did recommend Section (a)(6) be modified through
3 rulemaking to specify a requirement for site-specific
4 analysis for significant quantities of DU and the
5 technical requirements for such an analysis. The
6 Commission accepted this recommendation in their Staff
7 Requirements Memorandum and further directed the staff
8 in a future budget request to propose the necessary
9 resources for a comprehensive revision to risk inform
10 the 10 CFR 61 waste classification framework.

11 Staff prepared a Commission paper in
12 response to the directions in the SRM that I just
13 cited. In answering the Commission direction, we
14 completed a Commission paper that presented a range of
15 regulatory options that were informed by technical
16 analysis.

17 You're going to hear a lot of detail today
18 and tomorrow about the technical analysis during Dr.
19 Esh's talk since he was the lead for the analysis. I
20 will just describe it briefly as a screening model we
21 used to evaluate the radiological risk and
22 uncertainties associated with the near-surface
23 disposal of large quantities of DU at a generic low-
24 level waste disposal site that had a broad range of
25 site condition. So we looked at a range of

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1 characteristics of disposal sites rather than looking
2 at disposal at a particular disposal site.

3 We identified four options in that
4 particular Commission paper. The first option we
5 evaluated was that staff would issue a generic
6 communication, for example, a regulatory information
7 summary which is like a guidance document that would
8 clarify that for disposal of large quantities of DU
9 compliance with the existing performance objectives
10 need to be demonstrated and that classification under
11 61.55(a)(6) should not be relied upon for this
12 purpose.

13 The second option was to conduct a
14 rulemaking to require the disposal facility licensee
15 to perform a site-specific analysis demonstrating that
16 the unique waste stream including large quantities of
17 DU can be disposed of at the site in conformance with
18 the performance objectives set forth in Subpart (c) of
19 Part 61.

20 The third option was to develop a generic
21 waste classification, A, B, C or Greater-Than-Class-C
22 for DU and an associated concentration limit to be
23 added to the waste classification tables. Staff would
24 begin with existing technical analysis which was
25 consistent with Part 61 methodology but updated to

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1 include recent advances in modeling and performance
2 assessment techniques.

3 The last option was to evaluate the entire
4 basis for the waste classification framework and
5 update it for all radionuclides, not just for DU. The
6 staff recommended and the Commission agreed to pursue
7 a rulemaking to specify site-specific analysis be
8 performed prior to disposal of significant quantities
9 of DU and to specify the technical requirements for
10 such an analysis.

11 The Commission chose to combine two of the
12 options that I just cited into a thorough approach to
13 address both immediate changes needed to NRC
14 regulations and to address issues with the overall
15 existing waste classification scheme as well. The
16 Commission agreed with the staff's recommendation to
17 conduct a rulemaking to require site-specific
18 performance assessment prior to the disposal of
19 significant quantities of DU, to identify the
20 technical parameters that were needed to be evaluated
21 and to develop guidance that would provide the
22 agreement state regulators, their licensees and
23 applicants with the necessary information to conduct
24 site-specific analyses.

25 The Commission further directed the staff

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1 in a future budget request to propose the necessary
2 resources for a comprehensive revision to risk inform
3 the Part 61 Waste Classification framework. The staff
4 assumed this direction goes beyond merely budgeting
5 for this rulemaking but in fact to pursue the
6 development of the rulemaking which we will commence
7 in FY '11.

8 In terms of the initial rulemaking, the
9 rulemaking that we're here today and tomorrow to
10 discuss, the rulemaking will require the disposal
11 facility licensee to perform a site-specific analysis
12 demonstrating that the unique waste stream including
13 significant quantities of DU can be disposed of at the
14 site in conformance with the performance objectives of
15 Part 61. The analysis would be reviewed and approved
16 by the agreement state since the likely disposal
17 facilities are, in fact, located in agreement states.

18 The rulemaking is designed to be
19 comprehensive in that it addresses unique waste
20 streams, including significant quantities of DU and
21 others to be defined. We will define unique waste
22 streams and significant quantities in the rule
23 language. And these are topics, of course, that we
24 want to cover with you in some detail. This option
25 creates a legally-binding requirement to do a site-

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1 specific analysis. Specifying the technical
2 parameters for the site-specific analysis in the rule
3 language will provide uniformity in the technical
4 approach used by the agreement states and their
5 disposal facility licensees and allow more alignment
6 across the various disposal sites that might be
7 accepting depleted uranium or unique waste streams.
8 The NRC will also publish regulatory guidance on
9 implementation to help ensure more uniformity and to
10 assist with the implementation of the rule.

11 We're going to talk a lot about
12 performance assessment. So I wanted to make a few
13 comments about the role of the performance assessment.

14 The backbone of the site-specific analysis the
15 initial rulemaking will require is a performance
16 assessment. The performance assessment is meant to be
17 a living tool for both the site and the regulator to
18 be able to assess future compliance of the disposal of
19 the facility with the performance objectives in 10 CFR
20 61.41 through 10 CFR 61.44 or the agreement state
21 equivalent.

22 During the licensing of the disposal site,
23 assumptions must be made based on expected waste
24 volumes in streams of the possible final inventory of
25 a site or a specified disposal unit within that site.

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1 As operations occur, these assumptions should be
2 updated on a periodic basis with actual waste volumes
3 and any revised information of future waste that is
4 expected to be received.

5 The results of the performance assessment
6 can then be used to evaluate whether reasonable
7 assurance still remains and that the disposal unit or
8 site will remain in compliance with the performance
9 objectives. If the result of the performance
10 assessment is that compliance is uncertain or
11 unlikely, additional data collection and modeling may
12 be performed, the facility could be modified or future
13 waste volumes or specific radionuclide quantities or
14 concentrations could, in fact, be reduced. The
15 decision on what actions to take should involve both
16 the site operator and the appropriate regulator.

17 So who will be doing these site-specific
18 analyses and what are the current disposal pathways
19 for significant quantities of DU? This slide has a
20 lot of information on it. I apologize for that, but
21 it's designed to show the locations of the three
22 operating disposal sites and the one that has been
23 proposed. These, of course, are located in South
24 Carolina, Utah, Washington State with the one coming
25 online presuming near term in Texas.

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1 On the right is a table that identifies
2 the facilities, the waste that is authorized to accept
3 and the compact restrictions that apply to that
4 particular facility. I mentioned Texas is developing
5 a new site, but it's restricted at the current time to
6 waste from the States of Texas and Vermont. A
7 particular note is that the Clive, Utah site accepts
8 Class A waste from most of the United States, but the
9 Barnwell site which accepts the majority of the Class
10 B and C waste in the U.S. is closed to out-of-compact
11 generators impacting 36 states. These are the most
12 likely disposal paths for commercial DU waste.

13 For the moment, I would note that three of
14 the sites are in arid environments and that one is in
15 a humid environment and this is an issue of
16 consideration during our technical analysis which Dr.
17 Esh will discuss in more detail during his
18 presentation.

19 The second part of this effort is a long-
20 term rulemaking. This is the one that I referred to
21 earlier when the Commission directed the staff to
22 budget for a future rulemaking to risk inform. So the
23 second part of this rulemaking effort is what we are
24 calling the longer-term rulemaking. Specifically, the
25 Commission directed the staff to propose necessary

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1 resources for a comprehensive revision to risk inform
2 the 10 CFR 61 Waste Classification framework using
3 updated assumptions and referencing the latest
4 international committee on radiation protection, ICRP,
5 methodologies.

6 This revision would likely involve
7 different, updated methodologies and assumptions than
8 the original Part 61 methodology for key variables
9 such as disposal configurations, performance periods,
10 institutional control periods, waste forms, site
11 conditions, exposure pathways and receptor scenarios.

12 This effort would address all radionuclides, not just
13 depleted uranium, but in fact we were specifically
14 directed to address depleted uranium by the
15 Commission.

16 We have another category called "Other
17 Considerations." Thus far, I have covered the history
18 of how we got here and the purpose for why we are here
19 over the next couple of days.

20 But we recognize there are other concerns
21 on our minds and we have reserved some time on the
22 agenda tomorrow to discuss them. The few issues shown
23 on this slide are just some of the notable issues that
24 we've been thinking about, but there may be others.
25 We know that there are important issues and we want to

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1 hear your concerns.

2 For example, previously disposed volumes
3 of DU should be addressed through the site's
4 performance assessment as we have discussed. The PA
5 is a living tool designed to ensure compliance with
6 the performance objectives.

7 The second topic is something we've been
8 discussing quite a bit amongst ourselves and with the
9 agreement states and we will talk about more tomorrow.

10 If a site wishes to dispose of significant amounts of
11 depleted uranium before the initial rulemaking is
12 completed, it would be prudent for the site operator
13 and state regulator to review the existing PA,
14 performance assessment, supporting this site and
15 determine whether the issues that were raised in the
16 technical analysis supporting the Commission decision
17 to initiate this rulemaking and the issues that will
18 be discussed here in this workshop are adequately
19 addressed. If not, it would be prudent for the
20 performance assessment to be revised to adequately
21 address these issues on a site specific basis before
22 disposal of significant quantities of concentrated
23 depleted uranium takes place.

24 Finally, when we reexamined the waste
25 classification framework, we will need to think about

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1 any consequence for depleted uranium that has been
2 previously disposed of under the initial rulemaking
3 which is the subject of this workshop.

4 In terms of our agenda, first we're going
5 to start off with technical aspects of site-specific
6 analyses for DU and then we will broaden the topic to
7 think about other unique waste streams that this
8 rulemaking could apply to. We will then discuss how
9 the agreement states would implement the NRC change
10 and regulations of what NRC recommends states do in
11 the interim before both NRC's rulemaking is final and
12 before the agreement states have adopted these changes
13 and their regulations. Next, we will discuss the
14 long-term rulemaking and what potential changes could
15 be made to the classification of depleted uranium and
16 other radionuclides. And then finally we will
17 conclude with some time to discuss any questions that
18 may come up during the course of the discussions and
19 to address the other considerations that I
20 specifically pointed out a moment ago.

21 With that, I'll stop my context remarks.
22 Again, I beg your indulgence for reading all of that,
23 but it is important that everyone hear the same thing
24 both here and in Utah, that everyone have a level
25 playing field in terms of information that the staff

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1 has had on its mind to facilitate your discussions
2 and, with that, I'll take questions of a clarifying
3 nature.

4 Yes sir?

5 MR. BURNS: You mentioned the activity of
6 depleted uranium as 0.5 millicuries per cubic
7 centimeter. I'd like you to clarify whether that is
8 fresh or new depleted uranium or is that depleted
9 uranium in secular equilibrium with the starter
10 products?

11 MR. CAMPER: Dave, do you want to specify?

12 MR. ESH: I believe that's fresh or
13 relatively fresh.

14 FACILITATOR CAMERON: Does that answer
15 your question?

16 MR. BURNS: That answers my question, but
17 in general one should be aware that once depleted
18 uranium is in secular equilibrium with the starter
19 products you could figure roughly 15 or something
20 times as radioactive as that figure.

21 FACILITATOR CAMERON: Okay. Thank you.
22 So we may have more discussion on that point.

23 Let's go to Arjun and then we'll go to
24 Bill.

25 MR. MAKHIJANI: Yes. A couple of just

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1 clarifying questions. Will you be doing an
2 environmental impact statement as part of this
3 rulemaking process?

4 MR. CAMPER: Yes, you do. You do an
5 environmental assessment as part of all rulemaking.

6 MR. MAKHIJANI: You'll be doing an
7 assessment, not an impact statement.

8 MR. CAMPER: It depends. Well, certainly
9 we'll do an assessment. There's a process associated
10 with rulemaking whereby you do an environmental
11 evaluation. As you step through that, you reach
12 conclusions as to whether or not it's an assessment or
13 an environmental impact statement depending upon the
14 outcome following the process.

15 MR. MAKHIJANI: Well, I would just
16 recommend that the implications of this are so huge
17 that you do a proper environmental impact statement
18 assessing the options.

19 Part of what's leading you to an
20 environmental assessment is the Commission has pre-
21 judged the outcome of this process by saying you're
22 going to consider just a revision of the (a)(6) part
23 of the rule rather than consider that versus a
24 revision of the tables in Part (a), 61.55(a). And I
25 think it has done so based on an admittedly

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1 unvalidated model and I just want to know how did the
2 Commission decide that results based on an admittedly
3 unvalidated model should be used as the basis for
4 proceeding in this matter. I don't understand that.

5 MR. CAMPER: On your first point, there is
6 an environmental assessment required for any
7 rulemaking. You step through a process where you
8 determine whether it's environmental assessment or an
9 EIS. Typically, rulemaking would carry with them an
10 EIS, but it's a process you step through to reach that
11 conclusion. So we will be doing that as we will with
12 any rulemaking.

13 With regards to the Commission's decision,
14 I mean I describe and Dr. Esh will talk a lot more in
15 detail about the analysis. So I'm going to wait and
16 let him explain to you a lot more information about
17 our technical analysis. But as I said in my remarks,
18 we viewed it as a screening model. We did evaluate
19 several periods of time in that analysis and we felt
20 it was an adequate analysis to make a proposal to the
21 Commission.

22 Now here's what's important. This
23 rulemaking and whatever analytical methodology
24 supports how we perceive this rulemaking will, in
25 fact, be a matter of public record and scrutiny and

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1 will undergo a validation process. This is a
2 rulemaking to proceed with the Commission direction
3 and the analysis is not over. The screening technical
4 analysis that we did was a starting point to make a
5 recommendation to the Commission.

6 FACILITATOR CAMERON: And just a process
7 note at this point, I'm keeping track of some of these
8 issues in the parking lot which just means it's an
9 issue for us to come back and discuss later or it may
10 be an action item, for example, Arjun's suggestion
11 about there should be a specific response from the NRC
12 to all the substantive and process suggestions made at
13 this meeting.

14 The idea about the need for an EIS is
15 probably going to resonate through a number of the
16 discussions, but we'll make sure that we come back and
17 address that specifically under "Other
18 Considerations." So I will be trying to keep track of
19 these issues so that we don't lose them.

20 MR. MAKHIJANI: Could I put two in your
21 parking lot and then I just won't make a follow-up
22 comment? One is I believe a proper rulemaking should
23 consider both a revision of the tables and not just a
24 revision of 61.55(a)(6) and the rulemaking should --
25 And the EIS should consider a full range of options in

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1 how this should be done.

2 And secondarily, I do not think that any
3 objective analysis of the matter would regard what was
4 done in October of 2008 as a screening analysis which
5 is supposed to be conservative. This thing has very
6 nonconservative assumptions in it and cannot possibly
7 fit the definition of a screening analysis. So I
8 would like to see the definition of a screening
9 analysis and why you think that this fits the
10 definition of a screening analysis. Put that in your
11 parking lot and I'll let it go.

12 MR. CAMPER: As I said, certainly during
13 Dr. Esh's discussion, he's going to be giving you a
14 great deal of detail about the approach the staff used
15 and the technical analysis. I'm certain he'll try to
16 address some of the concerns you're raising with
17 regards to the nature of that technical analysis.

18 I mean in the final analysis as I said in
19 my remarks the staff did recommend a rulemaking to
20 modify the (a)(6) provision by adding a (a)(9) that
21 would require the site-specific performance
22 assessment. The Commission chose pretty much as
23 you're actually suggesting to take it a step further
24 and to also direct the staff to proceed with a
25 rulemaking that would risk inform the entire waste

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1 classification scheme in Part 61.

2 So I think the Commission in doing that
3 addressed the immediate issue in terms of the pending
4 disposal of depleted uranium and ensuring that there
5 was an adequate mechanism in place to protect public
6 health and safety. And I would add by the way it's an
7 increase in regulatory presence over the disposal of
8 depleted uranium as compared to the status quo and at
9 the same time directed the staff to take a broader
10 look at risk-inform Part 61.

11 So the Commission looked at the current
12 situation and the future situation. I think that was
13 a comprehensive decision.

14 MR. MAKHIJANI: This two-step process is
15 ill-advised at best because you're not going to unbury
16 the depleted uranium waste if the risk-informed
17 analysis of ten years down the line shows you that you
18 did the wrong thing. So you're actually prejudging
19 the risk-informed outcome because there's going to be
20 a lot of pressure to say whatever was done with DU is
21 okay on the broader level.

22 I think if you're going to do it right we
23 should just do it right to start with and not assign
24 one million tons of waste of a waste stream to one
25 category of short-term analysis just because you

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1 issued a license to a corporate without properly
2 considering the issues in advance.

3 MR. CAMPER: I respect that view and we
4 hear you. At the moment, we have direction from the
5 Commission to proceed with the particular type of
6 rulemaking and our primary objective in this forum is
7 to try to get as much input as we can on the various
8 technical parameters that we'll be discussing over the
9 next couple of days.

10 But all these types of concerns will be
11 reflected in the minutes of this proceeding and the
12 staff I'm sure will be communicating further with the
13 Commission about what we heard here.

14 MR. MAKHIJANI: What's the point if the
15 decision has already been made? What's the point of
16 taking the comments? What's the point?

17 FACILITATOR CAMERON: Okay. If I could
18 just make a process point here is that we do have a
19 slot on the agenda to talk about the long-term
20 rulemaking and certainly it's a legitimate question
21 for all of you to discuss about whether the initial
22 rulemaking should include other types of alternatives
23 and, as Larry said, the Commission will be told about
24 that.

25 But we will be going to discuss these

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1 issues specifically and the point of the questions is
2 not only to get answers for you but also to identify
3 issues that we need to discuss in further detail.

4 The issue of nonconservative nature of the
5 screening model, there's going to be an opportunity to
6 ask Dave questions about that. But then when we get
7 to the individual discussion points if there are
8 specific examples, Arjun, of what you believe are
9 nonconservative aspects, then we will be looking for
10 those to be raised and discussed.

11 Let's go to Bill and then we'll go to
12 Richard. Bill.

13 MR. DORNIFE: I have a clarification
14 comment and then an historical perspective comment.
15 First of all, on your map of the disposal sites, I
16 think it's important to note that WCS also is
17 authorized to have a federal disposal facility that
18 will meet the same Part 61 requirements. So it's not
19 just commercial waste that's to be considered under
20 this issue.

21 MR. CAMPER: Okay.

22 MR. DORNIFE: And secondly, from a
23 historical standpoint, I'd like to note that NRC has
24 approved alternate classification standards in
25 compatible state regulations. To be specific,

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1 Pennsylvania's regulation have 100 nanocuries per gram
2 for both uranium-238 and thorium-232 and the reason
3 for the uranium-238 was exactly because of this long-
4 lived issue. Texas has 100 nanocuries per gram for
5 radium-226. So NRC has allowed agreement states to be
6 more conservative on this issue.

7 FACILITATOR CAMERON: Okay, and that is a
8 -- Larry, I don't know if you want to make a comment
9 there. I was just going to point out that when we get
10 to the agreement state compatibility issues that
11 that's a great issue of discussion at that point.

12 MR. CAMPER: No, only that Bill's correct,
13 I mean, in both his comments. On the slide itself, we
14 need to make some adjustment to the slide to reflect
15 that authorization. We can do that. But, no, your
16 comments are correct. There have been different
17 approaches used in different states with NRC
18 recognition and approval. That's correct.

19 FACILITATOR CAMERON: Okay. Thank you.

20 Richard and, everybody, please use the --
21 make sure your mike is on and use the mike.

22 MR. HAYNES: Thank you.

23 Larry, I just want to clarify. I think in
24 one of your comments you said that the NRC like for
25 the previously disposed DU to be reevaluated in a --

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1 MR. CAMPER: Richard, I can't hear you.
2 I'm sorry. Can you speak up?

3 MR. HAYNES: Okay. I'm sorry. I think
4 you had indicated in your presentation that the NRC
5 wanted the previously disposed DU to be reevaluated in
6 an updated PA and if that's the case, what time period
7 are you all looking for for that performance
8 assessment?

9 MR. CAMPER: Yes, what I said, Richard,
10 was that we did a technical analysis in which we
11 evaluated a number of parameters. There have been
12 performance assessments done out there in several of
13 the states that are operating these facilities.
14 Certain of these states are expected to receive
15 depleted uranium near term before this rulemaking will
16 be finalized.

17 What we're saying is it would be prudent
18 to examine, reexamine, those existing PAs and make
19 sure that they minimally address the technical
20 parameters that we did in our assessment and take a
21 look and make sure that it is an appropriate PA for
22 the materials that we received at that particular
23 site.

24 In terms of how, we're not specifying a
25 time frame in which a state would have to do that.

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1 Obviously, it would be driven by which state is going
2 to receive the waste when. I suspect, for example, in
3 Utah -- In fact, I know in the State of Utah based
4 upon discussions with state regulators that they are
5 reexamining the performance assessment that's been
6 done. They've had some dialogue with the site
7 operator out there. My impression is that both the
8 state and the operator are eager to ensure that
9 there's an appropriate performance assessment in
10 place.

11 I think the simple answer to your question
12 is two part. One, we do think it would be prudent and
13 we've had some discussions. We've had two telephone
14 discussions with the agreement state regulators that
15 operate low-level waste sites and all the regulators
16 are in agreement that a performance assessment needs
17 to be done. An appropriate performance assessment
18 needs to be done and that the performance assessment
19 should be reexamined in light of current information
20 and current things that have taken place.

21 So I think there's an agreement upon that
22 and with regards to the timing I know that the State
23 of Utah is looking with their licensee, their
24 operator, right now at that performance assessment.
25 So I think each state will be driven by the time frame

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1 in which it expects to receive depleted uranium, large
2 quantities of depleted uranium.

3 FACILITATOR CAMERON: And, Richard, please
4 raise any concerns you have with that again when we
5 get to the appropriate parts of the agenda.

6 Just let me see if there's any -- quickly
7 go to the audience to see if there's any questions for
8 Larry before we go to the next presentation. Anybody?
9 And please introduce yourself.

10 MR. REGNIER: Edward Regnier, Department
11 of Energy.

12 I thought I understood you to say that the
13 previously disposed DU would be reevaluated. Was my
14 understanding there correct?

15 MR. CAMPER: What I said was is that --
16 Let me see if I can find the slide here.

17 (Off the record comments.)

18 FACILITATOR CAMERON: And, Larry, you may
19 want to clarify, I think, the nature of the question.

20 (Off the record comments.)

21 MR. CAMPER: Yes. What I said was --
22 Chip, do you have a clarification?

23 FACILITATOR CAMERON: I just wanted to
24 make sure you're very specific about what you mean by
25 evaluate what has been previously buried because it

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1 could have a number of different connotations and, for
2 example, that when there is a request to dispose of
3 additional DU at the site, would the site-specific
4 performance assessment also have to consider what has
5 already been buried?

6 MR. CAMPER: The simple answer of that is
7 yes. Of course.

8 FACILITATOR CAMERON: Okay. Is that what
9 you meant, Ed?

10 MR. CAMPER: What I'm saying in this slide
11 is that a couple of issues that have come up is during
12 the course of conducting this initial rulemaking the
13 question that has arisen in the minds of some is we
14 already have some previously disposed depleted uranium
15 and you're going to have in certain cases for example
16 potentially the Clive, Utah site substantial amounts
17 of additional depleted uranium to be shipped there.

18 What we're saying in this slide and what
19 I'm saying in my remarks is given that -- I mean, we
20 don't have a requirement. Well, we don't have this
21 new requirement in the regulations yet that would
22 require this site-specific performance assessment to
23 be performed and, as we discussed in the SECY, this
24 would be an item of compatibility assigned B which
25 means it has to be done that way.

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1 Now Duncan White will talk more about
2 compatibility and the subtleties of compatibility in
3 more detail tomorrow I think it is. Right, Duncan?
4 But what we're saying here is that if DU has already
5 been disposed of and more DU is going to be disposed
6 of, it would be prudent to make sure that your
7 performance assessment is current. That performance
8 assessment necessarily has to consider depleted
9 uranium that's been disposed of there, how much
10 additional depleted uranium is coming there and all
11 the various site characteristics would drive the
12 amount of material that can go there. And we're
13 saying during the course of this rulemaking one should
14 do that in those states that operate LLW facilities.

15 What we're also saying that under the
16 long-term rulemaking the question comes up if you
17 reclassify -- Let's say you reclassify depleted
18 uranium or let's say the waste classification system
19 that exists today doesn't continue to exist once that
20 rulemaking is final. I don't know. We have no
21 preordained views on that. But if we're going to risk
22 inform the waste classification system, we need to
23 look at it with an open mind.

24 So what happens to DU that gets disposed
25 of during the course of this initial rulemaking up to

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1 the time that you have a new waste classification
2 scheme in place? That's what the last box is getting
3 at. And typically what happens is rules that contain
4 statements that indicate that this particular
5 rulemaking is not retroactive or it provides certain
6 provisions or activities that may have taken place in
7 which a new set of conditions exist because of the new
8 rule. Is that clear? Does that help?

9 FACILITATOR CAMERON: Okay. Does that
10 answer it?

11 MR. CAMPER: Okay. Good. Thank you.

12 FACILITATOR CAMERON: Okay. Thank you.

13 MR. MAKHIJANI: It's not clear. You're
14 saying the second rulemaking won't be retroactive.

15 MR. CAMPER: I'm sorry. I can't hear your
16 question. Repeat it.

17 MR. MAKHIJANI: The second rulemaking
18 won't apply to initially disposed of waste.

19 MR. CAMPER: I'm -- What is your question?

20 MR. MAKHIJANI: The second rulemaking
21 won't apply to initially disposed of waste.

22 MR. CAMPER: No, I'm saying that during
23 the initial rulemaking DU has already been disposed
24 of. DU will be disposed of. This rulemaking will
25 take about two years.

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1 MR. MAKHIJANI: Yes.

2 MR. CAMPER: In theory. There will be
3 depleted uranium disposed of between now and the time
4 this rulemaking is final that requires a site-specific
5 performance assessment. Okay. And what we're saying
6 in this slide and what I was saying in my remarks is
7 you need to reexamine your performance assessment and
8 make sure that we feel at least minimally addresses
9 the technical parameters that we identified in our
10 technical assessment. Okay. And so we're saying you
11 need to do that now during this initial rulemaking.

12 We're saying that depleted uranium is
13 disposed of during this initial rulemaking. If the
14 waste classification for depleted uranium is changed,
15 the long-term rulemaking will need to address that in
16 particular.

17 FACILITATOR CAMERON: Okay, and this is
18 going to be a huge parking lot. I already can see
19 that.

20 (Off the record comments.)

21 But we will -- I'm going to put this issue
22 in the parking lot because we will be coming back to
23 address this when we get to those specific discussion
24 items.

25 Janet, did you have anything you wanted to

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1 add?

2 MS. SCHLUETER: I guess there is still a
3 subtlety.

4 FACILITATOR CAMERON: And if you would
5 just introduce yourself.

6 MS. SCHLUETER: Okay. Janet Schlueter at
7 NEI.

8 There's still a subtlety because your
9 statements imply that at sites that there's previously
10 disposed of DU that are not expecting to receive more
11 DU you would not revisit those PAs. That's the
12 subtlety, a site expecting more versus a site not
13 expecting more.

14 MR. CAMPER: Again, Janet, what we've said
15 is we clearly in my remarks we were emphasizing the
16 sites that either have or will most likely receive
17 depleted uranium, in particular, Utah for example.
18 But what we've said to the state regulators -- and
19 we've talked to the State of Washington, we've talked
20 to the State of South Carolina, we've talked to the
21 State of Texas and to Utah -- our advice has been as a
22 Federal regulator, on one hand, we believe it's
23 important to point out the prudent value in looking at
24 your performance assessment to make sure that it
25 passes muster technically, that it's up to date and

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1 that it considers all the site characteristics
2 specific to that particular site.

3 But given that we don't have a requirement
4 in the regulations yet to require this particular
5 site-specific performance assessment as defined in the
6 recommendations to the Commission, the most we can do,
7 the most effective thing we can do, to say at the time
8 that it's prudent to do that. All of the states that
9 are operating low-level waste facilities agree with
10 that. They all agree with the value of making sure
11 that the PA is up to date and my understanding is that
12 they're all doing that to varying degrees.

13 FACILITATOR CAMERON: Okay. Thank you
14 very much, Larry, and we will revisit. I'll keep
15 track of these issues. I think they're going to come
16 up in the normal course of discussion. If they don't,
17 then we'll specifically revisit them. Some of these
18 are going to be considered in the Other Considerations
19 part on the agenda and that's Patty Bubar is going to
20 tee that up for us tomorrow.

21 So thank you very much, Larry. Let's go
22 to Andrew Carrera is going to tell us about the NRC
23 rulemaking process and answer any questions for you.

24 Andrew.

25 MR. CARRERA: Chip, I cannot see the

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1 ladies and gentlemen of the meeting. May I do my
2 presentation at the table?

3 FACILITATOR CAMERON: Absolutely.

4 (Off the record comments.)

5 MR. CARRERA: Good morning. Before I
6 begin, English is my third language. So I must ask
7 for your pardon if I mispronounce a few words. So I'm
8 not going to be as eloquent as Chip. I have to ask
9 Larry Camper if I may do my presentation in Vietnamese
10 or Dutch, but he wouldn't allow it. It would have
11 been so much easier to understand.

12 Anyway, my name is Andrew Carrera and I
13 work in the Office of Federal and State Materials and
14 Environmental Management Program, Division of
15 Intergovernmental Liaison and Rulemaking. And before
16 I begin, I would like to thank the Division of Waste
17 Management and Environmental Protection for inviting
18 me to give a brief presentation on the NRC rulemaking
19 process. Next slide please.

20 So the question is what is rulemaking.
21 Rulemaking is a process used by government agencies
22 such as the NRC to develop regulations and NRC
23 regulations apply primarily to applicants and
24 licensees who are involved in the transportation of
25 nuclear materials or the use of nuclear materials in

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1 medical, industrial or academic setting or operating
2 facilities such as power plants, research reactors,
3 uranium mills, fuel fabrication and for today's
4 purpose waste repository sites. Next slide please.

5 So where does the NRC get its authority to
6 do rulemaking? The NRC rulemaking authority stems
7 from the Atomic Energy Act of 1954, as amended. It
8 established the Atomic Energy Commission which is now
9 the NRC. It also delegated the rulemaking authority
10 to the Commission.

11 The Commission, however, is bounded by the
12 Administrative Procedure Act of 1946, also known as
13 the APA and the APA established procedures that
14 regulatory agencies such as the NRC must follow to
15 implement the regulatory program. Among other things,
16 it sets requirements for publication of proposed rules
17 and final rules on the *Federal Register* for public
18 review and comment. Next slide please.

19 Rulemaking Stakeholders. There are a
20 significant number of people in organizations who are
21 directly and indirectly involved in the rulemaking
22 process. On the screen behind me, you see a wide
23 variety of rulemaking stakeholders ranging from the
24 Federal and non Federal Government organizations
25 listed in blue, the general public and industry in

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1 pink, as well as different offices within the NRC
2 listed in green. And the roles of the stakeholders
3 may include requesting a rule to be developed, for
4 example, through the petition-for-rulemaking process
5 or gathering and assembling information to support the
6 rulemaking and drafting rule text in supporting
7 documents or providing comments after the rule is
8 drafted. Next slide please.

9 Let us now talk about the rulemaking
10 process. Before the rulemaking process begins, a
11 regulatory basis which is sometimes referred to as a
12 technical basis should be developed. The preparation
13 or development of a regulatory basis is not part of
14 the rulemaking process; however, it's a very important
15 preliminary step to the rulemaking process.

16 The regulatory basis contains a
17 justification for the rule and serves as a solid
18 foundation of effective regulation and the purpose of
19 today and tomorrow's sessions is to a major extent to
20 gather information in support of development of a
21 regulatory basis. So we are here to participate in a
22 drafting in the regulatory basis.

23 Once the regulatory basis is completed, a
24 proposed rule is developed and published for public
25 review and comment. After public comments are

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1 collected from the proposed rule publication, the
2 comments are analyzed. Substantive comments are
3 considered in the final rule and, after the final rule
4 is published, the rule is implemented. I will now
5 discuss the steps of the regulatory basis, proposed
6 rule and final rule in greater detail. Next slide
7 please.

8 Regulatory Basis. For our purposes, the
9 first step is to develop a regulatory basis for the
10 unique waste stream rulemaking and the development of
11 a sound regulatory basis has become very important in
12 supporting and making the NRC rulemaking process more
13 efficient. The regulatory basis provides the
14 foundation of effective regulation and it is the
15 rationale for the rulemaking action.

16 It should be supported to the extent
17 practical with sound scientific principles, legal or
18 policy information. The regulatory basis should
19 answer the questions of who, when, what, why and
20 where, not necessarily in that order.

21 Now it should at minimum explain why the
22 current regulation or policy is insufficient or needs
23 to be changed. It should provide scientific policy or
24 legal information that supports the decision to
25 undertake the rulemaking. It should also discuss the

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1 stakeholder's point of view to the extent known. And
2 as I stated earlier, the major purpose of today and
3 tomorrow's workshop is to gather information from
4 stakeholders like yourself to support the development
5 of a regulatory basis for the unique waste stream
6 rulemaking. Next slide please.

7 Proposed Rule. Once we have a robust
8 regulatory basis and it has been accepted by the
9 rulemaking branch, a working group is assembled. The
10 working group consists of the NRC staff with
11 technical, legal and administrative backgrounds from
12 various organizations within the NRC. In addition, if
13 the rule is to be implemented by the agreement states
14 like the unique waste stream rule is expected to be,
15 the NRC will add agreement state representatives to
16 the work group.

17 The working group uses the regulatory
18 basis to draft the proposed rule text and other
19 supporting documents which may include an analysis of
20 the environmental impacts from the proposed action as
21 well as a regulatory analysis to evaluate the cost and
22 benefits of the proposed action.

23 The proposed rule package is then sent to
24 the Commission for review. In this particular case,
25 the draft rule text will be sent to the agreement

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1 states for their review before it goes to the
2 Commission. And if the Commission approves the
3 proposed rule, it is sent for publication in the
4 *Federal Register* for public comments. Normally, the
5 public comment period is 75 days. Next slide please.

6 The Final Rule. After the comment period
7 on the proposed rule ends, the NRC begins the
8 preparation of the final rule package. The final rule
9 is a logical outgrowth of the proposed rule and with
10 consideration of substantive comments received from
11 the proposed rule publication.

12 There should not be huge disconnects,
13 revisions or changes from the proposed rule.
14 Documents supporting proposed rules are also updated
15 to reflect the final rule text. Agreement states'
16 participation is similar to the propose rule stage and
17 once the final rule package is drafted it is sent to
18 the Commission for review.

19 After the Commission approves the final
20 rule, it is published in the *Federal Register*. The
21 *Federal Register* notice includes the rule text and
22 responses to all substantive public comments received.

23 And the final rule will be implemented on a schedule
24 as posted in the *Federal Register* notice. Next slide
25 please.

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1 So how long does it take to finalize a
2 rule? The complete rulemaking process may take
3 several years. The rulemaking starts with acceptance
4 of a regulatory basis and the regulatory basis itself
5 can take anywhere from months to years to prepare and
6 it's dependant on the complexity and the depth of the
7 issue as well as the availability of the information.

8 We are currently scheduled to complete the
9 development of the regulatory basis for the unique
10 waste stream rulemaking by September of 2010. And
11 once the regulatory basis is completed, the proposed
12 rule is to be drafted. It usually takes about one
13 year to complete the proposed rule and submit it to
14 the Commission for review.

15 However, this time frame varies from rule
16 to rule as well. For the unique waste stream
17 rulemaking, we would hope to submit the proposed rule
18 to the Commission by September of 2011. And once the
19 rule goes to the Commission, it may take anywhere from
20 weeks to months or more for the Commission to take
21 action and approve it to be published in the *Federal*
22 *Register* for public review and comments.

23 And after the public comment period ends,
24 the final rule is to be drafted with consideration to
25 the substantive comments received from the proposed

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1 rule. It usually takes about a year to prepare and
2 publish the final rule. But again it may vary based
3 on the complexity of the comments received. For the
4 unique waste stream rule, we would expect to provide
5 the final rule to the Commission for review by
6 September 2012.

7 And with the beginning of the
8 implementation phase, the NRC rulemaking process ends.

9 The agreement states, however, typically take up to
10 three years to finalize the equivalent rules.
11 Therefore, under the current schedule, we may see the
12 implementation of a unique waste stream rule by the
13 agreement states in late 2015. Next slide please.

14 And I summarized my presentation about the
15 NRC rulemaking process. I thank you for your time. I
16 thank Mr. Gary Comfort for working the slides and I
17 will be happy to answer any rulemaking question that
18 you may have. Thank you.

19 FACILITATOR CAMERON: Thank you, Andrew.
20 That was an excellent overview of the rulemaking
21 process.

22 Does anybody around the table have a
23 question about the rulemaking process either generally
24 or specifically in regard to this particular rule?
25 Felix.

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1 MR. KILLAR: Andrew, I'd like to ask you
2 about -- The process you lay out is a typical
3 rulemaking process. But the NRC also has availability
4 at two other methods. They have a direct final rule
5 and they also have an expedited rulemaking. Could you
6 talk about the criteria? What determines which one
7 falls in which category?

8 MR. CARRERA: Well, for this purpose, we
9 just kind of stick with the straight, regular process.
10 But I believe Gary Comfort can come and join the
11 ANPR.

12 MR. COMFORT: Well, for the questions that
13 you have for the direct final rule, generally those
14 are only done for rules that we basically think are
15 not going to have any significant or that won't have
16 any significant comment. We still put them out as a
17 direct final for comment and, if we receive comments,
18 we would then have to rescind the rule and issue it as
19 a proposed rule instead. So they're basically
20 considered to be noncontroversial rules when we go to
21 a direct final.

22 For an expedited rulemaking, those are
23 generally things again that we're going to have more
24 knowledge up front and not a lot of controversy and
25 it's basically I expect -- I'm not as certain as to

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1 how the expedited rulemakings are done other than the
2 fact that they are basically said, "Put your
3 priorities onto this one and get it done as quickly as
4 possible." But again, if you run into complicated
5 issues, you know you may overrun too quickly and you
6 certainly don't want to do something that may be as
7 complex as this rule doing it too quickly so that you
8 overrun what the process would normally allow for
9 comment and complete evaluation.

10 FACILITATOR CAMERON: Okay. Thank you.
11 And just a follow-on to that, if the environmental
12 impact statement as opposed to just an environmental
13 assessment was done on this particular rulemaking,
14 Andrew, would that add to the time?

15 MR. CARRERA: Add to the time, yes. The
16 time frame would be extended.

17 FACILITATOR CAMERON: Okay.

18 MR. CARRERA: Especially if it's an EIS,
19 environmental impact statement.

20 FACILITATOR CAMERON: Okay. Thank you,
21 Andrew.

22 Other questions around the table on
23 rulemaking?

24 (No verbal response.)

25 Do we have any questions from any of you

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1 in the audience about the rulemaking process?

2 (No verbal response.)

3 MR. CARRERA: Chip, may I ask myself a
4 question?

5 FACILITATOR CAMERON: You can if you want.

6 MR. CARRERA: I know the answer.

7 FACILITATOR CAMERON: We might answer it
8 for you.

9 MR. CARRERA: Thank you very much.

10 FACILITATOR CAMERON: Thank you.
11 Excellent, Andrew. Thank you.

12 We didn't want to wade into Dave Esh's
13 presentation before the break and I know we've only --
14 Well, we've been going an hour and a half. So this is
15 a good time for the break and I would just ask Dave to
16 take note of some of the issues that were raised
17 around the table and you may want to try to also
18 address those or elaborate on those in your
19 presentation.

20 I have five minutes to 10:00 a.m. Could
21 we come back around 10:12 a.m., but certainly we're
22 going to get started at 10:15 a.m. So take 15 to 20
23 minutes to do what you need to do. Off the record.

24 (Whereupon, a short recess was taken.)

25 FACILITATOR CAMERON: I think that just in

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1 those opening presentations, we have identified some
2 significant issues that will be discussed over the
3 next two days.

4 And I don't want to minimize the fact that
5 the time that you spend in breaks and lunch talking to
6 your colleagues, that is a very important time, as
7 important as what is going to be going around the
8 table. And that discussion will spark some of those
9 elevator conversations, so to speak. And so that is
10 great.

11 Dave Esh is going to talk about the
12 technical analysis, I guess is the formal term for it,
13 that was used and try to put that in perspective for
14 you in terms of what is going to be done in this
15 particular rulemaking.

16 We will break basically two times during
17 the presentation, the third time being at the end to
18 go out for clarifying questions and identifying
19 specific discussion topics that will happen also.
20 And, Dave, are you ready to turn it over to you and --

21 MR. ESH: Yes, sure.

22 FACILITATOR CAMERON: Okay. Great.

23 MR. ESH: All right. Thank you, Chip.

24 SITE-SPECIFIC PERFORMANCE ASSESSMENT AND
25 NRC DEPLETED URANIUM TECHNICAL ANALYSIS OVERVIEW

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1 MR. ESH: I am Dave Esh with the Nuclear
2 Regulatory Commission. My background, I had five
3 years of experience at Argonne National Lab and now
4 ten years of experience at NRC, primarily in
5 performance assessment, a lot of different types of
6 problems.

7 I have worked on complex decommissioning
8 sites; our high-level waste project; low-level waste,
9 obviously. And I am going to cover site-specific
10 performance assessment, our depleted uranium technical
11 analysis overview. Some of it may be a little
12 generic, but I wanted to give a full context for
13 everybody in the audience, regardless of their
14 backgrounds.

15 English is my first language, but you may
16 not be able to tell that unless you speak rural
17 Pennsylvanian.

18 (Laughter.)

19 MR. ESH: And I don't use talking points.
20 I like to wing it, which can be good and bad, but I
21 found that I don't think and read very well unless it
22 is something like *Green Eggs and Ham*.

23 So my overview here, I am going to cover
24 performance assessment generically and low-level
25 waste. That will be part 1 put together. Then we

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1 will have a little bit of a break so people have all
2 of their cards up. Maybe we can answer a few
3 questions in between there.

4 Then we will go over our analysis of
5 depleted uranium disposal. We will take another
6 little break and then what we thought were the key
7 issues that came out of that.

8 Now, to put this in context, this analysis
9 was done as part of the SECY paper to try to
10 understand what were the key variables for the
11 problem. But you don't need a complicated analysis to
12 say we need it to do something with 61.55(a)(6). You
13 can calculate those sorts of impacts on a sheet of
14 paper based on the concentrations and quantities
15 involved for depleted uranium.

16 But this issue is more generic than just
17 depleted uranium. Obviously we are here to talk about
18 depleted uranium, but we have to try to anticipate,
19 which we didn't do very well in the past what may be
20 future waste streams and what needs to be part of the
21 regulatory process to assure that we aren't here again
22 in 20 years when we find out, oh, there were some
23 other waste streams that we didn't think about the
24 last time we did the unique waste stream rulemaking.

25 So I want you to try to think specifically

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1 for depleted uranium but then also more generically
2 for all of the unique waste streams. And we are here
3 to get your input.

4 I heard a lot of people go around the
5 table and say, "Well, we want to know what is going to
6 be in guidance versus in the regulation." We would
7 like to hear from you. What should be in guidance
8 versus the regulation? That is why you are here.

9 We have experts here to give us their
10 input on some of what we think the key issues are.
11 Hopefully we end up with a combination of regulation
12 and guidance that provides all the essential criteria
13 but then provides some flexibility to evaluate these
14 different problems because they can be somewhat
15 different from site to site.

16 Okay. Part I, performance assessment and
17 low-level waste analyses. What is performance
18 assessment? Well, it is a systematic analysis of what
19 could happen and what is assessed. We assess what can
20 happen, how likely is it, what can result, how is it
21 conducted. We collect data. We develop scientific
22 models.

23 I am going to get a different pointer real
24 quick.

25 (Pause.)

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1 MR. ESH: Collect data, develop scientific
2 models, develop computer codes, analyze results. Why
3 use it? We look at the complex systems with it. We
4 want a systematic way to evaluate data. And it's a
5 generally internationally accepted approach. You have
6 its proponents and its detractors, obviously.

7 In the center here, this performance
8 assessment, it's a learning process. And it involves
9 the collection of data, development of models, running
10 and assessing those models, and developing confidence
11 in the models and the results. But it combines all of
12 these features, and this is the ultimate in job
13 security, a loop that never ends, right?

14 NRC would require performance assessment
15 to provide the site and design data; describe the
16 barriers that you are using to isolate the waste;
17 evaluate features, events, and processes that affect
18 safety; and provide technical bases for models and
19 inputs; account for variability and uncertainty; and
20 evaluate results from alternative models as needed.

21 An important point of this is that when we
22 look at a performance assessment, it is an explanation
23 of what you think is happening with your system. And
24 it should have enough detail to it to explain how your
25 model is working, how you think your site is working,

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1 what gives you adverse impacts, what gives you good
2 outcomes. It should be enough in there that it
3 basically explains your system and your site.

4 So in a more practical example, then, this
5 performance assessment you're taking a real system.
6 You're going to represent it with some mathematical
7 models or abstractions. And you're estimating some
8 future performance. That is the basic process.

9 Ultimately this estimated future
10 performance you hope is reasonably representative of
11 your real system. In this process and in the
12 low-level waste regulatory process, you do monitoring.

13 And you do other off-line work to help validate and
14 verify these mathematical models.

15 So our low-level waste framework, moving
16 out of the performance assessment generically and more
17 specifically into low-level waste, one of the
18 cornerstones of this system is stability. You want to
19 put the material at a place where you think it is
20 going to be stable and it is going to remain where you
21 want it to remain. You are trying to isolate the
22 waste from the environment and people. So you put it
23 in a low population area generally.

24 The sites have federal and state ownership
25 that allow for 100 years of institutional control. So

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1 you are hopefully controlling the site to limit access
2 to the material. Ultimately, though, we evaluate
3 public exposures to people near the site, people that
4 work at the site, and even somebody that may use the
5 site as you didn't intend.

6 This disposal site shall be capable of
7 being characterized, modeled, analyzed, and monitored.

8 So you can't put it someplace where you don't know
9 what is going to happen. You need to put it someplace
10 where you can at least feel you have some confidence
11 in knowing what is going to happen with that material
12 at that location.

13 The process involves site selection and
14 characterization, design and assessment, and site
15 control and monitoring. And all of those are linked
16 with each other. There is a very strong coupling
17 between these two boxes and weaker coupling between
18 the other one.

19 So in the part 61 EIS developmental
20 analyses that were completed in the early '80s, they
21 anticipated commercial low-level waste streams that
22 they did a lot of work to try to say, "What do we
23 think is going to go into one of these facilities?"
24 They developed waste types, isotopic distributions.
25 It was a way to try to assess, what do we think is

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1 going to go into a low-level waste facility?

2 Obviously based on this quantity of
3 depleted uranium, they didn't anticipate that. We
4 acknowledge that. That is why we are here. Four
5 reference disposal site environments were used,
6 ranging from arid or semi-arid to more humid
7 locations. And they evaluated the impacts to the
8 public through processes like environmental transport,
9 transport through groundwater.

10 I will show you a couple of slides here,
11 examples of what they did, what was done in the
12 low-level waste analyses.

13 Part of the process was the development of
14 a waste classification system. That waste
15 classification system, I like to think of it as it has
16 two functions.

17 One, it makes it easy for a generator or
18 somebody who wants to dispose of waste or a site
19 operator to know, how do I need to handle a particular
20 type of material that may be coming to my facility or
21 how does it need to be packaged and handled and
22 treated to dispose of?

23 Secondly, the waste classification system
24 provides some limit on the type of material that was
25 believed to be suitable for near-surface disposal. So

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1 you can either do that -- in this case, NRC did the
2 waste classification system. So they hard-wired what
3 they thought was appropriate for near-surface
4 disposal.

5 You could also take an approach, like DOE
6 does for a lot of their facilities. They do a
7 site-specific evaluation of what is suitable at a
8 particular disposal facility.

9 When this was developed, you can read the
10 regulatory basis. They evaluated whether they thought
11 they should go on a site-specific-type process or a
12 generic process. And there were pros and cons to
13 each.

14 Basically they thought, "Well, we are
15 going to have a lot of disposal sites. We should
16 probably do this generically and just apply it to
17 all."

18 Well, it turns out that probably wasn't a
19 good assumption either. There aren't a lot of
20 disposal sites now. So that begs the question of
21 whether you should be using a generic approach or
22 whether you should be using a more site-specific
23 approach.

24 Ultimately the waste classifications that
25 were derived for this waste classification system were

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1 primarily based on inadvertent intruder exposures but
2 not entirely.

3 So if we dig down into one of the
4 pathways, water pathway receptors, this is a
5 representation of disposal area, broken up into
6 disposal cells. And then the concept was there was a
7 buffer zone around the disposal area and a site
8 boundary. And they evaluated groundwater impacts at a
9 variety of locations, an individual well right next to
10 the facility, a boundary well, population well, and
11 then a population surface water.

12 This is trying to take releases from the
13 low-level waste and calculate a groundwater impact to
14 a receptor. That is the approach that was used in the
15 early 1980s.

16 As Dr. Ryan said, things have evolved
17 quite a bit. We have maybe some new tools. But he is
18 probably not aware that our government-issued
19 computers are still TRS-80s.

20 (Laughter.)

21 MR. ESH: The low-level waste groundwater
22 analyses here, this is then taking that previous slide
23 and representing it as a mathematical model. This is
24 a representation using analytical or semi-analytical
25 solutions to develop what the groundwater impacts

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1 were.

2 Of course, today we have numerical models,
3 and we can do all sorts of fancy things. It doesn't
4 mean it is better. I don't know if it is better. But
5 we can certainly do more sophisticated calculations.

6 Ultimately, though, you need enough
7 information to support your calculations and justify
8 them. So if you have limited information to support
9 your calculations, maybe a complicated model isn't
10 justified, a simple model is sufficient. If you have
11 a lot of information to constrain or support your
12 calculations, then certainly a more complicated
13 calculation would be justified.

14 And then another key aspect of this
15 low-level waste analyses and one of the reasons why we
16 advocated the approach that we did in the SECY paper
17 to the Commission was this idea of the site-specific
18 behavior.

19 What I have done is I have taken
20 retardation coefficients -- and our geochemist is
21 trying not to jump out of his chair here now, but in
22 the early 1980s, basically they took retardation
23 coefficients. They assigned them for a variety of
24 different sites. And they assumed different values
25 for those sites. That was put into the low-level

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1 waste analyses to represent site-specific behavior at
2 different sites.

3 Now, some more modern information here.
4 This is from a Sheppard and Thibault reference, which
5 is a compendium of distribution coefficients and
6 different material types and environments. But
7 basically you can convert the distribution coefficient
8 to a retardation factor so that it is an
9 apples-to-apples comparison.

10 And if you take the data from this
11 compendium and you calculate a retardation factor, you
12 can see that the ranges that you have in the more
13 modern data are quite a bit more broad than what were
14 used in the analyses in the 1980s. That is not an
15 unanticipated result. If you have a lot of
16 information and there is a variability, you get a
17 broader range of data.

18 The implication is that a site that has a
19 retardation factor of one for strontium may have
20 unacceptable performance and one that has a
21 retardation of 1,400 may have acceptable performance.

22 So this variability can greatly impact the
23 calculations at a specific site. So this is just an
24 example from geochemistry. It is a crude example from
25 geochemistry, but I think it emphasizes the point.

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1 The site-specific behavior can have a
2 large impact on the results. So whether you use a
3 site-specific approach or a generic approach, either
4 way the analysis has to be technically sound. But you
5 may be doing yourself a disservice in some cases if
6 you use a generic approach and you have a lot of
7 variability. That is the point of this slide.

8 So that is the part I. I think we can
9 stop. And then if people have questions, we will do a
10 few questions. Then we will move on to part II, the
11 depleted uranium and the NRC analyses that we did for
12 the SECY paper.

13 FACILITATOR CAMERON: Okay. Thanks, Dave.

14 I am just going to hold questions to the
15 table at this point. And at the end of Dave's
16 presentation, we will go out to all of you in the
17 audience. Anybody have a question on the first part
18 of the presentation?

19 (No response.)

20 FACILITATOR CAMERON: Okay. Great. Dave,
21 why don't you proceed.

22 MR. ESH: All right. Part II, depleted
23 uranium and the NRC analyses. I am going to cover
24 some problem contexts so we are all on the same page.

25 I want to talk a little bit about uranium and radon,

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1 uranium geochemistry, scenarios and receptors, and
2 period of performance. These latter things were all
3 important elements of the depleted uranium problem.

4 As you can envision, if we are trying to
5 develop a rule for unique waste streams, we might be
6 able to do pretty well specifying the technical issues
7 that we need to cover either in regulation or guidance
8 space for depleted uranium. But for other unique
9 waste streams, both that you have to anticipate what
10 those waste streams may be, it may be a little bit
11 more challenging. So your job here today is harder
12 than you probably anticipated.

13 The nuclear fuel cycle, these are just a
14 couple of pictures to show where depleted uranium
15 comes from. It comes from the fuel cycle process and
16 the enrichment of uranium.

17 And then in the enrichment process, it is
18 a byproduct of it. These are figures that come from
19 our fuel cycle Web page. And there is a lot more text
20 to go with it.

21 So any of you that want to get some more
22 familiarity with the fuel cycle and where depleted
23 uranium comes, that is where you can find it.

24 So the depleted uranium disposal, the
25 problem context, large quantities of uranium were not

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1 evaluated in the EIS for the 10 CFR part 61. But
2 uranium was evaluated. Basically they evaluated about
3 17 curies of uranium-238 and 3 curies of uranium-235.

4 And that was in roughly one million cubic meters of
5 waste. So that gives you an idea of quantity and
6 concentration that they assessed.

7 Looking forward, the quantity of depleted
8 uranium that may be generated could be as large or
9 larger than 470,000 curies of ²³⁸U just for a
10 comparison point. So it is significantly larger than
11 they anticipated.

12 When they did the analysis in the '80s and
13 they made the decision, "We don't need to put uranium
14 in the classification tables because we don't have a
15 lot of it. So we don't need to worry about it," well,
16 if you have a lot of it, well, then maybe you need to
17 assess it. You need to ensure that either it's
18 assessed appropriately or it's reflected in the
19 classification tables but in some way that it is
20 reflected in the technical framework that you are
21 trying to evaluate safety against.

22 So uranium and the environment, well,
23 uranium and surface soils, this is just the United
24 States. It is roughly one to five parts per million
25 in soils, although in farmland, for instance, where

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1 you apply fertilizer, it can be up to, say, 15 parts
2 per million or maybe even 30 parts per million.

3 Uranium in surface soils results in radon
4 in the atmosphere. Radon is a decay product of the
5 uranium decay chain. Of about .25 picocuries per
6 liter more or less, indoor radon levels are a bit
7 higher than the mean atmospheric calculations because
8 it decays very quickly.

9 It diffuses into your basement or into
10 your house. And there is less dilution indoors.
11 Basically you can get a higher concentration indoors
12 and outdoors, it is pretty typical. And this is a
13 pretty good rough ratio that you usually see.

14 But individual houses, for instance, in
15 Pennsylvania, where I live, there were some houses
16 that were 800 picocuries per liter or maybe even a few
17 thousand picocuries per liter.

18 So there is a lot of variability in the
19 environment of uranium. The radon transport is very
20 much influenced by the environmental conditions and
21 the presence of discrete pathways. So that is why you
22 can get a lot of variability from, say, one house to
23 the next or one area to the next.

24 As an aside, you should all have your
25 houses checked for radon if you have not. Radon

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1 contributes roughly 70 percent of the average annual
2 dose in the United States, more or less 250 millirem
3 per year.

4 So then a source comparison here. This is
5 to give some context of how does the depleted uranium
6 compare to other things that we have some idea about
7 or at least had some idea of how they are managed
8 right now.

9 Well, we have uranium mill tailings that
10 come from the mining of the uranium ore. They roughly
11 have much, much less than one percent uranium oxide in
12 them in the U.S. In other places, it can be
13 significantly higher.

14 There are some mines in Canada where the
15 ore in the ground is about 70 weight percent uranium
16 oxide. So their tailings are very high in uranium
17 oxide also. And it is a management issue and problem
18 for them.

19 In the U.S., much, much less than one
20 weight percent uranium oxide, which then the daughters
21 are observed to be roughly 26 to 400 picocuries per
22 gram for a radium-226 and maybe 770 to 600 picocuries
23 per gram thorium-230. That is what they see in
24 uranium mill tailings in the U.S.

25 By comparison here, depleted uranium, it

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1 has maybe about 40 weight percent uranium oxide as
2 disposed. So that is if you take into account how it
3 is packed into containers, how those containers are
4 put into a disposal facility and the use of space
5 between disposal cells. It will be something like
6 that, on that order.

7 It starts off relatively free of
8 radium-226, a daughter product that eventually gets
9 you to the radon. It starts off pretty free in
10 radium-226. At about 1,000 years, it is fairly
11 similar to mill tailings. And then at much longer
12 times, it could be significantly more concentrated if
13 you have no loss from the system.

14 So this is just a theoretical calculation
15 of how much build-up you could get without loss. Of
16 course, if you had loss, that would change the
17 numbers. It would make this lower. And it would
18 shift it earlier in time. So this is just a
19 theoretical decay calculation of what you build up or
20 what you could have over time.

21 Now, to compare depleted uranium to other
22 low-level waste, this is an activity ratio of depleted
23 uranium to 20 years of a commercial low-level waste
24 stream. It starts off that the depleted uranium has
25 much lower activity on a relative basis because the

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1 commercial low-level waste is generally high and it
2 has short-lived high specific activity material in it.

3 So it is only about 1/30 of the activity.

4 Over time, then, the low-level waste
5 decays pretty rapidly, most of the short-lived
6 component. It does have a long-lived component to it.

7 We will show that in some figures coming up.

8 The short-lived activity all comes out,
9 and depleted uranium gets the daughters in-growing. I
10 think we had that comment from Peter Burns I think
11 about the decay products and how much this specific
12 activity can change over time.

13 But, then, eventually there is a big
14 long-lived component to the depleted uranium. So you
15 get a higher relative value compared to a normal
16 low-level waste stream.

17 So what did we do in our analyses? Well,
18 we had a screening model developed for SECY-08-0147.
19 And we had the comment about, well, the screening
20 model wasn't conservative. Therefore, it is invalid.

21 I would agree that the screening model
22 wasn't conservative. The screening model was intended
23 to analyze the problem and look at how key variables
24 may impact the outcome, but it was not to say that the
25 outcome is X.

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1 So it gives you a range of outcomes over a
2 range of key variables. And we think it was
3 sufficient to make the decision of we needed to modify
4 the regulation to handle, basically the regulation
5 that said anything that is not in the table can be
6 considered class A.

7 You don't need a complicated calculation
8 to say, "Okay. Yes. That doesn't work if you
9 significantly change your source or it may not work if
10 you significantly change your source." You can do
11 that calculation on a sheet of paper. You don't need
12 a complicated model for it.

13 We actually used this model, though, to
14 help develop what we thought were some of the key
15 issues, specifically for depleted uranium. So that
16 when we get into this step of the rulemaking process,
17 we have both that evaluation, we have the input from
18 the people here, and we can do a much better job at
19 stage one of the rulemaking process so that everybody
20 is on a more firmer footing or at least common ground
21 as what we think some of the key issues were.

22 For the people here at the table and the
23 people in the audience, though, we do want to know, is
24 our list of issues comprehensive, is there something
25 on the list that shouldn't be there and then this

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1 issue of is it something that is an issue that demands
2 placing in the regulation, as opposed to placing in
3 guidance. Those are things that you need to consider
4 and that we're seeking your input on.

5 So we developed it to examine key
6 variables. Some of the ones that we looked at or
7 ended up at were period of performance, disposal
8 depth, receptor types and scenarios, and site
9 characteristics.

10 We did this probabilistically just because
11 we have more modern tools that allow us to use that
12 capability. We thought we should. And the analysis
13 methodology for unique waste streams, though, was
14 consistent with the original part 61 analysis.

15 So why did we do that? Well, we wanted to
16 do an apples-to-apples comparison. So if we are
17 trying to look at depleted uranium or some other
18 unique waste stream and we are trying to make a
19 judgment about changing the regulation or changing a
20 concentration table or whatever the case may be, we
21 felt we needed to do an apples-to-apples comparison in
22 order to accomplish that. So we used that previous
23 methodology.

24 There are people who believe that that
25 methodology is dated, that you should do something

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1 more modern, there may be a different methodology.
2 That is a good input to our process, but for this
3 stage of the process, we wanted to be consistent with
4 the old methodology, even though we deviated, we used
5 a probabilistic analysis. We used some updated
6 dosimetry, that sort of thing.

7 So our analyses, the receptor scenarios,
8 they were consistent with what was done in part 61.
9 You have a resident that lives near the facility but
10 not on the facility. They had a house with a
11 basement. They had a garden. They used the well they
12 could potentially get contaminated water from. And
13 they had all the various pathways associated with this
14 scenario, all the main pathways.

15 Then in the chronic intruder evaluation,
16 they can potentially -- it was both acute and chronic
17 intruder, but the chronic intruder was more limiting.

18 They can potentially build their house
19 over the facility, where in this case for depleted
20 uranium, they can get diffusion of radon into their
21 house. You can get diffusion of radon into the
22 environment.

23 For the person who builds their house next
24 to the disposal facility, you get diffusion of radon
25 into the environment and then transport to the

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1 location where they have their house. Then you also
2 have potentially leaching of uranium from the source
3 into the groundwater and exposure to the people.

4 So maybe you are encouraged by the
5 crudeness of my figure here that we don't spend a lot
6 of time making fancy drawings. On the right is just a
7 picture conceptually. I don't intend for you to be
8 able to see it.

9 We have to take these sorts of conceptual
10 frameworks and make it into a mathematical
11 representation. We used the commercial software
12 package GOLDSIM just because we are familiar with it.

13 We can do probabilistic analyses. We can do things
14 much quicker than we probably could if we were
15 writing, say, a FORTRAN program. But we used it to
16 make a mathematical representation of the problem and
17 assess what the impacts were for the various types of
18 receptors.

19 So this is a picture of a screen snapshot
20 of what that modeling software if you start getting
21 into it looks like. If you purchased a license for
22 GOLDSIM and you opened it up, none of this would be
23 here. It is a blank sheet that you can just make
24 whatever you want on it. It doesn't have to be a
25 low-level waste or radioactive waste model. You can

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1 do any sort of calculation on it.

2 So we had to build this calculation in
3 here using the basic building blocks that are supplied
4 in GOLDSIM. And it is good for this sort of analyses
5 where you are trying to get first-order type of ideas.

6 It may be good for site-specific analyses,
7 too, but if you needed to do a detailed groundwater
8 model, say a 3-D groundwater model, GOLDSIM wouldn't
9 be the right tool for that. It doesn't have strong
10 dimensional capabilities in it, but it is good for
11 this sort of analysis or we thought it was good for
12 us.

13 The major variables, period of
14 performance, disposal depth, receptor scenarios. We
15 did uncertainty analysis. We use a genetic algorithm
16 technique. It seems to work well for these sorts of
17 problems where you get a whole bunch of uncertain
18 inputs and you are trying to sift through them and see
19 which ones are driving the output. It seems to be
20 pretty powerful at being able to really cleanly tell
21 you which ones are driving the output without getting
22 some spurious correlations and those sorts of things.

23 The key parameters that we found with that
24 analysis, they were related to the water pathways,
25 hydraulic conductivity and gradient of the aquifer.

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1 That greatly influences the dilution that you get in
2 the problem.

3 Infiltration rate, which affects the
4 release rate and also then the amount of dilution that
5 you get in the groundwater system; and geochemical
6 conditions, which affect both the release rate and the
7 transport rate from the facility. So these are all
8 water-related types of important parameters.

9 And then down at the bottom here, liquid
10 saturation and properties of the house in this
11 scenario, those are radon-related. So those were the
12 drivers of the radon pathway calculations. We will
13 hopefully talk about those in more detail when we have
14 our specific round table discussions on each of these
15 topics.

16 So, then, what does the output look like
17 from this sort of process? Well, in this case we
18 developed a table that is a percent of realizations
19 that met our regulatory limits. So what does this
20 mean? I have a whole bunch of numbers on there. I
21 don't know what this means.

22 Well, okay. A hundred percent of the
23 realizations met the regulatory limits for an arid
24 disposal at 1,000 years for all pathways in these
25 calculations for a resident receptor.

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1 For a chronic intruder at this sort of
2 disposal, very few of the realizations met the
3 regulatory limits. This was applying a 500-millirem
4 dose to the chronic intruder and a
5 25-millirem-per-year dose limit to the resident.

6 So in shallow disposals, radon caused
7 problems for the chronic intruder. And it also caused
8 problems at both one meter and three-meter depth. As
9 you got to a deeper depth, then that was enough to
10 knock down your radon.

11 But, even at longer times, a key variable
12 was, of course, the performance period that you
13 evaluate. These sort of things get more challenging
14 as you go out in longer times. And that is because of
15 the decay and in-growth of the daughter products from
16 the uranium decay chains.

17 Uranium causes dose impacts, but the
18 daughters are generally much harder to manage. So
19 lead-210 is a difficult one. And eventually in the
20 water pathways, radon is a challenge and an inhalation
21 or an air pathway.

22 But then, even for a humid site, you get
23 kind of the opposite effect. When you have a lot of
24 moisture in the system, the radon transport can be
25 knocked down sufficiently. But then you start seeing

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1 effects in the groundwater pathway.

2 It can take a long time for those effects
3 to show up, though. It depends on the geochemistry,
4 the aquifer characteristics, gradient, et cetera.

5 The groundwater pathways can affect both
6 the resident and the chronic intruder. But you will
7 notice here for area disposal five meter depth, even
8 longer times, about half the site conditions could
9 meet the criteria and about half couldn't.

10 So this isn't an easy problem. It is not
11 simple and straightforward to do an assessment for one
12 of these problems. And you have competing processes.

13 The results can be very variable based on
14 the site conditions. So for this problem in
15 particular, it kind of at least nudges you in the
16 direction of maybe you should be doing a site-specific
17 evaluation and not doing something generic. But that
18 is for part of the rulemaking process to decide.

19 These are not doses. These were percent
20 of realizations that met the regulatory limits. That
21 is because in these analyses, we had to try to
22 represent a lot of different sites and a lot of
23 different site conditions. So we basically made the
24 decision to treat variability or aleatoric uncertainty
25 as real as epistemic uncertainty.

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1 So that basically means that it varied
2 from realization to realization, but it was not
3 variable within the assessment within a realization.
4 And that can have an impact on your results.

5 In a real disposal system, you should
6 represent that variability that you have at your site.

7 What that means is, then, when you have the site,
8 say, with moisture that is very low in an arid site,
9 then you would be in the range of having trouble
10 meeting the radon performance objective, where if you
11 had a wetter arid site if that makes sense, that would
12 be one that has a higher likelihood of meeting that
13 performance objective.

14 So if radon is included in the regulatory
15 limits for the dose assessment, then shallow disposal
16 at an arid site can be challenging. For humid sites,
17 the groundwater pathway can exceed the performance
18 objectives. And for this sort of material, generally
19 you would need to consider in more detail the
20 long-term stability of the disposal system.

21 Typical commercial low-level waste is
22 decaying very rapidly to levels that generally don't
23 pose an undue risk. So something that lasts a lot
24 longer, then you get into this long-term stability
25 issue.

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1 But as part of the NRC's low-level waste
2 regulations, it requires stability. It requires
3 stability of the disposal system. You can't avoid it.

4 But the bottom line is that the site-specific
5 conditions can result in a large variance in the
6 impacts.

7 So I guess we will stop there and see if
8 anybody has questions at this point.

9 FACILITATOR CAMERON: Great. Great.
10 Thank you. Thank you, David.

11 Do we have some questions on what was
12 presented during that frame? Bill?

13 MR. DORNSIFE: In your screening analysis,
14 did you assume zero erosion, no erosion?

15 MR. ESH: Yes. We didn't evaluation
16 erosion in the screening analysis because we made the
17 assumption that if this is a low-level waste facility,
18 it needs to meet the 61.56 stability requirements.
19 And it needs to meet the siting characteristics
20 regarding site selection and stability.

21 So that was one reason. The other reason
22 was we got a broad range of impacts that said
23 potentially acceptable to unacceptable. If we added
24 in the erosion evaluation, we anticipated we would get
25 a similar result, that we would get potentially

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1 acceptable to unacceptable results with the erosion
2 process.

3 We didn't need to carry it forward at this
4 stage of the process. In the rulemaking process and
5 in the associated guidance, for something that lasts a
6 long time, you have to deal with stability. And the
7 issue is whether you do that in a quantitative,
8 semi-quantitative, or qualitative way depending on the
9 time period that you are looking at.

10 MR. DORNSIFE: Well, in terms of obviously
11 our future discussions, you know, if you are talking a
12 million years of analysis, I mean, we're talking
13 climate change and everything else. And this is a
14 critical issue.

15 MR. ESH: Yes, it certainly is a critical
16 issue. I don't dispute that.

17 FACILITATOR CAMERON: Okay. Thank you,
18 Bill.

19 Let's go to Peter and then Mike and then
20 Arjun and Felix. Peter?

21 MR. ESH: Just all put them up.

22 MR. BURNS: I don't have a question but,
23 rather, a comment. And it is along the same lines as
24 part of what Bill said. I was kind of amused in a way
25 looking at the 1,000, 10,000, 100,000, and a

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1 million-year time frames and the zeroes and the 100s
2 and so on.

3 I was particularly amused by the climatic
4 divisions, none of which can be relied on, even
5 perhaps at 1,000 but certainly not in 10,000 or
6 100,000.

7 As an example, I am a geoscientist. So I
8 have this rare ability to see into the far distant
9 past.

10 (Laughter.)

11 MR. BURNS: And I know, for example, that
12 Death Valley was filled with about 1,000 feet of water
13 10,000 years ago. And that tells you how much the
14 climate can change in the arid regions.

15 So it is merely a comment. And I am sure
16 we will be back into this topic later in the afternoon
17 because I "Time Period of Performance" in there. And
18 that is all I had to say.

19 MR. ESH: Yes. We imagine we can cover
20 that in hopefully a lot of detail then. That is a
21 good comment.

22 FACILITATOR CAMERON: Thank you. Thank
23 you, Peter.

24 Michael?

25 MR. RYAN: Dave, thanks for getting us

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1 started on some of the technical details. We
2 appreciate that approach. I appreciate the approach
3 you have taken in getting us started on the technical
4 detail discussion.

5 A couple of points. We now talk about 600
6 millirem per year for medical exposure. The ICRP
7 reports updated us on that. So it is a much bigger
8 number and a lower percentage of radon. I don't know
9 if that makes you happy or sad, but it is a lower
10 proportion of the total.

11 I guess my second comment is the table
12 that we just went through that you just had another
13 comment on, it would be interesting to get some
14 insight as to what the uncertainties really do to that
15 table.

16 Does it just really make it -- I mean,
17 this is a calculational result. I understand the use
18 you are putting to it, but we have got to I think
19 remind folks that that doesn't have any analysis of
20 uncertainty. And, in fact, it could be all one
21 answer: real short and real long. You know, there
22 could be really two bins of results there.

23 So maybe you are going to talk about this
24 later on. And if you are, that is fine, even
25 tomorrow. How do you deal with uncertainty in these

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1 long-range predictions? And how do we make sense of
2 that, both in terms of where you are ending up with a
3 new regulation or guidance or whatever it might be?

4 And then how should folks deal with that
5 from a technical perspective, either as an applicant
6 or a site regulator, to say, you know, with confidence
7 that they don't understand the behavior of these
8 materials in the future?

9 That is sort of one area. The second one
10 is in the longer haul, I am guessing for this you
11 assume just waste in dirt. At some point there is
12 waste packaging and other things you can do to waste
13 to further sequester it in the environment, at least
14 for some reasonable period of time. Maybe that is
15 1,000 years and maybe even 10,000 if you are in the
16 right setting with the right material.

17 MR. ESH: Yes.

18 MR. RYAN: Are you going to talk a little
19 bit about those kind of things that might influence
20 the outcome of your analysis?

21 MR. ESH: Yes. Your second point first.
22 Yes, a good comment. We didn't solely just look at
23 depleted uranium in dirt, though. We looked at
24 variability in the form. So maybe different forms
25 could be disposed of, different oxide forms, or if you

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1 stabilize the material with grout, for instance, how
2 that may impact both emanation of radon and the
3 geochemistry for transport.

4 So we looked at some variability in the
5 engineered things you could think about doing but not
6 a lot.

7 MR. RYAN: Okay.

8 MR. ESH: We didn't really need it for
9 this stage of the process. But yes, if you are
10 dealing with a challenging problem, hopefully you
11 would look to your engineers for part of that
12 solution.

13 But then the second or your first comment,
14 I would say that performance assessment does not make
15 your decision for you. The decision-makers have to
16 make that decision. The performance assessment should
17 communicate the uncertainty. But then the
18 decision-makers have to make the decision.

19 So it is a good comment. I think you have
20 to clearly work in these problems to address the
21 uncertainty. Peter's comment about the variability or
22 the silliness of assuming the climate condition for an
23 extended period of time, yes, that is part of the
24 process.

25 I think you need to consider the

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1 variability in your climatic conditions, particularly
2 if they can drive your results, both in terms of
3 variability, site-specific variability and long-term
4 variability. You don't get to avoid it just because
5 it is hard.

6 MR. RYAN: I think you hit the nail on the
7 head, but I would request that when the documentation
8 of guidance comes along in this process, which is
9 years in the making, that some of those insights that
10 you have gained by developing the background for any
11 change in rulemaking and the tools and techniques and
12 the transparency of all of those calculations would be
13 something that you help to convey to folks who are
14 going to have to be making applications.

15 So it is not just the answer that counts,
16 which you have said clearly. It is how did you get to
17 the answer and how could that vary based on a wide
18 range of issues.

19 And if you could convey through the
20 GOLDSIM tool or anything else that gets developed to
21 use, I think that would be a really big step forward
22 in what the agency could do for the users and the
23 licensees or applicants.

24 MR. ESH: Yes. If we use calculations in
25 the rulemaking, they will be fully documented,

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1 available for stakeholder review, hopefully explained
2 in sufficient detail that somebody could replicate
3 them, understand them, verify them, whatever is
4 needed.

5 MR. RYAN: Right.

6 MR. ESH: But in this rulemaking process
7 also, where we are trying to decide on what needs to
8 be done for a rule change and what needs to be
9 developed in a guidance document, a lot of that might
10 not be calculation, right? That is technical
11 information that may come from people like Peter and
12 Stephen --

13 MR. RYAN: Sure.

14 MR. ESH: -- that end up in a guidance
15 document. That has nothing to do with the
16 calculation. So we have examples of that in a variety
17 of our regulatory processes, where we have technical
18 documents that provide, say, review criteria and
19 procedures, that sort of thing, that aren't relying on
20 a calculation. You know, there's technical
21 information that you need to develop something in a
22 licensing process.

23 MR. RYAN: Thanks.

24 FACILITATOR CAMERON: And, Dave, before we
25 go to Arjun, let me just ask you a process question.

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1 I think it is pretty clear where Peter's comment will
2 be discussion, "Period of Performance." In terms of
3 Mike's comments about uncertainty and waste packaging
4 and things like that, what agenda topics are most
5 appropriate for the discussion of those two items?

6 MR. ESH: Well, we have source term
7 issues, I think, where we could cover the engineering
8 or the source term part.

9 FACILITATOR CAMERON: Okay.

10 MR. ESH: The uncertainty really overlays
11 all of it. So people need to be thinking in
12 uncertainty mode when we are discussing each of the
13 topics.

14 And there is not just one way to handle
15 that. You know, we do probabilistic analyses. We
16 also do deterministic analyses. If you can do
17 conservative deterministic analyses that you can
18 support, that may be very much sufficient for a
19 licensing process, just as well as a probabilistic one
20 is.

21 So we don't demand or dictate a certain
22 approach. We allow people the flexibility to
23 generally do it a couple of different ways as long as
24 it is technically supported.

25 FACILITATOR CAMERON: Great. Arjun, let's

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1 go to you.

2 MR. MAKHIJANI: Yes. I have lots of
3 questions, but I will just, you know, put forth a few
4 of them with some comments. And maybe I can go after
5 Bill goes the second time or second round.

6 If you agree with Dr. Burns' comment that
7 your analysis, you agree with Dr. Burns' comment that
8 your analysis, is not valid in the conditions of
9 climate change?

10 MR. ESH: I agree that the climate
11 variation can impact the results, but it wouldn't
12 necessarily change the conclusion that you need to
13 make a change to the regulation to address unique
14 waste streams.

15 MR. MAKHIJANI: But the condition that I
16 am talking about is if you go from arid to wet, then
17 under all circumstances, your dose limits would be
18 exceeded. And so the kind of rule change that we
19 would be considering would be much more drastic than
20 what we are actually discussing.

21 MR. ESH: I understand your comment. I
22 don't think it is as simple as that. If you have
23 variability and conditions, either on a local basis
24 spatially and temporally, or on a broader scale
25 spatially or temporally, I could anticipate that you

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1 could get results that span those outcomes.

2 It is not predetermined that you would end
3 up with unacceptable outcomes under all of those
4 conditions. I don't think the problem works that way
5 necessarily.

6 MR. MAKHIJANI: Well, if you didn't look
7 at it. And you just described the silliness of
8 assuming -- that was your word -- the silliness of
9 assuming a constant climate. And what I gather from
10 that is the Commission's taking this SECY paper in
11 which their technical staff has described one of their
12 key assumptions as silly and made a pretty momentous
13 decision based on that when in your own analysis,
14 humid conditions were shown to be unacceptable.

15 MR. ESH: Well, okay.

16 MR. MAKHIJANI: That is just a comment.

17 MR. ESH: But, as I said, you don't need
18 an analysis to make the decision that we have made in
19 this step of the process.

20 MR. MAKHIJANI: No. It is not --

21 MR. ESH: So what is the relevance of
22 that?

23 MR. MAKHIJANI: The relevance is that the
24 technical basis that was presented to the Commission
25 for it to make its decision did not -- that one of the

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1 key assumptions was described by you as silly. Maybe
2 the Commission should know that, and they might want
3 to revisit it.

4 My second question is very straightforward
5 and factual. You calculated only TEDE. You did not
6 follow the subpart C requirement of calculating dose
7 to the most exposed organ, which in the case of
8 lead-210 and drinking water would be the bone surface.

9 And your dose results from drinking water in that
10 case would have been about 30 times bigger.

11 Why did you not follow the subpart C
12 requirements in doing your dose assessments and
13 preparing that table?

14 MR. ESH: Primarily because in more recent
15 evaluations; in particular, for waste incidental to
16 reprocessing, we have had direction from the
17 Commission to use more modern methods, instead of
18 those old methods. So we followed that direction.

19 MR. MAKHIJANI: Is there something more
20 modern than -- it is not a question of modern or not
21 modern. I mean, we do have organs. That hasn't
22 changed in modernity. I mean, human beings have
23 organs.

24 MR. ESH: But in terms of whether you
25 specify the dose criteria in terms of TEDE or in organ

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1 doses, the more recent direction that we had in lieu
2 of calculating the organ doses and other projects, we
3 have calculated the TEDE.

4 MR. MAKHIJANI: But you are only proposing
5 to modify subpart C?

6 MR. ESH: Not at this time, no.

7 MR. MAKHIJANI: Yes. So this rulemaking,
8 we are only proposing to modify 61.55(a)(6). It is
9 not proposing to modify subpart C. Yet, you chose not
10 to follow subpart C in your technical calculations,
11 even though the dose under subpart C properly
12 calculated from drinking water would have been 32
13 times bigger to be precise under the most modern
14 guidance published by the EPA, FGR-13.

15 MR. ESH: That is a good comment.

16 FACILITATOR CAMERON: Okay.

17 MR. MAKHIJANI: Well, I'll leave it --

18 FACILITATOR CAMERON: I don't want to get
19 into --

20 MR. MAKHIJANI: I'll leave it there.

21 FACILITATOR CAMERON: I want to save these
22 issues for discussion. Michael, do you have a quick
23 clarification on this for us?

24 MR. RYAN: Just a point of information.

25 FACILITATOR CAMERON: Yes?

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1 MR. RYAN: Just a point of information.
2 There is a rulemaking initiative -- and I don't know
3 at what stage it is -- where Don Cool and folks are,
4 in fact, gathering information about the more modern
5 methods of dosimetry. And they are beginning
6 evaluation process to look at that formally within the
7 agency.

8 I was aware of it because of a briefing
9 you gave to the ACRS. So I just want to point out
10 there is an activity at least underway to look at the
11 more updated ICRP dose methods and so forth.

12 FACILITATOR CAMERON: Thank you.

13 MR. MAKHIJANI: I just want to put
14 something up on your parking lot there that the
15 Commission should clarify whether we are going to
16 follow subpart C or revise it and whether the
17 calculational modeling done in this process will
18 follow subpart C or not because so far they have not.

19 FACILITATOR CAMERON: Okay. We are going
20 to put that in the parking lot. And we will find a
21 place to discuss it.

22 MR. ESH: I don't remember in the
23 direction in the SECY paper for the long-term
24 rulemaking whether they said to use the more modern
25 dosimetry methods. I think they told us that in

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1 addition to -- they are pointed in that direction. I
2 mean --

3 MR. MAKHIJANI: It is not a question of
4 more modern or not.

5 MR. ESH: It says it in the direction of
6 where we are going to go forward. So I don't see how
7 we avoid that.

8 MR. MAKHIJANI: Does that mean you are
9 going to revise subpart C? It is a very simple
10 matter. If we are here to talk about revision of
11 61.55(a)(6), let's talk about that and follow subpart
12 C.

13 If we are here to revise subpart C, then
14 that ought to be put on the table properly. But it
15 hasn't.

16 MR. ESH: We are here to talk about that
17 first step and the second step. The second step, the
18 direction from them is that we are proceeding in that
19 direction.

20 MR. MAKHIJANI: But that hasn't been put
21 on the table anywhere explicitly that we are
22 proceeding in the direction of revising subpart C.
23 This is a complete surprise.

24 MR. ESH: You can read the SECY paper
25 where they give us direction with respect to this

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1 topic.

2 MR. MAKHIJANI: Well --

3 FACILITATOR CAMERON: Okay. Arjun, I
4 think you are putting it on the table.

5 MR. MAKHIJANI: Yes.

6 FACILITATOR CAMERON: Okay? So it is in
7 the parking lot. And there may be a simple way to
8 clarify this in terms of maybe modern isn't the exact
9 way to characterize it. But evidently it does need to
10 be put into some context to see if there is a huge
11 conflict in terms of revising subpart C.

12 So we will go there. I would just note a
13 couple of other things, that you gave a very clear
14 explanation of what the intent, the objective of the
15 screening model and purposes of the technical analysis
16 was.

17 And I think that everyone, as you pointed
18 out -- and this is Arjun's point, too, that in going
19 forward, rather than looking at the technical
20 analysis, in going forward, then the screening models,
21 everything has to be a lot more rigorous.

22 The point about the Commission's decision
23 to do site-specific and then long-term classification,
24 I think Arjun's point will be noted in the material
25 information that is provided to the decision about

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1 whether they had particular pieces of information on
2 which to make their decision and further discussion.
3 I just wanted to try to put this in context.

4 Felix?

5 MR. KILLAR: Yes. I just had a couple of
6 questions about how you went about developing your
7 model. Did you have any consultation with EPA in the
8 way that they developed their performance assessment
9 models for hazardous waste sites?

10 MR. ESH: No.

11 MR. KILLAR: Will you have some
12 discussions with them along those lines?

13 MR. ESH: I anticipate that if we need to
14 do calculations in the looking-forward rulemaking, the
15 rulemaking process, step one or step two, but we are
16 hoping to get input from any group that would
17 positively influence that process, so yes, EPA, your
18 institution, licensees, whomever.

19 MR. KILLAR: I think if you look at
20 subpart C, subpart D hazardous waste sites, they have
21 similar issues that we have right now. And from a
22 policy across the board, we need to make sure that all
23 of them are protected to the appropriate level of
24 safety for the protection of the public.

25 When you start getting to the question

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1 that we just talked about, the 10,000 years and what
2 is under water and what is not under water, the
3 hazardous waste site that is adjacent to the low-level
4 waste sites could be flooded just as well as the
5 low-level waste site if that is the assumption you are
6 going to make.

7 So we need to as a policy across the board
8 look at that. I don't know if the NRC should be
9 dictating those directions. It is something to take
10 into consideration as you go forward.

11 MR. ESH: It is a good comment. NRC has a
12 different approach to waste disposal than EPA does in
13 the chemical regime, different regulatory frameworks.

14 And yes, they have different implications for how you
15 assess them or how you evaluate them.

16 FACILITATOR CAMERON: Thanks, Felix.

17 Let's go to Bill and then see if Arjun has
18 one more. And then let's go to the third part.

19 MR. DORNSIFE: Well, I would just note on
20 your comment, Felix, that there is no performance
21 assessment required for hazardous waste sites. It is
22 a standard-based regulation. So you don't do a
23 performance assessment for a hazardous waste site.

24 On the issue of uncertainty, I could
25 easily argue that there is 100 percent probability

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1 that the uncertainty goes to 100 percent with 1,000 or
2 10,000 or 20,000 years for certain sites when the next
3 Ice Age occurs.

4 MR. ESH: Yes. I agree that the
5 uncertainty can be large at particular locations,
6 particular sites. And remember --

7 MR. DORNSIFE: But it is 100 percent
8 probability. So how do you deal with that?

9 MR. ESH: Well, basically I think if you
10 are trying to dispose of long-lived material, you have
11 to strike a balance between the decision that you're
12 trying to make today and what you are trying to
13 accomplish with that decision.

14 So if in the event that the disposal site
15 experiences an Ice Age, is the risk from the
16 radioactive material of the greatest concern when that
17 Ice Age is occurring at that location?

18 I mean, I think you have to balance in
19 some sort of practical way in a quantitative,
20 semi-quantitative, and qualitative manner these
21 associated impacts. I can't give you the answer here.

22 MR. DORNSIFE: The risk is probably after
23 the glacier melts and where it deposits. I mean, is
24 there any performance assessment model that can even
25 begin to look at that issue?

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1 MR. ESH: Yes. I understand.

2 MR. DORNSIFE: I am just pointing it out.

3 I think we will get into more, but I am just pointing
4 out that the very steep slope when you look at
5 performance assessments for shallow end disposal
6 facilities beyond what is currently required.

7 MR. ESH: Yes. And I think what I tried
8 to emphasize up front and I will re-emphasize here,
9 the low-level waste regulations and framework
10 anticipated certain types of materials and
11 characteristics. And that framework was to ensure
12 safe disposal of that material.

13 So we collectively, NRC and all of you at
14 the table, have to look at when you are stressing that
15 framework more than was anticipated. And if you are
16 stressing it more, do you need to make a different
17 decision? That is part of this process.

18 FACILITATOR CAMERON: Okay. And that's
19 part of the crux of the regulatory conundrum here is
20 how you deal with these. What is the best way to deal
21 with this?

22 Arjun, did you have one more question
23 before we go on?

24 MR. MAKHIJANI: Yes. If you applied your
25 method of analysis and disposed of spent fuel at 20

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1 meters, would anybody get any large doses of radiation
2 from spent fuel disposal?

3 MR. ESH: I can't fully speculate on that,
4 but I would anticipate probably.

5 MR. MAKHIJANI: Sorry?

6 MR. ESH: I would anticipate they would.

7 MR. MAKHIJANI: Really? Even if they
8 didn't drill wells directly into the waste. Your
9 wells don't go directly into the waste.

10 MR. ESH: They do.

11 MR. MAKHIJANI: No, they don't.

12 MR. ESH: Yes, they do.

13 MR. MAKHIJANI: From the figure that I
14 saw, you have a resident intruder on site.

15 MR. ESH: The resident --

16 MR. MAKHIJANI: But the well is not in the
17 waste.

18 MR. ESH: Either they place the house over
19 the facility --

20 MR. MAKHIJANI: Right.

21 MR. ESH: -- or they drilled the well if
22 the waste was deep, but the well goes through the
23 material.

24 FACILITATOR CAMERON: That's an intruder.

25 MR. ESH: That is the intruder.

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1 FACILITATOR CAMERON: Okay, which is
2 different than what Arjun is talking about. I think
3 that the point that Arjun is trying to make is if you
4 buried the waste, if you put a condition in that would
5 require the waste to be buried at 20 meters, is that a
6 much safer thing to do than having it at 3 meters? Is
7 that what you are trying to imply?

8 MR. MAKHIJANI: Well, you never get any
9 exposure from anything. You have no erosion. You
10 have no migration. You have no nothing. And
11 everything is very stable. You have no climate
12 change. And so we have apparently found the solution
13 to spent fuel disposal for one million years.

14 MR. ESH: I think that is a broad
15 mischaracterization because if you place spent fuel in
16 this model, you would have leeching from the spent
17 fuel, transport for the aquifer. You would have a
18 potential intruder drilling for the spent fuel.

19 I don't want to speculate, but my guess is
20 the doses from either of those pathways would greatly
21 exceed the regulatory criteria.

22 MR. MAKHIJANI: Another quick question.
23 Your analysis doesn't apply to the Clive, Utah site,
24 does it, which has above-ground disposal?

25 MR. ESH: We did not do an above-ground

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1 disposal analysis. And we did not attempt to evaluate
2 a specific site.

3 FACILITATOR CAMERON: Okay. Let's move on
4 to the third part.

5 MR. ESH: And to address the issue about
6 the silliness, poor choice of words on my part. And I
7 understand Peter's comment, but as I thought about it
8 more, it is very likely that you have locations that
9 are going to have an amount of variation in their
10 conditions that aren't going to be as extreme as the
11 example that you cited.

12 So take like the location near Clive,
13 where you had Lake Bonneville. And that was under a
14 lake and now not under a lake. And you would say, in
15 the future could it be under a lake?

16 You can have broad processes like that,
17 but you also have locations and conditions that are
18 much more stable and semi-arid for long periods of
19 time or certainly the geologic material is stable for
20 long periods of time.

21 So I don't think it is fair to
22 characterize it as, well, because you represented
23 these conditions as epistemic uncertainty, then the
24 whole thing is invalid.

25 I think the representing it as epistemic

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1 uncertainty tells you the importance of the
2 site-specific variation. And that is what we went
3 forward with in this process.

4 We believe the site-specific variation is
5 important. Whether it is short-term and local
6 conditions and processes or longer-term and more
7 global, the assessment process has to capture that.

8 FACILITATOR CAMERON: Okay. And just as a
9 sort of a watch word, the NRC staff it has been said
10 many times, including by Dave, is here to listen, to
11 comment, and to provide information on what we did and
12 to ask questions about proposals that are made about
13 how would this work. They're not here to defend any
14 future rulemaking decision because that has not been
15 made yet.

16 So this is basically to provide you with
17 background. And I think, as David suggests, the term
18 "silly" is probably not good regulatory language. So
19 we won't use that anymore.

20 (Laughter.)

21 MR. ESH: Maybe I should have used
22 "talking points." Right?

23 MR. MAKHIJANI: Fair enough. Fair enough.

24 FACILITATOR CAMERON: Okay. Go ahead,
25 Dave.

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1 MR. ESH: Okay. So the depleted uranium
2 rate on this -- we're in now, let's see, what we think
3 are some of the key issues for depleted uranium
4 disposal.

5 Now, remember, these are some of the
6 things that we think are key issues that we would like
7 to address in the regulation or guidance. But you are
8 here to give input on this. Are there issues we
9 missed? Are there issues that are on this list that
10 aren't issues?

11 That is part of why you are here, so that
12 when we get into the regulatory process and we do that
13 draft 0 of the rulemaking, we have hit the target the
14 best we could for a draft 0. This is your
15 opportunity. Don't blow it. Okay?

16 Radon. Radon is a decay product from
17 uranium. It is ubiquitous in the environment. It is
18 transported via diffusion and advection in gas or
19 liquid. And the rate of the radon transport is
20 strongly affected by moisture contents in the system.

21 So diffusivity and tortuosity are very non-linear
22 functions of saturation.

23 They have all sorts of relationships so
24 you can try to represent this characteristic or this
25 empirical functional relationship. Lots of them are

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1 different power laws. So they change very quickly as
2 you change the moisture content in the system. That
3 is why you can get results where a humid site, you
4 don't have much of an impact and an arid site, you can
5 have a lot of impact.

6 You can anticipate if you are doing the
7 work like Stephen Webb does and you have a soil
8 column, that you have variability in the moisture
9 content, it changes over time. That is going to give
10 you a much more complicated calculation of what the
11 radon diffusion rate is and, therefore, the radon flux
12 rate from that system may be.

13 The complexities for this evaluation can
14 include the presence of discrete features, processes
15 like barometric pumping that basically pulls the radon
16 out of the ground and emanation. So when it is
17 released, how much of it actually gets into the gas
18 phase and can be transported?

19 The low-level waste EIS did not include
20 radon, but it was primarily because they didn't
21 anticipate the large quantity of uranium that would
22 produce the radon. There isn't much about it in the
23 regulatory document supporting the EIS. There is one
24 guidance document that basically implies that you
25 should include radon if it is present, but that is

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1 only a lower-level NUREG guidance document.

2 So that is a first issue. The radon
3 transport or presence of radon, one of the key issues
4 that came out of the analysis. Second key issue is
5 uranium geochemistry. So they observed uranium
6 concentrations. And transport rates can vary very
7 widely depending on the site-specific conditions.

8 The uranium is relatively mobile under
9 humid and oxidizing conditions, but it can be immobile
10 under reducing conditions. It depends a lot on the
11 geochemistry, of course. And the uranium is available
12 for transport under arid conditions, but the
13 availability of water can result in long transport
14 times.

15 I think Karen has a slide in her kickoff
16 presentation for uranium geochemistry or just
17 calculate some uranium transport times with some
18 simple assumptions and show the broad range of results
19 that you can get.

20 So scenarios and receptors. Basically we
21 have an approach that was used in the part 61 EIS
22 where institutional controls are required for up to
23 100 years. You have site ownership by state and
24 federal entities. And it is anticipated that that
25 will occur for a long period of time, but in the event

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1 that those controls break down, part 61 framework has
2 an unanticipated public exposure. So an intruder,
3 that is evaluated on the disposal facility.

4 And they do things that we would expect
5 people to do today: build a house, drill a well to
6 get water, common activities like that. This
7 regulatory process is based on reasonable assurance,
8 where you are trying to do something that you think
9 reasonably bounds the uncertainty and potential
10 scenarios and receptors, but it is not the absolute
11 worst case.

12 Normal public exposures are evaluated
13 near but not on the disposal facility. And their
14 limiting scenarios usually involve the residential or
15 agricultural practices, but you have to evaluate the
16 suitability of various scenarios and receptors at a
17 particular site.

18 So the one that we had the most fun on,
19 depleted uranium period of performance, basically our
20 low-level waste regulations do not provide a period of
21 performance. It is silent on the matter.

22 We do have a guidance document,
23 NUREG-1573, which recommends 10,000 years. And it
24 does talk about longer-lived materials and
25 considerations for longer-lived materials or large

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1 quantities of longer-lived materials; in particular,
2 uranium.

3 Outside of Yucca Mountain, which does have
4 a 1 million-year period of performance, a period of
5 performance longer than 10,000 years has not been
6 applied in the U.S. This includes WIPP, which has
7 long-lived waste in it.

8 Uranium mill tailings, which is long-lived
9 material, has a 1,000-year goal. And some of our
10 decommissioning sites have some long-lived material.
11 And we apply 1,000 years there, too.

12 There is not an international consensus on
13 this topic. There is a recent report out, a 2009 NEA
14 report, which I have a copy of there at my seat that
15 people can see if they want to, that talks about
16 period of performance. It talks about the balancing
17 act you are trying to achieve.

18 It is basically ethical considerations.
19 How much do you think you need to protect future
20 generations, balancing that with how much you think
21 you need to give them the flexibility to make future
22 decisions for themselves?

23 It is not an easy problem. And there are
24 very diverse views on the topic. So we do expect to
25 have a very animated debate on this topic.

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1 Scenarios and receptors. I think that is
2 a duplicate, isn't it? I went the wrong way. Sorry.

3 Depleted uranium NRC analyses. Basically the SECY
4 provides a basic description of the assessment and
5 assumptions.

6 We felt that we were going above and
7 beyond what was required for this step in the process.

8 We didn't need to do an assessment like we did, but
9 we wanted to be better informed as to what we thought
10 the key issues were so that when we got in this stage
11 of the process, we would hopefully do a better job at
12 hitting the target.

13 The analysis is not intended to replace
14 site-specific evaluations. Those are intended to be
15 done at disposal facilities based on their conditions,
16 their models, their data, all those sorts of things.

17 All future calculations supporting
18 proposed regulations will be fully documented, will be
19 provided for stakeholder review and comment. If we
20 have to rely on calculations, you will get the full
21 details. You will be able to comment on them, review
22 them, give any sort of input you want.

23 That is what will be needed. If that is
24 needed in future rulemaking process, you will have
25 full opportunity to do that. The basic conclusion

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1 that we needed to do a rule change to address unique
2 waste streams was pretty straightforward.

3 I think that is it. And we can have some
4 more questions.

5 FACILITATOR CAMERON: Okay. And we are
6 running a little bit late. And I don't want to get
7 you too late for lunch. All of these topics in the
8 last segment that Dave talked about are going to be
9 addressed in specific discussion topics.

10 So let's try to hold this to just
11 clarifying questions at this point. And then I want
12 to check in with the audience. And then we will move
13 on to the first discussion area, which is significant
14 quantities.

15 So are there questions on the last part of
16 Dave's presentation? Okay. Peter?

17 MR. BURNS: I am trying to rethink my
18 observations that I was going to make and turn them
19 into questions in real time here because I realize
20 that observations are no longer allowed at this
21 moment.

22 FACILITATOR CAMERON: At this moment.
23 But, you know, we have had lots of observations. Time
24 has been well-spent because we are popping questions
25 up for the discussion.

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1 So don't go to any great calisthenics on
2 this. Just make your observations.

3 MR. BURNS: Well, no. I am going with a
4 question.

5 FACILITATOR CAMERON: Okay.

6 MR. BURNS: I've got it straightened out
7 in my mind. So we have U308 powder or U308 something
8 or other that is probably the form of depleted uranium
9 we are going to dispose of.

10 So I was wondering what the relevance,
11 really, of reducing conditions is in your slide on
12 depleted uranium, uranium geochemistry, and the
13 implication that uranium is fairly immobile under
14 reducing conditions.

15 I certainly agree with that statement, but
16 when you place vast quantities of oxidized uranium,
17 which U308 is, I can't imagine a geologic environment
18 that is going to be reducing enough to really
19 overwhelm that and reduce the uranium.

20 MR. ESH: Yes. It's a good comment. You
21 may have to engineer it or attempt to engineer
22 reducing conditions and/or it would depend on the
23 unique disposal, of course.

24 This has to cover potentially small to
25 enormous quantities. So if you had a small quantity

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1 in a disposal environment, you may be able to have
2 some reducing conditions that you would be able to
3 have that effect from.

4 And I agree with the comment a very large
5 quantity, it would be a challenge for the natural
6 system to provide that reducing environment.

7 FACILITATOR CAMERON: And this question
8 that Peter asked, the idea of reducing conditions,
9 will that appropriately be addressed in the
10 geochemistry topic?

11 MR. ESH: Oh, yes. Yes.

12 FACILITATOR CAMERON: Okay. So we will
13 get that.

14 MR. ESH: You will have an hour on each of
15 these topics and some other things to talk about each
16 of these. So hopefully everybody feels like they have
17 enough time to have their voice heard and get their
18 input out there.

19 We are also going to be really reliant on
20 the written information that you submit if you can to
21 us in this process. So we will do the best we can
22 minding the transcript and trying to use that
23 information, but if we get something sent to us, that
24 will be much easier for us to work with.

25 FACILITATOR CAMERON: Well, I would just

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1 note possibly that just as reliant because the idea
2 here is not -- we are hearing lots of individual
3 comments now. But the idea of the discussion is for
4 other people around the table to respond to Peter's
5 concern about reducing conditions. But, of course,
6 you will be able to amplify with written comments.

7 MR. ESH: That is my point. If they can
8 provide the context and the detail in those written
9 ones that they might feel like they can't right now in
10 some circumstances.

11 FACILITATOR CAMERON: Great. Mike?

12 MR. RYAN: This is a follow-on question to
13 Professor Burns' question. It always strikes me with
14 uranium that we very quickly get into the discussion
15 of the natural environment's ability to serve as a
16 barrier.

17 So you have talked a little bit about
18 that. That is obviously going to be a point of
19 discussion and analysis, I would assume, in what folks
20 will be advised to do or required to do.

21 The second is a concept. Can you engineer
22 the site to give you some of those desirable
23 characteristics, like reducing conditions or other
24 things? To me that is important to be explicit about
25 because, at least from other low-level waste

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1 regulations and requirements now, we have been in the
2 mode of not doing that. Other than geotechnical
3 engineering, we really haven't tried to do chemical
4 engineering or other kinds of engineering to force the
5 site to behave the way we want.

6 So if that is going to be a shift for
7 these longer time frames, I think it would be good to
8 be pretty explicit about the fact that's kind of a
9 change in thinking that some engineering that would
10 also stand up and have to hold and meet the
11 requirements of long-term reducing, as opposed to
12 short-term or whatever it might be, be explicit, that
13 would be I think a real valuable thing for site
14 operators of potential applicants to understand
15 exactly what the dimensions of that site engineering
16 could be for these longer-term wastes, like uranium.

17 FACILITATOR CAMERON: Great. Thank you.
18 And that will be part of the discussion.

19 Does anybody in the audience have a
20 question on this? Let's go to John. Please introduce
21 yourself, John.

22 MR. GREEVES: John Greeves with Talisman
23 International. It's a quick comment. Dave, the
24 staff, you did a good job of identifying key
25 parameters and key variables.

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1 A lot of the speakers started with, what
2 is in the rule, what is in guidance? And either today
3 by the time you get to Utah, if you can kind of
4 express where you are leaning to because the written
5 comments will vary depending on what the answer to
6 that question is.

7 From my perspective, the period of
8 performance is one of them. It has got to find a home
9 in the rule. The rest of them are typically guidance
10 topics. If that is not where you are going, tell us
11 so that we will at some point in time know where the
12 staff is.

13 How much of this is in rule? How much of
14 this is in guidance? It is kind of a parking-lot
15 topic unless you want to address it real quickly.

16 FACILITATOR CAMERON: I think we know the
17 rule versus guidance issue is important. And the
18 staff is going to get comment on that. That is going
19 to be reflected in the transcript. I am not sure the
20 staff is going to be ready to put anything down in
21 terms of what direction they are going to be going on
22 those issues. It is a good comment: rule versus
23 guidance.

24 MR. ESH: Yes. I think those are broad,
25 difficult decisions. And I can give you my opinion,

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1 but it's not going to be worth anything.

2 FACILITATOR CAMERON: Okay. Dave, that
3 was a real tour de force of presenting the overview on
4 this. So thank you very much.

5 Do we have another last question?

6 MR. MAKHIJANI: Yes, quick.

7 FACILITATOR CAMERON: Arjun, go ahead.

8 MR. MAKHIJANI: Under the modeling
9 assumptions of putting these containers and covering
10 them with soil, you would normally have oxidizing
11 conditions, right? I mean, I just want to be clear.

12 MR. ESH: Yes.

13 MR. MAKHIJANI: Did you assume any
14 chemical changes in the uranium when you did the
15 modeling in terms of exposure scenarios?

16 MR. ESH: You mean when it potentially
17 comes from the disposal environment to the accessible
18 environment?

19 MR. MAKHIJANI: Yes.

20 MR. ESH: Yes. No.

21 MR. MAKHIJANI: Okay.

22 FACILITATOR CAMERON: Okay.

23 MR. ESH: Remember, though, it was a
24 probabilistic analysis. So basically if you are using
25 a probabilistic, say, dose conversion factor or other

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1 thing, that is partly incorporating variation in the
2 environment in that parameter.

3 MR. MAKHIJANI: I just wanted to be clear
4 about what was done.

5 FACILITATOR CAMERON: Okay. Thank you,
6 Arjun. Thank you, Dave.

7 And, Dave, you can relax now and tee up
8 the first discussion question if that is relaxation.
9 Okay.

10 MR. ESH: I don't get to sit down?

11 FACILITATOR CAMERON: All right. The
12 first discussion issue is going to be what are
13 significant quantities, depleted uranium. And Dave is
14 going to explain, is going to tee up why that is an
15 important question.

16 And then we are going to go out to you for
17 discussion and see what your colleagues think of your
18 perspectives on these particular issues.

19 David?

20 MR. ESH: Yes. Thank you.

21 ISSUE 1: SIGNIFICANT QUANTITIES OF DEPLETED URANIUM

22 ISSUE 1.1: DEFINITION OF SIGNIFICANT QUANTITIES

23 INTRODUCTION

24 MR. ESH: The definition of significant
25 quantities of depleted uranium, this is where you have

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1 to start doing your work here. We are going to give
2 you a little bit of framework, but then it is pretty
3 open for you to give your perspectives on how you
4 think one would go about defining what a significant
5 quantity is.

6 So a little bit of background and talk
7 about how one would determine a significance level and
8 maybe some methods to determine significance. So in
9 lieu of saying what's significant, that could also be
10 defined maybe by what is insignificant. There are a
11 few measures of maybe what somebody could look at and
12 say is insignificant.

13 In the development of 10 CFR part 61, the
14 NRC considered that these quantities were essentially
15 insignificant. Seventeen curies of ^{238}U , 3 curies of
16 ^{235}U , if you convert those, that would be roughly 30
17 parts per million uranium distributed homogeneously
18 over a waste disposal system or roughly 90 drums,
19 55-gallon size, if you concentrated it.

20 So this quantity back in the early '80s
21 they thought of as generally insignificant. The
22 quantities were limited. But based on this, they said
23 no need for waste classification limits for uranium
24 based on these limited quantities. That gives you at
25 least one point in space to do a comparison to.

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1 What I would note here is that risk is
2 obviously a function of the quantity and
3 concentration. So it is a product of both of those.

4 So what would be some methods to determine
5 significance? Well, we could look at historical
6 values, like I just showed on the previous slide.
7 Maybe you could talk about significance with respect
8 to local background.

9 Obviously in the first presentation, I
10 showed you that uranium is ubiquitous in the
11 environment and what concentrations it is present at
12 and what sort of impact that gives to people from
13 normal, natural sources. So that gives you another
14 point of reference.

15 And then whatever is done to define what
16 the significance is, there are a few ways that that
17 could be done. It could be defined in the regulation
18 based on a calculation or based on where it is coming
19 from. Those are potential approaches and then maybe
20 other methods.

21 It could be defined more generically and
22 give people the opportunity to calculate how they
23 would determine whether an amount is significant or
24 not. But this gets to the question that a lot of
25 people had of, is this something that needs to be in

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1 the regulation? Does it need to be in the guidance?
2 What approach would you use to try to do this?

3 FACILITATOR CAMERON: Great.

4 MR. ESH: So we are looking at public
5 feedback on developing the criteria for significant
6 quantities, how we would do that, what are our factors
7 to consider, what alternative approaches do people
8 have.

9 FACILITATOR CAMERON: Good. And, Dave,
10 could you join us at the table for the discussion?
11 And thank you for that tee-up.

12 Who wants to start off on this idea of
13 significant quantities. Let's go to Christine first.

14 And then we will go to Bill.

15 MS. GELLES: Okay. Thank you.

16 ROUND TABLE DISCUSSION

17 MS. GELLES: I am going to begin with a
18 follow-on question. And it is echoing one of the
19 opening comments during our introductions. And that
20 was, are we going to also have a dialogue on defining
21 what is a unique waste stream as well as what is a
22 significant quantity? Is that going to be a separate
23 discussion item?

24 FACILITATOR CAMERON: Yes. I think it is
25 a separate discussion item on the second day.

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1 MS. GELLES: On the second day.

2 FACILITATOR CAMERON: Tomorrow.

3 MS. GELLES: Okay. Thank you.

4 And now my comment from the Department of
5 Energy. While we are very experienced, as I alluded
6 to in the introductions, in doing site-specific
7 performance assessments and we are comfortable with
8 the idea of unique waste streams being disposed of in
9 near-surface disposal facilities, but if we are moving
10 towards a site-specific focus, we are wondering
11 whether or not it really is necessary to define what
12 is a significant quantity given that the site-specific
13 conditions that are evaluated will, in fact, be
14 defining what is the limiting quantity that can be
15 accepted.

16 So we are wondering whether there is
17 really real merit in defining it. And, to that end,
18 obviously we would have more significant concerns with
19 it actually being in a rule, rather than being in
20 guidance.

21 FACILITATOR CAMERON: Okay. Let's follow
22 that thread. Do we need to define what is a
23 significant quantity, either in the regs or in
24 guidance? Tom, you have something on that, right?
25 Why don't you go ahead?

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1 MR. MAGETTE: I would basically agree with
2 what I think I heard Christine say. I think if you
3 are going to do a site-specific performance
4 assessment, then you are going to get to the question
5 of quantity.

6 If you want to have as a requirement the
7 disposing of uranium, depleted uranium, in some
8 quantity that requires a site-specific performance
9 assessment, then require a site-specific performance
10 assessment and don't spend a whole lot of time arguing
11 about tons or drums or concentrations.

12 I mean, the numbers you just threw up
13 there, David, as I could calculate quickly, your 90
14 drums is 60-ish tons by our calculation. It is a lot
15 more than the one to ten that the SECY references as
16 being non-significant.

17 So I think we could spend an awful lot of
18 time talking about that and not really get very far.
19 So I don't think you need to specify a threshold, a
20 quantitative threshold.

21 And as to rule versus guidance, I think if
22 you are going to require a site-specific performance
23 assessment, if you are going to have a 61.55(a)(9),
24 then yes, it is going to be in the rule. This belongs
25 in the rule absent a threshold.

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1 FACILITATOR CAMERON: Okay. Continuing on
2 with the question of do we need this in light of a
3 requirement to do a site-specific performance
4 assessment, Bill, did you have a comment on that? Why
5 don't you go ahead? And then we will come over to
6 this side of the table.

7 MR. DORNSIFE: Yes. I think there are a
8 couple of issues here. There's an issue of is there a
9 concentration where you can establish that anything
10 below that concentration is acceptable in shallow
11 burial.

12 And so that is exactly what -- when NRC
13 came out with their decision to do rulemaking, we had
14 analyzed for 10,000 cubic meters of pure DU. And it
15 met our performance assessment out to 100,000 years.

16 We had to then negotiate with the state
17 and came up with a ten-nanocurie per gram
18 concentration later. Anything below ten nanocuries
19 per gram is a diffuse DU waste stream, and we could
20 dispose of it.

21 I would also like to mention that the
22 examples that were put up here, I think a better
23 example is recognizing that DU is a subset of source
24 material, there is an exempt level for source
25 material, which is 500 parts per million.

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1 There are also categories of pure depleted
2 uranium that are exempt, like DU counterweights. We
3 have disposed of probably approaching 10,000 tons of
4 depleted uranium in our RCRA cell as exempt material.

5 So that issue needs to be considered also. What are
6 the current NRC exemptions?

7 I think you could argue that non-depleted
8 source material is worse than depleted source material
9 because you have a higher concentration of ²³⁴U in
10 source material. So it reaches equilibrium sooner.

11 FACILITATOR CAMERON: So ne question for
12 you. The last point about the implications for exempt
13 materials, exemptions that have been established in
14 the regulations, is that independent of the answer to
15 the question about whether the NRC needs to define a
16 significant quantity?

17 MR. DORNSIFE: Well, they certainly can't
18 define a significant quantity that would allow more
19 exempt materials to be disposed of than the
20 significant quantity as unregulated material.

21 FACILITATOR CAMERON: Okay. I wanted to
22 get that tie-in.

23 MR. DORNSIFE: Yes.

24 FACILITATOR CAMERON: All right. Let's go
25 to Peter. And then we will go to Mike and then Felix.

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1 MR. BURNS: I find myself in agreement
2 with Christine in her comment that there probably
3 doesn't need to be a specific quantified cutoff here
4 because I find myself thinking of some of the world's
5 famous ore deposits of uranium, like Cigar Lake in
6 Saskatchewan that has ore that is over 50 weight
7 percent uranium. And it has been there for two
8 billion years, hasn't gone anywhere, fortunately.
9 Otherwise we couldn't utilize it and so on.

10 There are many examples of this. There
11 are geologic environments that will contain vast
12 quantities of uranium. But I can also come up with
13 environments where I wouldn't want to put four
14 kilograms of uranium.

15 So, independent of the geologic and
16 engineered constraints, it seems pretty difficult to
17 set a quantitative limit. But, rather, the limits
18 should be related to the dose that appears through
19 time from whatever is put in that particular
20 environment.

21 FACILITATOR CAMERON: Okay. Thank you.
22 That puts it in context.

23 Michael? Bill Dornsife?

24 MR. DORNSIFE: I think that's important,
25 the diffuse issue.

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1 FACILITATOR CAMERON: Okay.

2 MR. DORNSIFE: Is there a concentration
3 limit where it doesn't matter.

4 FACILITATOR CAMERON: Sorry. Okay.

5 MR. RYAN: I would agree with what most
6 folks are saying, that I would not try and get at that
7 quantity of insignificant because it is very difficult
8 from a number of points of view. Concentration, on
9 the one hand, in Bill's example might be a metric of
10 interest, but when you look at a disposed quantity, it
11 is really the total quantity of uranium disposed I
12 whatever matrix it might be in that drives performance
13 assessment.

14 So is it concentration-based? Is it
15 quantity-based? You run into all of these
16 difficulties because both of those units have grams of
17 uranium or grams per cubic meter of uranium have
18 meanings in various contexts and no meaning in other
19 contexts. So it is tough from that standpoint.

20 I think that if you require a
21 site-specific performance assessment, I can understand
22 why that would want to be in the rule. But I would
23 sure vote for a detailed guidance document, a
24 NUREG-level document that gives you if you do these
25 analyses and these calculations and these assessments,

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1 you are on the right track to meeting the regulatory
2 assessment requirements.

3 Now, if the assessment comes out good or
4 bad, that's the decision process. But I would sure
5 like to see all of the things that you have talked
6 about laid out clearly of how an applicant or somebody
7 who was trying to make an assessment goes about
8 meeting those obligations that might be in the rule
9 but very explicitly laid out in a guidance document as
10 to how they can get there.

11 With regard to a lot of the issues that
12 you have covered already today we will cover in the
13 rest of the day and all day tomorrow. So just be
14 thinking ahead. If I am not going to have things
15 about unimportant quantities or de minimis
16 concentrations, all the words we have used over the
17 years, it would be good to say, how do you assess what
18 it is you have?

19 And can you get to an assessment under
20 certain circumstances that is a very easy answer to
21 say, under these conditions, the way you have assessed
22 it, it is okay? And if it doesn't pass that criteria,
23 you have to do a more detailed assessment to decide
24 whether it is okay or not.

25 In other words, a staged approach of

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1 assessment, as opposed to trying to specify a de
2 minimis amount, now might be a way to incorporate a
3 low end of interest or concern relative to a high
4 interest.

5 So you kind of incorporate the question
6 of, do you need an insignificant quantity defined as a
7 unit? I would say no. But can you build it into the
8 performance assessment part, a method to assess
9 whether something is significant or not at various
10 levels of concern because of the dose criteria or
11 whatever you apply might be a way to incorporate the
12 two ideas into the one assessment.

13 FACILITATOR CAMERON: Okay. And I want to
14 ask people. I want to go to Felix and Arjun. But I
15 want to get some response from others around the table
16 in terms of Mike's suggestion that you don't need to
17 put this in the rule, but it would be useful to
18 address I think some of the issues, the issue that
19 Peter brought up, about it's context to assess that
20 and to have something in the guidance on that. I want
21 to get a reaction from all of you to Mike.

22 First of all, let's see what Felix and
23 Arjun had. And then we are going to go to Bill.

24 MR. KILLAR: Yes, I guess I am on the "me,
25 too" wagon in that the significance is sort of like

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1 beauty is in the eyes of the beholder. If you have a
2 site that has a lot of other active isotopes, the
3 impact of that depleted uranium coming into that site
4 may have significance. But if you have a site that
5 has a lot of very I would say non-active or
6 lower-significant isotopes, you could bring in a lot
7 more of that depleted uranium and not have a
8 significant impact on the overall performance
9 assessment.

10 So trying to define a specific term as
11 significant is highly site-specific. So I think that
12 you are doing a disservice by coming up with a
13 significant quantity or level or what have you.

14 But certainly I think it would be
15 appropriate of how you take that activity from that
16 uranium, depleted uranium, in consideration with the
17 other materials that you plan to dispose of in that
18 site and your total performance assessment and do your
19 total TEDE for that site.

20 FACILITATOR CAMERON: So that is another
21 context item. Consider the context.

22 Arjun?

23 MR. MAKHIJANI: Yes. I mean, I do think
24 the comments that have been made, I think they are
25 very good points. But in order to connect it to one

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1 other point that was made earlier, shallow land
2 disposal means oxidizing environment.

3 If you are going to require engineered
4 reducing environments, that implies some kind of limit
5 on what you can -- can you put 100,000 tons of
6 depleted uranium in a site and require reducing
7 environments?

8 We do know under the existing rules that
9 we have come here because significant quantities,
10 large quantities, are defined as what comes out of
11 enrichment plants. And that is the main application
12 that is going to be made.

13 You know, if we can't define those as
14 large quantities and retain some idea of what large
15 quantities are, then by implication what insignificant
16 quantities might be, it would be a problem, I think,
17 in general, I think, unless we are going to abandon
18 the idea of requiring a reducing environment to take
19 the chemical changes, climate changes into account.

20 FACILITATOR CAMERON: Okay. Thank you,
21 Arjun. That's again this idea, another idea, on
22 context.

23 Peter, did you want to say something on
24 that? And then we are going to go to Bill and Tom.

25 MR. BURNS: Maybe some of my earlier

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1 comments gave the impression that I would strongly
2 encourage a reducing environment for storage of
3 depleted uranium or maybe other people made the
4 comments that led to that conclusion.

5 The bottom line is that that is not what I
6 intended to imply. It is a very different situation
7 if you have a reducing environment versus an oxidizing
8 environment. But let's say we go with an oxidizing
9 environment. There are very readily achievable
10 chemical engineering treatments that you can use, not
11 necessarily treatments but engineered barriers that
12 you could use to greatly impact the use of uranium out
13 of the site.

14 What jumps to mind immediately is
15 phosphate amendments of some sort, uranyl phosphate,
16 uranium-6 plus phosphate, not reduced uranium. It is
17 highly insoluble. And it is currently being tested at
18 the Hanford site to a mobilized uranium that is
19 already in the vadose zone and traveling with the
20 groundwater. And, to the best of my knowledge, it is
21 working rather well.

22 It doesn't even need to be expensive. I
23 mean, one can grind up a bunch of old fish bones and
24 put that in a barrier system, right, and achieve
25 probably chemically almost as good as reducing

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1 conditions.

2 FACILITATOR CAMERON: Okay. Thank you.
3 Thank you for that clarification.

4 Bill and Tom, some reactions perhaps to
5 Mike Ryan's suggestion? Bill?

6 MR. DORNSIFE: Yes. Well, first of all, a
7 very easy way of making a reducing environment is to
8 put the waste in a concrete canister because, even
9 after the concrete canister fails, NRC's NUREG reports
10 have shown that you still have that concrete
11 environment around the waste that creates that
12 reducing environment. So a lot of the waste is
13 currently being disposed of in a reducing environment
14 because of the use of concrete canisters.

15 On Mike's, I just want to come back to
16 this diffuse issue. The reason I feel so strongly
17 about it is that my concern is if there is not in
18 regulations a lower concentration that specifically
19 says this is a never/no mind, we will get to a rule.
20 And then we will have potentially agreement states
21 saying, "Moratorium on all DU disposal until you all
22 do the site-specific analysis." And that could take
23 quite a while.

24 And so that we really want to prevent
25 necessary cleanup from facilities that have depleted

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1 uranium while we are looking at this longer-term
2 performance assessment.

3 FACILITATOR CAMERON: Bill, are you
4 suggesting that it is sort of going the other
5 direction? In other words, you don't need to define
6 significant quantities --

7 MR. DORNSIFE: You define a concentration
8 that doesn't matter.

9 FACILITATOR CAMERON: Okay. All right.
10 Let me ask if there are any more reactions. Let me go
11 to Tom and see about a reaction to Mike. And then
12 let's have some discussion about the suggestion that
13 Bill is making that there is a concentration limit
14 where below that, it doesn't matter. This is some
15 familiar territory.

16 MR. DORNSIFE: Very.

17 FACILITATOR CAMERON: Four-letter,
18 three-letter, four-letter word, I guess.

19 Anyway, Tom? And then let's hear from
20 Christine. Tom?

21 MR. DORNSIFE: When I say it doesn't
22 matter, I don't mean exempt. I mean, you know, a
23 place where we know that the performance assessments
24 already done for low-level are good enough for this
25 concentration. It is not an exempt level.

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1 FACILITATOR CAMERON: Okay.

2 MR. DORNSIFE: You don't need to do any
3 additional analysis. You don't really have to do any
4 additional analysis to demonstrate that the current
5 site in its current configuration can adequately
6 isolate that material.

7 FACILITATOR CAMERON: Okay. Tom, do you
8 want to talk to Mike's point? And can we get a
9 reaction from you if you have one to Bill's
10 suggestion?

11 MR. MAGETTE: I think those two are
12 inextricably related because, I mean, obviously if you
13 are going to talk about a regulation that doesn't have
14 a threshold, which is where I started and I still
15 think that is okay, then I am not sure what you put in
16 guidance. I'm not sure where you need to guide
17 anybody to.

18 I mean, you could certainly have an
19 interesting discussion. It might go to some of the
20 things that Bill is talking about. But if the
21 regulation says there is no minimum, then there is
22 nothing, there is no guidance to how to interpret
23 zero.

24 So I don't know what the guidance would
25 say. Now, if, in fact, you want to look at a de

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1 minimis level --

2 MR. DORNSIFE: No. It is not de minimis.
3 Don't use that word.

4 MR. MAGETTE: Strike that.

5 FACILITATOR CAMERON: And don't use that
6 three-letter acronym. Go ahead.

7 MR. DORNSIFE: No, no. Don't use that one
8 either.

9 MR. MAGETTE: What are you going to call
10 it, Bill?

11 MR. DORNSIFE: We'll call it that your
12 existing performance assessment and what you are
13 licensed for is adequate to deal with this
14 concentration. I mean, your license for disposal of
15 source material, you obviously had to do a
16 demonstration. You can dispose of that amount of
17 source material. This is no different.

18 FACILITATOR CAMERON: Okay. Let's test
19 this idea out, then. Tom is saying if you don't need
20 anything in the rule for significant, what are you
21 going to say about it? Why is there any need to say
22 anything about it in the guidance? I want to give
23 Mike an opportunity to respond to that.

24 Mike, maybe there is some connection with
25 what you were suggesting to what Bill was saying. I

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1 don't know. Why don't you go? And then we will go to
2 Christine.

3 MR. RYAN: It's a good dialogue. And I
4 appreciate these thoughts. What I am trying to get
5 across is that if you have a de minimis or some
6 low-level concentration that you say is below this,
7 you don't need to worry about any additional
8 requirements for uranium.

9 I don't really have a problem with that
10 idea. It will be a real low limit, I am guessing
11 because you have got to assess that. And that has got
12 to be based on probably the most dose-significant case
13 that you look at across a range of cases is where the
14 staff would be on it. So I have no problem with that.

15 My other part of my comment is that okay.
16 Now I have got, let's say, a material for which an
17 analysis is required. And whether it is for any
18 material, it is required or if it is above some limit,
19 as, Bill, you and Tom have suggested, I am finding a
20 way.

21 What I am asking for in the second part of
22 the comment is that the guidance be real explicit with
23 what I have to analyze, what parameters I have to
24 evaluate, how I have to do it, how I have to do
25 uncertainty analysis so that I will know when I am

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1 done.

2 FACILITATOR CAMERON: Okay. That's --

3 MR. RYAN: That is my big question in any
4 performance assessment, is please tell me when I will
5 be done.

6 FACILITATOR CAMERON: So your point is an
7 over-arching point --

8 MR. RYAN: Right.

9 FACILITATOR CAMERON: -- that covers the
10 whole performance assessment.

11 MR. RYAN: But they are not completely
12 separate from one another because if I have to go down
13 to lower ALARA concentrations, my performance
14 assessment may get more and more complicated because I
15 now have to include things that are at that level that
16 may exist in nature as part of the dose.

17 FACILITATOR CAMERON: Okay. So you see
18 some value in what Bill is saying?

19 MR. RYAN: Oh, absolutely, yes. I am not
20 saying I am absolutely against some concentration
21 limit, but the other caution I would offer is that
22 concentration doesn't determine the risk in disposed
23 waste. It is quantity. If I have a high
24 concentration and I only have three milligrams of it,
25 it is certainly not nearly as important as having

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1 300,000 tons of the same.

2 And, likewise, if I have a concentration
3 that is very low, like below average surface soil, I
4 don't care about it at all. But I may have lots of
5 curies of uranium.

6 So concentration doesn't determine
7 disposal risk. It is a convenient metric we use for
8 transportation requirements and surface health physics
9 and all of that. But I think we ought to be very
10 careful and try and clarify when concentration is a
11 metric and for what purpose and what drives doses that
12 are calculated from a performance assessment, which is
13 total quantity and not concentration.

14 FACILITATOR CAMERON: Okay. Thank you,
15 Mike.

16 We will go to Christine and then Arjun and
17 then Felix. Christine?

18 MS. GELLES: Thank you. I think there are
19 a lot of really valuable ideas and thoughts that have
20 been put on the table already. It is certainly a
21 complicated question.

22 Mike, I am responding first to your first
23 representation of I guess a reaction to what was
24 perhaps this initial discussion on the issue. Now I
25 have a question about the second way you just

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1 described it.

2 It really boils down for the Department of
3 Energy based on our experience to a balancing act. I
4 mean, I heard first that you were suggesting that we
5 have as detailed a guidance document as possible so
6 the owner/operator knows what is expected of them.
7 But then I heard very explicit guidance in your second
8 description.

9 What we would certainly support is a
10 guidance document that recognizes and implements a
11 graded approach that certainly is against
12 site-specific, has a site-specific, focus and
13 certainly requires an iterative analysis so that as
14 you get new information, as you receive additional
15 quantities over the time of your operation, as you
16 understand that there are new hazards or risks that
17 need to be analyzed, you incorporate that into your
18 site-specific PA and you keep that as a robust
19 defensible document or representation of your system
20 but not be so prescriptive that you hinder the
21 flexibility that is needed by the operator to respond
22 to changing circumstances or new information or new
23 waste streams that, all of a sudden, are unique
24 because we didn't know enough about them to analyze
25 them the last time we ran our PA. I mean, in our two

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1 decades, three decades of experience, we have
2 generated a lot of new additional waste streams that
3 require constant analysis.

4 So it is finding that balance between
5 detailed guidance and prescriptive guidance so that
6 you are not tying the hands of the owner/operator.

7 MR. RYAN: And I think the NRC might be
8 slightly differently than the DOE in that licenses and
9 license conditions drive the agreement state or NRC
10 world. And perhaps the system at NRC is a little bit
11 different. You are really relying on an updated
12 performance assessment to sort of be your license.

13 So for a licensee, once I have got a
14 license, I follow the license conditions. It is that
15 simple. But when I find that I need to take different
16 materials that might challenge the license conditions,
17 there is a new constituent or a different
18 concentration or whatever it might be. Then I have
19 got to go back to the regulator and say, you know, let
20 me try and convince you this is within what we can do.

21 And it should be added to the things we are allowed
22 to take less than our license.

23 So I accept your comment, but I don't
24 think it's incongruous with what I am suggesting. I
25 think it agrees with what I am suggesting. And all I

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1 am asking is that guidance tell you or me when we want
2 to assess something that is outside of our current
3 working envelope, that we get pretty clear direction
4 as to what I need to assess in order to come to them
5 with a case to say, "Is this okay?" or "I think it is
6 okay based on my analysis according to your guidance.

7 And how about let's sit down and make sure I have
8 done it right and I can convince you where I am."

9 FACILITATOR CAMERON: But there doesn't
10 necessarily seem to be any inherent conflict between
11 the type of thing that ideas that Christine was
12 suggesting.

13 MR. RYAN: I think we are in agreement. I
14 don't think there is any difference whatsoever.

15 FACILITATOR CAMERON: Okay. Great. That
16 is terrific.

17 Arjun?

18 MR. MAKHIJANI: Well, if Bill isn't
19 talking about BRC or de minimis, then you are really
20 talking about a revision of table 1, I think table 1
21 or table 2. I can't remember, one of the tables.

22 And because you are asking for a
23 concentration limit that you can dispose of with your
24 existing license, I am okay with putting revision of
25 table 1 in the table. I said that in the beginning,

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1 that I thought that we should be doing more here than
2 just looking at revision of (a)(6).

3 Then I would simply suggest that we revert
4 to the draft EIS from 1980 or '81. And there is a
5 quantity defined there, 17 curies, and a limit, .05
6 microcuries per cc, if I remember right, and that we
7 just accept that. And that would give us a quantity
8 as well as a concentration.

9 FACILITATOR CAMERON: Bill?

10 MR. DORNSIFE: As a kind of a compromise
11 on this concentration issue, I think NRC can easily
12 come up with a number and justify that concentration
13 number.

14 I mean, the way we did it in Texas, ten
15 nanocuries per gram is the class A limit for
16 transuranics. And that allows you a factor of ten to
17 play around with in terms of what it really is. Okay?

18 And right now we are disposing of
19 everything in concrete canisters. The way we treat A
20 versus B and C is no different, what we are currently
21 authorized at waste control.

22 But, anyway, I mean, I think NRC can
23 easily come up with a number: ten nanocuries per
24 gram. You know, give that a ride. And then have that
25 limit in there so people don't start questioning what

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1 has already been disposed of because you take any DOE
2 waste stream out there. They cannot prove there is
3 not some depleted uranium in that waste stream.

4 So are you going to risk preventing any
5 disposal in any cleanup because you don't have some
6 number that is okay? But then eventually when you do
7 your site-specific analysis, you have got to include
8 that, whatever you have disposed of as part of that
9 analysis, to make sure it is acceptable.

10 MR. RYAN: If I may react to that, Chip?
11 I understand your need for a least common denominator.

12 I appreciate the practical aspects that you are
13 raising there, Bill.

14 Maybe the compromise is, okay, if there is
15 some number below which I am fine, I can dispose
16 material, so be it. And that is kind of the least
17 common denominator for any site, any sort of
18 geohydrology or geochemistry or whatever it might be.

19 Then how do I show that my limit for my site under my
20 circumstances is probably more like ten times that,
21 your number?

22 All I'm asking is that the guidance that
23 is given allow me to address that or give me the
24 flexibility to define a different baseline below which
25 I can just dispose without any further constraint.

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1 So let's don't make it one number. And
2 that was my point I didn't articulate so well maybe at
3 the beginning, but if we have got an absolute floor,
4 so be it. And then if we have got some other way that
5 I can set a different floor based on my site-specifics
6 and waste specifics and all the rest, that should be
7 part of the process to --

8 MR. DORNIFE: I mean, when you are doing
9 your site-specific analysis, are you really setting a
10 different floor? You're setting no floor, I thought.

11 That was the intent, that you can --

12 MR. RYAN: No, no.

13 MR. DORNIFE: -- take your DU if you do
14 your site-specific --

15 MR. RYAN: I didn't communicate well if
16 that is what you took away from my comment. That is
17 not what I am saying at all.

18 MR. DORNIFE: But isn't that the premise?

19 FACILITATOR CAMERON: Are you guys on the
20 same wavelength here or I sense there is still a
21 difference?

22 MR. RYAN: I thought we were okay up until
23 Bill's last comment.

24 (Laughter.)

25 MR. RYAN: I actually agreed with him.

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1 And now he is saying he doesn't agree with me.

2 MR. DORNSIFE: No. No, no, no. I mean,
3 this concentration limit, when you do your
4 site-specific analysis, which my understanding is is
5 intended to allow you to dispose of pure DU --

6 MR. RYAN: I didn't say anything about
7 pure DU. I just said a limit. So I am not trying to
8 imply anything about pure DU or any other kind of DU.

9 MR. DORNSIFE: Well, I mean, when you do
10 your site-specific analysis, I mean, are you proposing
11 that maybe there is a concentration-based limit that
12 comes out of that?

13 MR. RYAN: I think you sure could do that
14 if you want or you could do a quantity limit.

15 MR. DORNSIFE: Why would you want to? You
16 just said, you know, it is a total quantity that makes
17 the difference.

18 MR. RYAN: I am trying to recognize, Bill,
19 if there is a wide range of disposal opportunities for
20 DU. There are chunks of metal DU that might be
21 over-packed in a concrete canister of some kind. And
22 there is diffuse DU that is intermittent with some
23 soil matrix or some other solid material matrix. And
24 one size of shoe doesn't fit all of those cases.

25 So, I think, you know, if there is some

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1 exemption-level concentration, which is --

2 FACILITATOR CAMERON: Lowest common
3 denominator.

4 MR. RYAN: -- the lowest common
5 denominator for all of it, great. I am thrilled with
6 that. All I am asking is if I want to increment that
7 up because of some other concentration, quantity,
8 physical or chemical formed circumstance, that the
9 guidance give me advice on how to do that. That is
10 not a lot. But it did change from your concentration
11 that you want.

12 FACILITATOR CAMERON: So, if I understand,
13 what you are saying is that there is a default lowest
14 common denominator, but that when you do the
15 performance assessment for the site, you may find out
16 that there is something about the site that would
17 cause you to not accept that, not want to follow that
18 default.

19 MR. RYAN: Not quite. What I am trying to
20 say is that default value might be -- you know, there
21 is nothing wrong with having the opportunity to change
22 the default value on a site-by-site basis.

23 FACILITATOR CAMERON: Okay. Tom?

24 MR. RYAN: Because one site may have a
25 default that is completely different than another one.

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1 FACILITATOR CAMERON: Let's go to Tom, and
2 then let's hear from Dave Esh. And then I want to
3 come back to Bill in terms of what Mike just said and
4 see whether that totally kicks the pins out from what
5 you were suggesting. Tom?

6 MR. MAGETTE: My fear with this whole
7 concept and this notion is that it would be difficult
8 to establish a floor, whatever we are going to call
9 it. I think this discussion illustrates that that is,
10 in fact, the case. I think if you were going to have
11 to do a performance assessment at the sites that are
12 accepting depleted uranium, then, really, I don't see
13 how you need a floor.

14 I mean, Bill's issue about the uranium
15 coming in and a lot of it being diffuse is entirely
16 correct. I mean, the shippers' manifest, the rate
17 that they are shipping into the market is a default at
18 some level anyway. So, in essence, we get it
19 virtually constantly.

20 I am still not convinced that it
21 necessarily makes sense to try to establish a floor.
22 We have heard comments about rule versus guidance. I
23 don't know that there is a place on the agenda to
24 discuss that, in particular, but I still think as for
25 the rule, simpler is better.

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1 You require a site-specific performance
2 assessment for taking uranium or depleted uranium.
3 Then you don't have to do much more. I think you are
4 going to have to establish a period of performance in
5 the rule. And I think you are going to have to
6 establish a dose standard in the rule. And that may
7 also include revisiting or revising subpart C.

8 I don't think that that should be off the
9 table. It is not just 61.55(a)(9) that I would be
10 talking about, but I think that is pretty simple.
11 That is not very many words or sentences that goes in
12 a rule. It is very, very short and succinct.

13 Then I agree I think with the outcome of
14 the discussion that Mike and Christine had about
15 guidance. We have guidance documents that I think
16 both go into detail and allow flexibility in
17 NUREG-1573 and NUREG-1854. This is not new. So I
18 think those objectives are possible to achieve
19 simultaneously. And I think the NRC could do that.

20 As for concentration versus overall mass,
21 I mean, certainly yes, you could have a lot. But if
22 you have a lot in a very large site, you can still
23 have a tolerable concentration.

24 So here again, you back into the
25 complexity of trying to establish a floor. So I don't

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1 see that there is necessarily a lot of fruit to be
2 born there because I don't think anybody is going to
3 be saved, so to speak, from doing a performance
4 assessment by the virtue of the existence of that
5 floor.

6 FACILITATOR CAMERON: So you could spend a
7 lot of time trying to figure out what this should be.
8 And it may not gain you that much --

9 MR. MAGETTE: Precisely.

10 FACILITATOR CAMERON: -- in the long run.
11 Okay. Let's hear from David, and then one last
12 comment from Bill. And I want to check in with the
13 audience. And then we will go to lunch.

14 MR. ESH: I was going to add that I
15 appreciate Tom's last comment about keeping it simple.
16 We like to keep things simple. It seems like the
17 discussion here might be an opportunity to consider
18 whether you need a couple option approach, you know,
19 option A. NRC specifies concentration. You can
20 either use that as your lower level or not.

21 If you don't want to use that as your
22 lower limit, use B, which is you do a site-specific
23 determination of what your lower limit is or if you
24 are doing a site-specific performance assessment, then
25 forget A and B. You just do your site-specific

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1 performance assessment.

2 I mean, I think we want to be flexible.
3 We want to ensure that all of the requirements are
4 there, that we achieve the safety goals that we are
5 trying to achieve. But we also want flexibility, too.

6 That is a comment for you to consider, whether you
7 can do an approach where you have a couple of options
8 of which way to proceed. And, of course, you could do
9 that in regulation or guidance.

10 FACILITATOR CAMERON: Thanks, David.

11 Bill, last comment before we go to the
12 audience?

13 MR. DORNSIFE: Yes. I think, first of
14 all, as I said, my reasoning for the floor limit or
15 floor concentration was that when a rule is published
16 and if it doesn't have that, the states are liable to
17 say, "Cease and desist all DU disposal until you do
18 your site-specific performance assessment."

19 FACILITATOR CAMERON: So that is your
20 concern, is that --

21 MR. DORNSIFE: Yes.

22 FACILITATOR CAMERON: I think that is very
23 explicitly stated.

24 MR. DORNSIFE: And I am wary. Okay? I am
25 wary of any ability for a specific site other than a

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1 maximum quantity, a limit on the total quantity that
2 they can have, of any site-specific, meaning
3 state-specific, concentration limit.

4 That is why I would like to see one
5 standard because you get then into the situation that
6 different regulators have different standards in terms
7 of evaluating data. And then you come up with a
8 non-uniform, non-competitive environment.

9 FACILITATOR CAMERON: Well, let's go to
10 one of those scary state regulators.

11 (Laughter.)

12 FACILITATOR CAMERON: Mark, do you want to
13 say something?

14 MR. YEAGER: That was the perfect segue,
15 Bill.

16 Option C, one of the things we faced at
17 South Carolina was the continued extension of
18 Barnwell's life. And it transcends regulation because
19 you have the public perception that "When is this
20 going to end? When is the material going to end?"
21 And we can talk the technical part, but there is that
22 part where the public, the stakeholder, says, "Yes.
23 You are telling me this is safe, but you keep putting
24 it in the ground."

25 So option C for me would be -- and, Mike,

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1 I appreciate your comment on this -- to make the
2 performance assessment simpler. Would it not be a
3 possibility to have a facility source term limit up
4 front and then base your performance assessment on the
5 company that makes the proposal based on what form,
6 metal, diffuse, what type of waste form are we going
7 to be disposing of.

8 You can make a pretty good guess on what
9 your customers are going to be needing. And then you
10 could, you know, make your performance assessment
11 conform to those different types of waste form.

12 And then if it does change down the road
13 based on the regulatory framework, you could ask for
14 an amendment to your license, for example, that could
15 be put out to the public at that point and say,
16 listen, we did the initial assessment for this
17 facility source term. We said we wouldn't increase
18 it. Conditions have changed. We're doing a revised
19 performance assessment. Is this acceptable?

20 Because you have to have that buy-off
21 because eventually you are going to lose credibility.

22 And you just have a bunch of angry people showing up
23 at public meetings that you can't satisfy.

24 MR. RYAN: Mark, thanks for your comments.

25 I appreciate what you have said, and I will try and

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1 respond. I think if you look at a facility that has a
2 decades-long life span -- and in my own experience,
3 the waste streams change over time. The waste forms
4 change. The waste packaging changes. The
5 concentration of radionuclides per package changes.
6 And all those things are variable.

7 So a couple of ideas. One is you have got
8 to somehow envision how your approach to performance
9 assessment can change with all of that. So the idea
10 that you would have updates or periodic reassessments
11 or reassessments of other waste being added I think is
12 a reasonable thing to think about. I can't think of a
13 site that doesn't have a sort of a living performance
14 assessment capability to address that.

15 The second part of transparent
16 communication of all of that to the public is a
17 challenge for everybody that does this kind of work.
18 And I think that certainly takes a lot of work to get
19 folks to understand that.

20 My own experience is the closer you are to
21 a site, the better people understand that because they
22 are nearby and may have relatives who work there and
23 those kinds of things. And the further away you get,
24 you get less understanding.

25 I think having a system that is clear and

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1 transparent and how you got from A to B and you can
2 lay that out helps you to do a better job of that. So
3 I admire your goals and appreciate both of those
4 things, but the fact of the matter is sites and site
5 licenses are going to evolve and change because
6 conditions change.

7 Just from nuclear power waste management,
8 ion exchange resident in solidified concrete were the
9 waste streams of interest for a long time and now are
10 producing very low-volume solid mass waste that came
11 out of reverse osmosis processing. And solidified
12 concrete is almost a thing of the past for water waste
13 streams. So how do you deal with evolving
14 technologies and evolving issues in waste management?

15 You have just got to have your basic structure of
16 your system such that you can deal with those changes.

17 And they are changes not because something
18 failed. They are changes because something better is
19 coming along.

20 FACILITATOR CAMERON: Okay. Do you want
21 to say anything quickly on that?

22 MR. YEAGER: Yes. It is a good point that
23 Mike brings up. And that might come up within the
24 unique waste stream discussion later about how
25 low-level waste has evolved from volume to lower

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1 volumes with higher concentrations.

2 And that is something that I don't think
3 was factored in when part 61 was originally drafted.
4 I think when it was originally drafted, people did
5 approach it from the standpoint of large quantities
6 with activities spread out over a large volume.

7 But then as facilities charged by volume,
8 guys said, "Well, let's try to reduce that volume to
9 save costs." So, as a result, you have a higher
10 concentration, higher source term, higher
11 ramifications.

12 MR. RYAN: I always think about five
13 things, Mark, when I think about those new issues.
14 One is the chemical, physical, and radiological
15 content of the waste; the waste package; the disposal
16 technology used to put it below grade; the cover
17 technology, which you use simply to shed water so it
18 doesn't get wet because if it doesn't get wet, nothing
19 is going anywhere; and then the geohydrologic setting
20 in which all of that sits.

21 FACILITATOR CAMERON: Okay.

22 MR. RYAN: Now, for a lot of things, only
23 three of those change. So that is the system I always
24 think about when I address those emerging issues.

25 FACILITATOR CAMERON: This has been a

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1 great discussion. And I think it gave the NRC some
2 really strong things to think about in terms of what
3 you are hearing from people around the table on
4 whether you need to establish that.

5 We have a couple of minutes. We actually
6 have hours since we are already a half-hour behind.
7 We have a couple of minutes. Does anybody in the
8 audience want to ask anything? Okay. And we are
9 going to welcome Diane D'Arrigo back when we get back
10 after lunch. She will be at the table.

11 Yes, Gary?

12 PUBLIC COMMENTS

13 MR. COMFORT: I am Gary Comfort. I am
14 with NRC in the Rulemaking Branch.

15 One of the questions that I have because I
16 heard a little bit of discussion on the variety of --
17 you know, I have gone from depleted uranium, that the
18 rule is based on that we are getting a large supply of
19 depleted uranium that wasn't originally evaluated,
20 mostly coming from enrichment facilities.

21 Then I heard some expansion of doing
22 performance assessments for DU in general and then
23 maybe even uranium as part of the source term and
24 stuff.

25 The question I have is, because we are

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1 doing this as a two-phased rulemaking, would one of
2 the concepts also be to limit this first part to just
3 DU from a specific source, meaning if you are getting
4 disposals from the enrichment facilities, and that
5 would get rid of some of these issues also potentially
6 of how do you deal with the most diffuse waste streams
7 and things like that because this rulemaking is not
8 focusing well and you are continuing to use that as
9 well as then in the future rulemaking, you look at the
10 big change to the waste classifications and all. Do
11 you then address them and all that? And you keep a
12 much more focused rulemaking.

13 You know, is that what people are
14 potentially looking at or considering or were they
15 looking at a much broader all of DU being assessed in
16 these waste streams?

17 FACILITATOR CAMERON: And that is a good
18 question. And let's save that and either first thing
19 after lunch see what people think about that before we
20 go to the next discussion topic. But we will get to
21 it.

22 It is around 12:30. Originally you had an
23 hour and a half, I think, for lunch. So maybe let's
24 come back in an hour and 15 minutes. That still gives
25 you time to figure this neighborhood out. Okay?

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1 So a quarter to 2:00. 1:45 we will start.
2 (Whereupon, a luncheon recess was taken at 12:29 p.m.)

3 FACILITATOR CAMERON: Okay. Welcome back
4 from lunch, everybody. There is a couple of
5 administrative details.

6 I would like to welcome Diane D'Arrigo,
7 who is here from the Nuclear Information and Resource
8 service. And, Diane, do you want to just introduce
9 yourself in any more detail than that? Go ahead.

10 MS. D'ARRIGO: I think that explains it.

11 FACILITATOR CAMERON: Okay. All right.
12 Thank you.

13 There are some little cards out on the
14 table, if you parked in a hotel, that will give you a
15 reduction in parking rates. So if you want to park
16 here tomorrow, then I would get one for tomorrow also.

17 And it's probably the same rate as the County Hotel,
18 which is down the street, or it may be cheaper.

19 Also, so that Charles can get everything
20 that you are saying, hit the button on your mic before
21 you start to talk, because he has been missing some of
22 the -- just the first couple of words, and so we just
23 made some stuff up.

24 (Laughter.)

25 And also, I think you are doing really

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1 well on the Somali pirate ship standard. We have had
2 some good discussion. And we are going to address
3 this issue that got brought up right before we broke,
4 before we go to the next agenda item, because it did
5 address some -- or may be a way to address some of the
6 issues we were talking about, and Gary Comfort from
7 the NRC's rulemaking staff raised it.

8 Should the rule only -- in other words,
9 this site-specific criteria rule -- only address the
10 disposal of DU from a particular category of sources?

11 Is that correct, Gary? Okay. And I just put in
12 parens I guess one of the issues there is: what do
13 you do with the other DU if the rule only does this?

14 So I wanted to get a few minutes of
15 discussion that, and then we will go to the next
16 agenda item. Christine, did you want to talk to that
17 point?

18 MS. GELLES: I would, thank you. I think
19 the example we cited was DU from enrichment
20 facilities, and the Department of Energy would have to
21 oppose such a restrictive focus on this, because if
22 there are questions about the disposal of our DU waste
23 streams I would say that not all of our existing DU
24 waste streams that require disposal would fall under
25 that category. So I think we would have to have some

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1 discussion about exactly what would be the waste
2 streams that we would be limiting.

3 FACILITATOR CAMERON: Okay. Thanks,
4 Christine.

5 MS. GELLES: In terms of both form and
6 quantity.

7 FACILITATOR CAMERON: All right. And Tom?

8 MR. MAGETTE: I would say that you
9 probably could limit this rule, accommodating
10 Christine's comment, you still probably could limit it
11 more than just having it totally wide open. But that
12 definitely assumes that there is a follow-on rule,
13 this notion of risk-informing Part 61. I mean, what I
14 have heard so far is that, you know, from -- the SRM
15 said put it in the budget.

16 Larry told us it's in the budget for '11.
17 As long as it stays there, you know it's going to
18 happen. I mean, budgets change in Washington
19 occasionally. And so I would not like to think that
20 you deferred something that then became indefinitely
21 deferred.

22 FACILITATOR CAMERON: So you think it
23 might be -- it might turn out to be an indefinite
24 deferral.

25 MR. MAGETTE: I think you could mitigate

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1 that risk administratively, but you would have to take
2 some steps to do that, to make sure that there was in
3 fact a follow-on rulemaking before you did anything
4 more limited.

5 FACILITATOR CAMERON: Okay. Do we have
6 any thoughts on what Christine offered to us about the
7 Department of Energy issues, or from the NRC staff,
8 any thoughts on that? Peter?

9 MR. BURNS: I have a question for
10 Christine. If the -- where do you get depleted
11 uranium except from enrichment?

12 MS. GELLES: Well, and again I didn't want
13 to assume that I knew exactly what was being offered
14 as the illustrative example. But we have historical
15 -- we have volumes of DU that resulted from our
16 reprocessing activities at Savannah River three
17 decades ago. If the reference to enrichment
18 facilities meant, you know, the modern day enrichment
19 facilities, and maybe even the deconversion product
20 from our soon-to-be-operational conversion facilities,
21 then I think we would potentially orphaning our
22 historical DU volume.

23 So it really just boils down to defining
24 what we mean by the stream that is going to be
25 addressed by a limited rule.

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1 MR. BURNS: So you are referring to
2 weapons-related production of depleted uranium from --

3 MS. GELLES: Yes.

4 MR. BURNS: Okay.

5 FACILITATOR CAMERON: And, Bill?

6 MR. DORNSIFE: I have a general question
7 about the rulemaking. Could the outcome of the
8 rulemaking be a rule isn't necessary, and some other
9 option?

10 FACILITATOR CAMERON: In other words, such
11 as?

12 MR. DORNSIFE: Well, you know, we make it
13 all Class C for a such as.

14 FACILITATOR CAMERON: Which would probably
15 require a rulemaking, if you wanted to make it all
16 Class C. Let's get to the --

17 MR. DORNSIFE: No, right. Well, I mean,
18 yes. Yes.

19 FACILITATOR CAMERON: I mean, you are
20 taking it from Class A to Class C.

21 MR. DORNSIFE: Well, let's -- I mean,
22 maybe that's a bad example. I mean --

23 FACILITATOR CAMERON: Okay.

24 MR. DORNSIFE: -- could the result of the
25 rulemaking be we don't need a rule, everything is okay

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1 the way it is?

2 FACILITATOR CAMERON: Now that would --
3 that would require the staff to definitely go back to
4 the Commission. But how would the staff get to that
5 point, Larry? Do you want to talk to that?

6 MR. CAMPER: That last one is a good
7 question, Chip. I mean, at this point, the Commission
8 directed the staff to do something outside of the
9 adjudicatory process. The staff undertook that
10 assignment. We conducted an analysis, which I
11 discussed in my presentation. We provided four
12 options in the SECY. We made a recommendation, i.e.
13 option number 2, to require a site-specific
14 performance assessment and to identify the technical
15 parameters and to create the guidance to accompany it.

16 The Commission, at the moment, has chosen
17 to accept the staff's recommendation, but also direct
18 us to proceed to budget for at least -- and we assume
19 that means proceed with the rulemaking to risk-inform
20 Part 61. So we have an assignment on the table.

21 If in the course of these deliberations --
22 and now that -- the purpose we are here now is to do
23 gathering of principally technical information on the
24 several technical subjects we have identified on the
25 agenda to aid in that rulemaking.

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1 I mean, at some point along the line, if
2 we were to -- if the staff would hear compelling
3 arguments that suggest, based on sound reasons, that
4 you don't need a rulemaking, then the staff can always
5 go back to the Commission and communicate further, you
6 know, go further than we have already in discussions.

7 However, the Commission would then have to
8 decide that it wanted to do something different,
9 whatever that something is. But thus far I have not
10 heard anything in the discussions this morning that
11 get to the point where you don't need a rulemaking. I
12 have heard some very interesting comments made, not
13 the least of which was Christine's regarding, you
14 know, this notion of significant quantities.

15 But I guess the simple answer is, yes, you
16 can arrive at that place where the staff would go back
17 to the Commission and communicate, but you really have
18 to identify some compelling reasons that that is where
19 you were, have some discussion about it, so the staff
20 would have something to work with that would make a
21 compelling case to the Commission to change direction.

22 FACILITATOR CAMERON: Okay. Let's -- on
23 this issue, let's take the -- and Christine has
24 already pointed out some practical issues that would
25 be presented, the orphan-DUs issue. Let's take the

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1 cards that are up now on this.

2 When we get to tomorrow afternoon, the
3 long-term rulemaking, the other considerations, after
4 we have had discussion about a number of points, let's
5 revisit this rulemaking issue. But that is -- it's
6 not to mean to say to take your card down, Bill, but
7 we have -- let's go down, Greg, Arjun, Diane, Felix.
8 We'll go down the list. Greg?

9 MR. KOMP: Yes, I just wanted to really
10 second Christine's point. There are more forms of DU
11 than just the enrichment facility, and we would also
12 have a hard time of disposing of source if we were
13 just limited to that, because we have a variety --
14 everything from, you know, plating that we use in
15 tests all the way through, you know, contaminated
16 materials and also some other variety of materials.

17 FACILITATOR CAMERON: That's -- the
18 question is, then, what do you do about the rest? And
19 if there was some suggestion that you don't even need
20 the rule, that you could effectively do something by
21 doing X, that is sort of Bill's point, although he
22 filled in the X with don't do anything. Okay.

23 Arjun?

24 MR. MAKHIJANI: I just want to follow up
25 on Bill's point. Is it possible that the outcome

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1 could be this is all greater-than-Class-C waste and
2 can't be disposed of in shallow land burial? Because
3 one of my concerns is that shallow land burial seems
4 to be a pre-judged outcome of the current rulemaking
5 process. I would love to be disabused, but at least a
6 clarification would help.

7 FACILITATOR CAMERON: Some thoughts on
8 that, Larry? I don't think you are necessarily pre-
9 judging anything, but is there some assumption about
10 that?

11 MR. CAMPER: In the course of this
12 analysis, and in the course of the interface with the
13 Commission, the class of this waste was not changed.
14 One of the recommendations that was provided to the
15 Commission, option number 3, was to examine the class
16 of this waste, using the methodology, perhaps
17 modernized somewhat, that was used in 1979, 1980, when
18 Part 61 classification scheme was developed.

19 The Commission did not choose that option.
20 I mean, any modification of class of the waste would
21 have to undergo an analysis appropriately designed,
22 and then it would have to be subjected to appropriate
23 stakeholder review, rulemaking, and the like.

24 So, again, the assignment that the staff
25 has at the moment is to proceed to conduct a

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1 rulemaking that would require a site-specific
2 analysis, and then to proceed to budget for risk-
3 informing Part 61. So that is a remarkably different
4 potential outcome as compared to where we are at the
5 moment.

6 FACILITATOR CAMERON: But going along on
7 Arjun's track, we have heard this morning about, well,
8 maybe you need to bury it six meters instead of three
9 meters. Mike Ryan was talking about the waste form
10 and things like that. Would things like that -- and,
11 David, I should ask you also, are we going to get to
12 -- is one of the discussion topics going to focus on
13 those types of things that might be done? Not making
14 it greater than Class C, but how do you ensure that
15 the radon, etcetera, etcetera, is not going to harm
16 anybody? Dave, do you want to talk to that?

17 MR. ESH: Yes, I think I understand this
18 discussion and the -- what we are trying to get at.
19 The elements that we hope to cover in the issue
20 discussions that will follow are the issues that will
21 need to be evaluated to assess what would need to be
22 specified in the regulation and in the guidance to
23 ensure safe disposal of depleted uranium.

24 If, in the event we got to the point where
25 we said, "You can't do this," in the course of that

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1 rulemaking process, then obviously that would be a
2 different outcome or direction than where we are now.

3 But certainly that is what we would do. I mean, we
4 will do the technical basis and the appropriate
5 technical basis. And if it came out different than
6 where we may expect now, or where we are right now,
7 then we would reflect that in the outcome. So --

8 FACILITATOR CAMERON: Okay.

9 MR. MAKHIJANI: Can I just ask for a
10 clarification?

11 FACILITATOR CAMERON: Go ahead. Go ahead.

12 MR. MAKHIJANI: So right now you are only
13 going to consider shallow land burial. Leaving aside
14 the classification issue, I stand corrected. Within
15 (a)(6) of course you are creating a Class A1 and a
16 Class A2 basically.

17 But within the context of this analysis is
18 an outcome that only deep burial would be a suitable,
19 safe disposal method. Is that -- are you going to
20 look at that even?

21 MR. ESH: I think I understand what you
22 are asking.

23 MR. MAKHIJANI: Yes.

24 MR. ESH: And if the technical evaluation
25 would not support near-surface disposal, which in our

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1 regulations is defined as the upper 30 meters, then
2 obviously that wouldn't be done under low-level waste
3 regulation any more. It would have to be moved into
4 some other regulatory program.

5 MR. MAKHIJANI: That is not correct,
6 because depleted uranium would remain low-level waste,
7 but it wouldn't be Class A.

8 MR. ESH: The low-level waste only applies
9 to -- low-level waste only applies to disposal in the
10 upper 30 meters.

11 MR. MAKHIJANI: No. GTCC is low-level
12 waste, but cannot be disposed of in the upper thirty
13 meters. It's in the rule. I have the rule in front
14 of me.

15 FACILITATOR CAMERON: Okay. We can
16 clarify this issue. I think the important point is is
17 that, what is the NRC going to consider in this
18 rulemaking? And Arjun, others, may make suggestions
19 that, look, you can't assume this can't be done with
20 shallow land burial, or it needs to be of, you know,
21 maybe not -- if it needs to be 29 meters or something
22 like that.

23 As I understand it, the NRC is going to be
24 listening to all suggestions like that, and is going
25 to consider that in developing the technical basis for

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1 the rule. So I don't want to -- this is an important
2 discussion for everybody here. I don't want to get us
3 way off track, so I would like to finish up this
4 topic, so that we could move on to the agenda item.

5 Larry, can you shed some light on any of
6 this for us?

7 MR. CAMPER: Well, the -- I mean, a couple
8 of points. I mean, we are listening to everything we
9 hear here, obviously. And we will review the
10 transcripts and the like. But, again, the assignment
11 at the moment is to gather technical information on a
12 Commission decision to proceed, to require site-
13 specific performance assessment.

14 Now, on this question of the suitability
15 of depleted uranium for disposal near surface, that
16 means up to 30 meters, that was the driving question
17 that the staff asked itself when we undertook the
18 analysis. That was the driving question. Is this
19 material suitable for near-surface disposal?

20 And the reason that was the driving
21 question to staff -- one of the first order of
22 principles that we followed is because there were
23 serious contentions filed in the course of the LES
24 hearings that said it was not suitable for near-
25 surface disposal.

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1 And if we had determined as a staff that
2 it was not suitable for near-surface disposal, then my
3 view was we would have had to have gone back to the
4 Commission and further communicated with the
5 Commission regarding the direction it had given us,
6 because the direction, which I had on my slides
7 earlier today, did not direct the staff to determine
8 what class of waste this was.

9 It did not determine to -- it did not ask
10 us to reclassify it. It asked us to consider whether
11 those quantities warranted modifying those two parts
12 cited. And had the material not been suitable for
13 near-surface disposal, as witnessed by our analysis,
14 my view is we would have had to have gone back to the
15 Commission and communicated. Our analysis determined
16 that it was suitable for near-surface disposal, albeit
17 under certain conditions, for example, burying it
18 deeper or taking other mitigative measures to reduce
19 the amount of radon in the nation, things of that
20 nature.

21 So we did explore that very question at
22 the essence of our technical analysis.

23 MR. MAKHIJANI: Are you saying that your
24 analysis was definitive enough to have advised the
25 Commission that near-surface disposal is suitable when

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1 subsequent to your presentation the person who is
2 responsible for that technical analysis said that they
3 didn't take climate into account?

4 And excusing the informality of the
5 language, that it was silly to exclude climate change,
6 that erosion was not considered, and a lot of things
7 that are very essential in the real world are not
8 considered. There wasn't a screening analysis --

9 MR. CAMPER: I think --

10 MR. MAKHIJANI: So --

11 MR. CAMPER: I think we are going to --

12 MR. MAKHIJANI: Wait a minute. You two
13 have said very different things about the objectives
14 of that paper. Dr. Esh said that the objective of
15 that paper was simply to advise the Commission of
16 whether a new rulemaking was necessary, so essentially
17 the details of the analysis, which was done with a
18 non-validated model which the NRC has refused to
19 provide to us, were not important.

20 What you are saying is the details of the
21 analysis are all important, because they were the
22 basis on which the NRC decided that the next
23 investigation was to be done under Class A for shallow
24 land burial.

25 MR. CAMPER: I think --

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1 MR. MAKHIJANI: And that our analysis,
2 which I did in the LES case, that shallow land burial
3 was not suitable was in effect wrong.

4 MR. CAMPER: I didn't say your analysis
5 was wrong. I said --

6 MR. MAKHIJANI: That is the effect of what
7 you are saying.

8 MR. CAMPER: First of all -- first of all,
9 we are going to spend a lot of time debating something
10 that is not the purpose of why we are here today.
11 Okay? Now, we can do that, or we can focus on other
12 -- let me finish. Let me finish.

13 MR. MAKHIJANI: Okay.

14 MR. CAMPER: Let me finish.

15 FACILITATOR CAMERON: Larry, finish up,
16 and then --

17 MR. CAMPER: Okay.

18 FACILITATOR CAMERON: -- let me say
19 something.

20 MR. CAMPER: We can spend a lot of time
21 debating this issue, or we can spend our time focusing
22 on the reason we are here, is to gather technical
23 information. I suggest we do that.

24 Dr. Esh answered your question I thought
25 very thoroughly a while ago as to the purpose of the

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1 technical analysis and how we used it in communicating
2 with the Commission. I think he gave you a thorough
3 and reasonable and accurate answer. Okay? You may
4 not agree with it. That's your prerogative. But he
5 gave you a reasonable answer.

6 And what I'm saying now is we have drifted
7 into a discussion as to the suitability of this
8 material for near-surface disposal, and all I am
9 saying to you is that was one of the fundamental
10 questions we had to ask ourselves when we undertook
11 the design of the technical analysis, because if the
12 answer had led us to the conclusion that it was not,
13 we believe we would have been in a different position,
14 given the Commission direction to us at the time, and
15 would want to communicate with the Commission further.

16 That's all I'm saying.

17 MR. MAKHIJANI: Well, what you are saying
18 is that it was appropriate for you to do calculations
19 with a non-validated model you won't provide the
20 public, and that you concluded that shallow land
21 burial was appropriate. The Commission made their
22 decision on that basis, that we are going to pursue a
23 rulemaking on that basis.

24 But your model expert has said that
25 essentially -- my words -- that essential factors,

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1 like climate change and erosion, were omitted. The
2 one site that is under practical consideration for DU
3 disposal, which consists of above-ground pyramids,
4 which are vulnerable to erosion unless you build them,
5 would not be vulnerable for one million years, would
6 not be covered by the present analysis, and that is
7 not germane to the technical questions that were here
8 today. I --

9 FACILITATOR CAMERON: Okay.

10 MR. MAKHIJANI: I came with the explicit
11 idea that these kinds of technical questions would be
12 on the table. Otherwise, if we are going to say
13 shallow land burial is suitable, and it is already
14 decided, what is the point of my being here when I
15 have spent a lot of years and a lot of time and a lot
16 of money concluding otherwise?

17 FACILITATOR CAMERON: Okay.

18 MR. CAMPER: I'm going to let Dr. Esh
19 speak to the technical analysis, since he was the lead
20 individual in the technical analysis. He's far closer
21 to it than I am, and he is better suited to answer
22 those particular questions.

23 FACILITATOR CAMERON: I've got to do an
24 intervention here, okay, so to speak so that we can
25 get on with the discussion of points. Certainly --

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1 and, Dave, if you have something to say after this,
2 say it. But I want to get to Diane and others, and I
3 want to get to the next agenda item.

4 Certainly, Arjun's logic on this may be
5 correct, and people around this table can tell the
6 staff that they should not be -- they should be doing
7 something else than pursuing a rulemaking that is
8 based on the assumption that shallow land burial is
9 correct.

10 Those issues need to be brought before the
11 Commission, like everything else that is being said
12 here. The Commission has to know that people who came
13 to the table disagree with the assumptions, and the
14 reasons why. For example, the technical analysis did
15 not look at this, that, and the other thing. I mean,
16 it is a very important issue.

17 Arjun, all I can say to you is to make the
18 point, which you are making, and then we get to the
19 specific discussion issues like period of performance,
20 etcetera, etcetera. If there is something relevant
21 there from this aspect, bring it in, but also perhaps
22 suspend disbelief, in a sense, and tell them what you
23 believe on those things.

24 Before we go to Diane, because she may
25 have a similar point, Dave, do you have -- do you want

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1 to give a short explanation to -- on this point? You
2 were very clear before, but the issue on the table is,
3 did you have enough information to assume that shallow
4 land burial would be the way this is going to be done?

5 MR. ESH: Yes. I think we attempted to
6 describe clearly the assumptions that were made in
7 that assessment and the basis for that assessment. We
8 acknowledged that, for instance, in our treatment of
9 climatic variation we took the approach of
10 representing it as epistemic uncertainty, which means
11 in a particular realization those conditions are
12 invariant in that assessment, which, as Dr. Burns
13 stated, may be somewhat reasonable for shorter periods
14 of time. But as you go to longer periods of time,
15 that may not be reasonable.

16 But what I want to emphasize is, when you
17 take that approach of representing that variability as
18 epistemic uncertainty, there is a pretty strong
19 likelihood, based on our experience, that you may be
20 overemphasizing the extremes of the outcomes, which
21 means you can say that you may get results that are
22 very unfavorable when in fact, when you put that
23 variability into your simulation and you incorporate
24 it on a site-specific basis, the outcomes aren't
25 nearly that extreme.

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1 So it was an approach to simplify a part
2 of the calculation. It does not make it invalid from
3 the standpoint of our outcome was you need to do a
4 site-specific analysis, and that site-specific
5 analysis needs to support the decision that you are
6 making. Period. And if that site-specific analysis
7 is dependent on some parameters that are uncertain or
8 variable, they need to be factored into that site-
9 specific analysis.

10 So with regard to climate change, what the
11 -- with regard to erosion, I would say near-surface
12 disposal is in the upper 30 meters. We may have
13 disposal facilities now that are looking at disposals
14 at one meter, two meters, or three meters' depth.
15 Thirty meters is quite a bit different from a long-
16 term stability standpoint than three meters or one
17 meter.

18 And there are lots of locations in the
19 United States, based on isotopic dating and those
20 sorts of things, where I am sure you can demonstrate
21 -- and maybe Dr. Burns could talk to -- you can
22 demonstrate that there are portions of our country
23 that have been stable for long periods of time. Not
24 every location is highly dynamic. Some certainly are,
25 but the decision and the assessment that you are

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1 making needs to evaluate that.

2 FACILITATOR CAMERON: Okay. So, and we'll
3 get to period of performance. But could -- if the
4 site-specific performance analysis showed that the
5 waste should be buried at 31 meters, is that also --
6 is that also a possibility?

7 MR. ESH: Anything is a possibility. I
8 mean, sure.

9 FACILITATOR CAMERON: Okay. Well, let's
10 go to Diane, and then Felix, and then we'll hear a
11 final word from Bill, and then we'll go on. Diane?

12 MS. D'ARRIGO: My question might be moot.
13 Earlier on you were having a discussion about
14 something that Christine said this morning, and I
15 wasn't here, so I was asking if there could be a
16 summation of what that was. But if we're done with
17 that topic, we don't have to go back to it. But if
18 it's something that is going to keep coming up, I
19 would like to know what it was.

20 FACILITATOR CAMERON: Okay. Thanks,
21 Diane. Do you mean this morning, or do you mean just
22 -- not what she said right at the beginning of this
23 session?

24 MS. D'ARRIGO: I don't know what you all
25 were talking about. You were saying Christine

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1 mentioned something, and everybody was saying, "Yes,
2 and I support what she said," or "I have this
3 question." I want to know what you all were talking
4 about.

5 FACILITATOR CAMERON: Okay. Okay.
6 Christine?

7 MS. GELLES: I think Larry was referring
8 to my comment when we began the discussion on
9 significant quantities.

10 MR. CAMPER: That's correct.

11 MS. GELLES: And what I simply had stated,
12 Diane, is that if the focus is on site-specific
13 performance assessment, it is the Department of
14 Energy's position that perhaps it is not prudent to
15 define what is a significant quantity, because in fact
16 the site-specific performance assessment, if it's done
17 properly, is going to establishing the limiting
18 quantity of any isotope or radionuclide that you would
19 want to put in that facility, in that specific site,
20 given the conditions there.

21 So I offered that perhaps we were focusing
22 on the wrong element --

23 FACILITATOR CAMERON: Okay.

24 MS. GELLES: -- in defining.

25 FACILITATOR CAMERON: Thank you.

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1 Felix, and then Bill, and then we are
2 going to tee up period of performance.

3 MR. KILLAR: Actually, I am going back to
4 the question that initially was asked after lunch, and
5 that was: should we focus strictly on depleted
6 uranium as coming from enrichment facilities? And
7 basically my perspective is very consistent with what
8 Christine said, is that you have a lot of sources of
9 depleted uranium. Enrichment is only one of them.
10 And so you shouldn't necessarily lead us to one
11 particular source.

12 And it actually gets into -- part of the
13 discussion I am concerned about is identifying unique
14 sources of material for unique waste streams and
15 stuff, because to me the waste stream is a waste
16 stream, not the source of the waste stream. That if
17 you have cobalt-60 coming from a hospital versus
18 cobalt-60 coming from an irradiator versus cobalt-60
19 coming from a reactor, it's cobalt-60.

20 So you are looking at the particular
21 isotope, particular materials involved, and the waste
22 form. You are not looking at the origin of the
23 material. And so I think trying to get into a
24 discussion that is focused on the enrichment facility
25 versus a deconversion facility versus a facility that

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1 makes munitions for the military, you know, those are
2 different perspectives than looking at the waste
3 itself, at the waste stream itself, the depleted
4 uranium.

5 FACILITATOR CAMERON: Okay. Thanks,
6 Felix.

7 And, Bill, the last comment on this. And
8 we will find an opportunity to revisit it again,
9 because it's important. Bill?

10 MR. DORNSIFE: Yes. I think obviously the
11 dilemma we have here with shallow land burial is you
12 have to first of all assume timeframes that are well
13 outside what you currently have to do from a
14 performance assessment standpoint to even get a risk.

15 And then, secondly, you have to do a silly
16 performance assessment to determine whether or not it
17 is real.

18 And, you know, this is not -- another way
19 to look at it could be there are other waste streams
20 under the current scheme of shallow land burial that
21 we -- at some point we only look for certain things.
22 Like for example, you know, for the long term under
23 the current guidance we look for mobile radionuclides.

24 That could impact the need for site limits. Okay?

25 We ignore all of the other stuff that is

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1 there in terms of erosion, you name it, which could
2 indeed present the same kind of problems we are
3 talking about from the long-term standpoint.

4 So, you know, somehow we have got to I
5 think deal with this issue that the risk doesn't occur
6 for a very, very long time period. And what is likely
7 to happen to civilization, and what does that mean?
8 Does it matter that 50,000 years from now there is a
9 problem?

10 FACILITATOR CAMERON: Okay. Good segue to
11 period of performance.

12 (Laughter.)

13 Do you want to tee that up?

14 MR. ESH: Well, this one is easy. I know
15 we will all be in agreement on period of performance.

16 (Laughter.)

17 I am going to give you a little background
18 for our low-level waste regulations and associated
19 NUREG, some other waste programs, maybe some key
20 considerations, and talk about various approaches to
21 period of performance.

22 As I mentioned in my earlier presentation,
23 there really isn't a consensus on how this should be
24 done internationally. The NEA has done some good
25 recent work doing a fairly comprehensive evaluation of

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1 the problem. It's an NEA 2009 report on time scales.

2 You can Google it. There is a Google book result
3 that you can see some pages of it, or you can order it
4 from NEA. I happen to have a copy if anybody wants to
5 see the reference but not take it from me.

6 But this is a challenging part of this
7 problem. A little bit of background here. In
8 development of Part 61, it was initially considered a
9 10,000-year performance period, but the regulation
10 itself does not provide a value. The site and the
11 waste characteristics can obviously influence the
12 timing of the projected doses.

13 So if we look at a 10,000-year slice on
14 the picture of the activity ratio here, this is
15 commercial low-level waste inventory normalized to
16 one, the decay characteristics look like basically.
17 It starts off at its highest point. It drops off very
18 rapidly, in hundreds of year timeframes. And then at
19 much longer times you would have a little bit of a
20 tail come in from the long-lived in-growth.

21 Both of these calculations are assuming no
22 loss from the source. And, obviously, you will have
23 loss from the source. You could have very different
24 losses from the sources, depending on your site
25 conditions.

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1 Depleted uranium is essentially flat for a
2 long period of time, and then eventually you have the
3 daughters come in, because it is so long-lived. So
4 these -- the behavior of these two different types of
5 material are quite a bit different, and you have to
6 ask yourself in your regulatory process and in your
7 technical evaluations whether I have appropriately
8 accounted for these differences.

9 I guess I forgot my animations.

10 NUREG-1573, which is our performance --
11 our guidance document by our performance assessment
12 working group, it considered a 10,000-year period of
13 performance sufficient with some exceptions. The
14 exceptions are noted here, or the exceptions are noted
15 at the bottom.

16 It was sufficient to capture the risk from
17 the short-lived radionuclides and to assess the risk
18 from the more mobile long-lived radionuclides. That
19 is just what Bill Dornsife spoke to.

20 And it was felt that it would potentially
21 bound the potential peak doses at longer times, based
22 on the characteristics of the typical commercial low-
23 level waste stream.

24 The exceptions that were noted in that
25 document were the in-growth of daughters from large

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1 inventories of uranium, and also peak doses at humid
2 sites from large inventories of long-lived
3 transuranics. So, and noted there were exceptions to
4 the selection of that period of performance.

5 Within the U.S. we have some other points
6 of reference for period of performance. In the Yucca
7 Mountain-specific regulations, 10 CFR Part 63, it goes
8 out to a million years. It uses a different radiation
9 limit for the first 10,000 years compared to the
10 longer times. For WIPP, 10 CFR 61, it specifies
11 10,000 years, and then the general regulations for
12 high-level waste disposal, which would apply to any
13 site outside of Yucca Mountain currently, still
14 maintains a 10,000-year period of performance.

15 For near-surface disposal, for some other
16 types of materials, decommissioning sites,
17 contaminated sites, it has a 1,000-year period of
18 performance, and then for mill tailings it has a
19 1,000-year goal. Now, as I have said many times,
20 there is no international consensus.

21 So what would be some considerations that
22 I hope we can talk about? Hazard and longevity of the
23 waste. What is your analysis framework that you are
24 putting it into? A consideration of socioeconomic
25 uncertainties, which we don't really talk about too

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1 much, but I think Bill alluded to a few moments ago.
2 And then, uncertainty in extending models; we have
3 talked some about that.

4 So this is a horsetail plot of PA
5 calculation, and what I want to illustrate with this
6 are two different things. First, some people that
7 maintain that performance assessments aren't credible
8 are -- partly maintain that because they look at this
9 period of time, and maybe when you first start getting
10 the horsetail curves and say, "Look at this broad
11 range of results you can get," and then the
12 uncertainty is reduced. But we know the opposite is
13 true, that the uncertainty grows in time.

14 Well, this sort of performance on this
15 chart is solely due to the fact that in this early
16 times, from the few hundreds of years to the ten
17 thousands of years on this result, you are seeing the
18 uncertainty in both the magnitude and the timing of
19 when that result occurs. Whereas, when you get to the
20 longer times, the timing isn't as uncertain. It is
21 just the magnitude that you are achieving. So one
22 reflects two components of uncertainty, and one
23 reflects just one. That can kind of give you this
24 misleading impression.

25 Then, the other point is in our regulatory

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1 processes people argue, "Well, what society is going
2 to be doing long times into the future." Now, this is
3 an enormous time scale, and we basically have
4 something that we are assuming today and extrapolating
5 that forward. Well, that is done partly to avoid
6 unnecessary speculation. It is a regulatory
7 construct. You are trying to do the best you can
8 today with the decision you are making for society.

9 And the receptors and the societal
10 uncertainties that are really selected by your
11 receptors and scenarios are done in some manner to try
12 to mitigate, or at least account for, these potential
13 societal uncertainties.

14 If we go forward now, some perspective.
15 Now, what I have done is I have taken some things of
16 various ages from the past and projected them onto
17 this projection forward, so you can get -- get you
18 thinking about the time scales and how big they are.

19 So the first thing is the NRC -- and this
20 is a picture of my twin brother and myself. And we
21 were not Siamese twins; it just looks that way on the
22 picture.

23 (Laughter.)

24 About 40 years more or less. It's a log
25 scale, so you don't really know how old I am.

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1 (Laughter.)

2 So then if we look at some things that are
3 more like 100 years old --

4 (Laughter.)

5 -- the State of Utah is about 106 years
6 old or so, and this guy here, he is around 100 years
7 old.

8 (Laughter.)

9 The United States, okay, that is more or
10 less 250 years. See, if we are projecting this
11 forward, as Bill was talking about there, you don't
12 even see an impact on this calculation. Just
13 understand this is to convey a point, and it's not
14 specific to depleted uranium. You don't even see an
15 impact beyond the age of the United States.

16 Here is the Great Wall of China, at least
17 a part of it, that is on the order of a couple
18 thousand years old, and a mastodon. I had a lot of
19 trouble finding anything that was accurately dated
20 beyond 10,000 years that I could put on the figure as
21 a point of reference. A lot of the prehistoric or
22 ancient animals and plants, there are very broad
23 ranges for their ages, you can't even put a context to
24 it.

25 So this is just put up there to

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1 communicate this issue at time scales and the enormity
2 of them, and that it needs to be thought about in
3 maybe a different way. Myself, being an engineer and
4 a scientist, sure, I like to go off and calculate
5 something. But you always have to step back and say,
6 "What does it mean? And does it make any sense?"

7 So what are some approaches to period of
8 performance. Well, of course, we could specify in the
9 regulation a period of performance. That would be one
10 method. Another method would be NRC could specify the
11 factors to consider, and somebody develops that on a
12 site- or condition-specific basis.

13 But either way, whether we specify the
14 period of performance or we allow some approach to
15 specify the performance of -- the period of
16 performance, we want to discuss during this meeting,
17 what are the factors that need to be considered for
18 either approach? And is there some other way that we
19 haven't thought of that maybe we could go about this?

20 FACILITATOR CAMERON: Okay.

21 MR. ESH: That's it.

22 FACILITATOR CAMERON: Thank you. Thank
23 you very much. Thank you, Dave.

24 Let's start with Mike, Mike Ryan. Mike,
25 what are your thoughts or questions on this? Let's

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1 turn on --

2 MR. RYAN: Oh, thanks. Sorry. Sorry,
3 Charles.

4 You know, I think the period of
5 performance has to be in the context of -- and, David,
6 you have done a nice job laying out the context of,
7 you know, what -- what are we looking at a disposal
8 site for, over what period of time?

9 We haven't touched on it yet, but at year
10 100 a very important event occurs, at year 100 plus
11 zero days with a probability of one. And that is that
12 an intruder occurs and digs into the waste and grows
13 food and ground-up irradiated hardware and stuff like
14 that, and conducts his whole life through the highest
15 activity waste that happens to be in a low-level waste
16 site.

17 Well, for a place like Barnwell, I
18 calculated once the probability of randomly hitting
19 the Class C waste is 10^{-5} or so. So, you know, we have
20 got a couple of artifacts along the timeline that we
21 assume for the purpose of conservatively estimating
22 impact what occurs and doesn't occur. We don't have
23 that construct yet for some longer timeframe, like
24 10,000 years. But we assume there is some use of the
25 resource, typically water, that carries radioactivity

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1 from the disposal site to a receptor, and we go
2 through a dose calculation.

3 So when we think about alternate
4 timeframes for a period of performance, are we going
5 to attach some -- the same kinds of constructs? Like
6 use of the water would be the one you would think
7 about for really long timeframes, or something else,
8 or, you know, what do you want to do there?

9 I'm not suggesting anything. In fact, I
10 am suggesting that it is something to think about, and
11 I don't really have a good suite of ideas of things
12 that would be relevant at that time. But it is such a
13 long time period for the very reason that you showed
14 in your last graphic, David, that it -- that deserves
15 some additional thought.

16 I personally think, for example, at the
17 100-year point that it is a very conservative thought
18 to say that, you know, any low-level waste site will
19 be intruded to with a probability of one at day zero
20 past 100 years. You know, if you get it to 300 years,
21 and cesium and strontium are gone, you get a whole
22 different profile of what that intruder might get for
23 a dose.

24 So, you know, within reasonable bounds of
25 certainty or uncertainty, even for the current

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1 constructs -- and I am not criticizing or complaining
2 about them at this point. I am simply saying you need
3 to think about what is the endpoint of interest that
4 you will be interested in evaluating against. And,
5 you know, it may be a transport kind of a question, or
6 it may be just an inventory question, you know, and
7 the potential for mobility.

8 So that is something to think about in
9 this arena. Thank you.

10 FACILITATOR CAMERON: Okay. Thanks, Mike.

11 Peter, do you have any thoughts on this
12 from your perspective?

13 MR. BURNS: Well, I found myself thinking
14 about Yucca Mountain, which is apparently no longer a
15 viable site for disposal of high-level nuclear waste.

16 And the court decision in D.C. however many years ago
17 it was, that the 10,000-year regulatory timeframe was
18 not appropriate because it did not capture peak dose,
19 predicted dose, which I think is something in the
20 order of 100- to 200,000 years, and I was thinking,
21 gosh, if that scenario developed with the depleted
22 uranium storage situation, peak dose is way out there,
23 further than it would be for spent nuclear fuel,
24 because it is -- it has got such long-term
25 radioactivity, peak doses in the millions, and you

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1 would be toast. You could never put it anywhere.

2 So I guess maybe that's not a terribly
3 useful comment, but if -- you know, there has to be a
4 regulatory timeframe that makes sense in a societal
5 framework, rather than ending up at a peak dose
6 scenario.

7 MR. RYAN: And, Peter, if I may, maybe
8 that is a good reason you have just given why perhaps
9 an endpoint of dose might not be the most meaningful
10 or useful concept for those super-long timeframes. So
11 that is -- I think we are on the same page you are
12 suggesting. Think carefully about what time you are
13 talking about as well as the construct for what impact
14 you are trying to assess.

15 FACILITATOR CAMERON: And how about that
16 issue that Peter raised about peak dose versus other
17 factors that you might consider to deal with the risk
18 so to speak? Anybody? Richard?

19 MR. HAYNES: Thanks. I guess from our
20 standpoint -- my standpoint as a regulator, my concern
21 is is that your uncertainty is so great at -- when you
22 get out to 10,000 years that, you know, the number or
23 the calculated number is almost irrelevant at that
24 point, because if you are looking at your own graph
25 there, you are showing that there is almost four --

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1 there is five or six orders of magnitude that that
2 value of exposure could be at over that -- at that
3 10,000-year mark. So is the number you actually
4 calculate meaningful at that point?

5 FACILITATOR CAMERON: So, Richard, with
6 that, are you saying that the uncertainty is so great
7 after 10,000 years that it doesn't make any sense to
8 go beyond that?

9 MR. HAYNES: I would back it up. I would
10 say I don't know that it makes much sense to get out
11 beyond 1,000 years, because even at 1,000 you still
12 have quite a bit of uncertainty. But at 10,000 it is
13 like throwing a dart at a dartboard at that point.

14 FACILITATOR CAMERON: Okay. Peter raised
15 his flag on that one. Let's get a direct response,
16 and then we will go over to Tom.

17 MR. BURNS: Well, the response I wanted to
18 make was when -- and this is sort of philosophical in
19 a way, I suppose. But if you rely upon the
20 performance assessment, at some point -- at some point
21 you start to be -- your decisionmaking process starts
22 to be driven by events that are not necessarily what
23 is actually going to happen. And you start responding
24 to those in order to make your model or your scenario
25 work better.

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1 And what I'm trying to say, I don't think
2 that made any sense, so -- I had a fair bit of
3 experience with the Yucca Mountain program. I was not
4 part of the program, but I was funded for nine years
5 to do research. And when the decision was made to go
6 from 10,000 years to a million years, neptunium-237
7 became very important overnight. It didn't make any
8 difference at all in 10,000 years. But at 100- to
9 200,000 years, neptunium-237 was a major dose
10 contributor.

11 And so all of a sudden we are all
12 scurrying around trying to figure out what is going to
13 happen with the neptunium. But if you had a different
14 knowledge of how the colloids would behave in that
15 environment, which we might have, say, in 10 years, it
16 might well be plutonium that is the most important,
17 and then you are scurrying all around trying to
18 correct your repository design, and so on, for
19 plutonium.

20 And you get into this cycle where the
21 probabilistic performance assessment starts to drive
22 the engineering, or something like that, and it gets
23 -- it is a no-win situation when you get to that
24 point. I'm not sure I'm being clear, but maybe
25 someone else can expand on it.

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1 FACILITATOR CAMERON: I think people
2 realize what you are saying. It is a question of what
3 you do backing off from that, perhaps for some of you
4 at any rate. But let's go to Tom and Arjun, Felix,
5 and then back over to Bill. Tom?

6 MR. MAGETTE: I am certainly inclined to
7 agree with Richard's point as well as Mike and Peter's
8 about uncertainty. I haven't heard a whole lot about
9 specifics thrown out, so at least for a point of
10 discussion I would suggest that there is certainly
11 some regulatory precedents which could inform us.

12 And I think David had them all up there,
13 actually. 10 CFR 60, 40 CFR 191, 10 CFR 63, all talk
14 about 10,000 years. 63 also has, as he mentioned, a
15 different standard out further in time. But there
16 clearly is an established precedence that it may be
17 worthwhile to do some sort of specific deterministic
18 modeling out to that time period, acknowledging that
19 there is a lot of uncertainty associated with that.

20 But I think that that is probably as
21 reasonable a line as any to start with. There is also
22 the concept of peak dose, which in this case, if you
23 are talking about the in-growth of daughter products
24 from depleted uranium, gives you a number much further
25 out in time.

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1 NUREG-1573 speaks to that and says that
2 you should consider a time to peak dose. You may not
3 model out to it. You aren't really able to model out
4 that far in any sort of rational way, but you can take
5 into consideration what that may mean. And so some
6 sort of combination of those two ideas, a compliance
7 number and another number at peak dose, which you take
8 into consideration, but it is not a compliance number
9 in a regulation, I think would make as much sense as
10 anything I can think of.

11 FACILITATOR CAMERON: Okay. Thanks, Tom.

12 And as all of you speak to these points,
13 let's keep in mind Tom's suggestion, so that we can
14 get reactions to that.

15 Arjun, what do you have on this?

16 MR. MAKHIJANI: Yes, two points. You
17 know, of course, those of us who do science and models
18 all recognize that when you get out to 10,000 years
19 and one million years, anybody who knows history knows
20 that this is a very difficult thing. But we all draw
21 different lessons from it.

22 The lesson that we have drawn at my
23 institute, and many of us who don't -- you know, are
24 two-fold. One is that society should do its utmost to
25 not create problems for which we can't foresee the

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1 solutions, and burden future generations with
2 pollution and pollutants when we get the benefits and
3 we pass on the costs to them.

4 The idea that our generation should pass
5 on costs to future generations is unacceptable to us.

6 The other thing, from a practical point of view, as
7 to what you do if you are stuck with a situation --
8 we've got 60,000 tons of spent fuel, and we all
9 recognize we have to do something with it. Not a good
10 situation.

11 How we respond in the face of this
12 uncertainty is to say that we protect future
13 generations in the same way that we protect our own
14 generation, at least no less. And if our models are
15 not good enough, we should try to make them better.
16 We cannot clear up our crystal balls more, but it just
17 doesn't mean that we can throw them in the trash.

18 So we need to keep the same dosimetric
19 rules and the same risk protection rules. We can't
20 say, "Oh, you know, day after tomorrow we are going to
21 have a cure for cancer." And day after tomorrow we
22 may all be more vulnerable to a new set of diseases
23 that radiation may cause. We don't know that.

24 The other point is regulatory. If we are
25 going to limit the period of performance, I think in

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1 my opinion -- I have been playing a lawyer on TV for
2 some time, so I'll do it here -- a new notice of
3 rulemaking has to be issued that Subpart C is going to
4 be modified.

5 You cannot hide a modification of
6 Subpart C by saying we are going to modify
7 61.55(a)(6). Subpart C is explicitly devoted to
8 performance. It contains dose limits. It contains --
9 and does not contain a period of performance. That is
10 what would need to be changed.

11 And if that's the direction in which we
12 are going to proceed -- and you may want to do that,
13 and I recognize the issues -- a new notice of
14 rulemaking and a new document needs to be put on the
15 table, perhaps along the lines that Dr. Esh has
16 outlined in his presentation. These are the
17 situations, these are the precedents, this is the
18 reason we ought and out not to limit, and we are going
19 to do this.

20 But I think that in this particular
21 discussion, for the same reason that you said, maybe
22 deep burial is out of limits, I would say period of
23 performance is out of the limits, and dose -- to say
24 that we are going to do modern methods of dose
25 calculation, also off limit unless you put Subpart C

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1 on the table.

2 FACILITATOR CAMERON: Okay. And I want to
3 get reactions from the NRC staff and all of you to
4 what Arjun has just said. I do want to go to Felix
5 and Bill before we do that. And, Tom, this is up for
6 another -- are you --

7 MR. MAGETTE: I am responding.

8 FACILITATOR CAMERON: Okay, good. Good.
9 Let's go to Felix and Bill and Tom on these issues,
10 including thinking about what Arjun is saying, and
11 then let's go to Larry and Dave on these issues.
12 Felix?

13 MR. KILLAR: Yes. The points I wanted to
14 make on coming up with a performance time is that it
15 actually goes along the lines of all that has been
16 said so far, is that when you go beyond the 1,0000
17 years you are out into never neverland. Ten thousand
18 years, you have no idea what is going to happen in
19 10,000 years, from a socioeconomic issue, from a
20 climate change issue, what have you. So using
21 something like 10,000 years is ridiculous.

22 But if you have to come up with a number,
23 I would like to see a uniform number across all of
24 the government agencies, and so I would like to see
25 the NRC get more interactive with the EPA in

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1 establishing something that has some credibility
2 across the board for all types of hazardous waste
3 sites.

4 As pointed out this morning, for the
5 subtitle C and D sites, the EPA does not have a time
6 period on those sites. If you look at the life of
7 those toxicity, those materials, you know, 10,000
8 years is nothing.

9 So, you know, when we start talking about
10 these things, we need to talk about them across the
11 board of all hazardous materials, because, really,
12 when you talk about radioactive materials, it is just
13 another hazardous material. And you have to look at
14 protection of the public from all hazardous materials,
15 and that level of protection should be uniform across
16 the board.

17 FACILITATOR CAMERON: Okay. Thank you.
18 Thank you, Felix.

19 Bill?

20 MR. DORNSIFE: Well, this is facetious to
21 begin with. Maybe from the standpoint of intruder
22 protection we can assume after 10,000 years the
23 intruder lives in a tent, and, therefore, radon isn't
24 a problem.

25 FACILITATOR CAMERON: Okay.

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1 MR. DORNSIFE: Getting to something
2 serious --

3 FACILITATOR CAMERON: That is a starter.

4 (Laughter.)

5 MR. DORNSIFE: It's as good an assumption
6 as we know we do now.

7 My biggest concern about this timeframe is
8 the implementation of it. And what I mean by that is
9 unless it is very, very prescriptive, and agreement
10 states have to carry it out to the letter, it is going
11 to be implemented differently. For example, for our
12 license evaluation we had to literally do a
13 performance assessment, a real performance assessment,
14 including the effects of erosion, site stability, you
15 name it, out to 50,000 years.

16 And if we have to do a million-year
17 analysis, God knows what our regulator is going to
18 suggest. We had to look at climate change as part of
19 our -- as part of our performance assessment work for
20 shallow land burial. We had to assume twice the
21 rainfall falls in west Texas.

22 So, you know, we are already out there,
23 and I think, you know, we did analyze for 10,000 cubic
24 meters of depleted uranium in our original license,
25 pure depleted uranium, and it was okay out to 50,000

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1 years. But, you know, when you start going beyond
2 that, I mean, it was tough to even do that,
3 particularly from an erosion standpoint, even though
4 we have evidence that our site is not eroding, it is
5 accumulating. Okay?

6 It is -- but, you know, it is extremely
7 difficult, depending upon how the state determines
8 that you implement that performance assessment. And
9 that is going to lead, again, to mischief I think in
10 terms of different sites dealing with the issue
11 differently and not having uniformity.

12 From the standpoint of the societal issue,
13 I mean, another way of looking at the societal issue,
14 you are taking something that is naturally occurring
15 and you are redistributing it. Okay? And, you know,
16 if you assume linear no threshold, you get the same
17 risk, unless you can demonstrate that you are giving a
18 dose that is going to be a fatal dose. That is the
19 way we deal with radiation risk.

20 FACILITATOR CAMERON: And, Tom?

21 MR. MAGETTE: Just one point regarding the
22 uncertainty. Mike mentioned one point, you know,
23 regarding if you do assume a resident farmer scenario,
24 Barnwell, the odds of actually having, rather than a
25 probability of one, what a more reasonable probability

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1 might be.

2 There are other aspects of conservatism
3 built into this, which we can talk about more or less,
4 but a performance assessment is not the only factor by
5 which we actually ensure the safety of a site for the
6 disposal of low-level radioactive waste. We have
7 siting criteria, site selection criteria. We have
8 site licensing. We have packaging requirements, site
9 closure requirements.

10 This is part of a tier, and it is well
11 down in the tier, and each of those layers includes
12 conservatism. So there is an awful lot of margin that
13 is built into here that I think addresses a lot of the
14 uncertainty. So I would just like to get that on the
15 table to, if not demystify, at least put into some
16 sort of context this notion that we are overwhelmed by
17 uncertainty and, gee, who knows what might happen?

18 The other thing I would like to say is we
19 don't have a proposed rule on the table. I think a
20 proposed rule can come out and modify 61.55(a) to add
21 nine. They could modify Subpart C, or could modify
22 whatever else the NRC determines is an appropriate way
23 to implement the guidance that is in the existing SRM
24 without starting over, unless I'm missing something.
25 So I'm a nuclear engineer playing lawyer now.

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1 There is no -- there is nothing in the
2 Administrative Procedures Act or the Atomic Energy Act
3 that would prevent a proposed rule from coming out to
4 implement the kinds of things that we are talking
5 about today without starting over.

6 FACILITATOR CAMERON: Okay. Thank you for
7 that, because emphasize there is no proposed rule on
8 the table now. So certainly the type of thing that
9 Arjun or others are expressing could be in that
10 proposed rule.

11 Do you want to hear from these two before
12 you guys talk? Because -- let's go to Peter and Mike,
13 and then let's hear what the NRC has to say. Peter?

14 MR. BURNS: I found Bill's last statement
15 to be very provocative and interesting, so I just
16 wanted to follow up with a comment, because I don't
17 think I agree that this is a situation of mining
18 something from nature and redistributing it.

19 The reason I don't agree is because the
20 geologic conditions over a period -- a very long
21 period of time led to the formation of the uranium
22 deposits from previously-dispersed uranium, so they
23 actually concentrate uranium and create a uranium
24 deposit, which we then disturb greatly, change to
25 chemical form totally, of the uranium, and we are

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1 talking about putting it in a near-surface environment
2 where we know it is not stable.

3 So I don't think there is any relationship
4 between the uranium or deposit in nature, and what we
5 are talking about doing in terms of disposal. We can
6 learn, no doubt, from nature. We can learn from the
7 natural analogues what will work for a long time and
8 what won't. Well, it's harder to learn what won't,
9 because it is gone. But we can certainly learn what
10 did work and apply that, but it is a very different
11 situation.

12 FACILITATOR CAMERON: Thank you.

13 Michael?

14 MR. RYAN: I just pulled up 10 CFR 61, and
15 I want to read this part, 61.58, that I think helps
16 with the discussion from 20 minutes or so ago. "The
17 Commission may, upon request, through its own
18 initiative authorize other provisions for the
19 classification and characteristics of waste on a
20 specific basis, if after evaluation of the specific
21 characteristics of the waste, disposal site, and
22 method of disposal, it finds reasonable assurance of
23 compliance with the performance objectives of
24 Subpart C."

25 So, I mean, there are a lot of provisions

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1 in 61 that have those kind of features where
2 alternatives are allowed and in fact recognized as
3 being a good possibility. So, and they are in several
4 places. I would just suggest that, Chip, it is
5 probably useful for everybody to refresh on where
6 those alternative requirements are actually spelled
7 out for either the Commission to take or licensees to
8 submit or those kind of things, because a lot of the
9 things that we have talked about in a rigid way in our
10 conversations today actually have flexibility built
11 into the language of the reg.

12 So all of that is in there, and I think we
13 have covered a lot of that territory. And there is no
14 need to go through the other ones that are like that,
15 but that is one that would seem to be on point.

16 FACILITATOR CAMERON: Thank you, Mike, for
17 putting that out there. 61.58.

18 MR. RYAN: Yes, exactly.

19 FACILITATOR CAMERON: Alternative
20 approaches.

21 Okay. Larry, you and Dave have heard --

22 MR. CAMPER: Yes.

23 FACILITATOR CAMERON: -- this
24 conversation? What is your reaction?

25 MR. CAMPER: Well, I want to make a couple

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1 of comments, and then I want to ask you a couple of
2 specific questions. You know, Arjun twice has raised
3 this issue of Subpart C, and this morning you have
4 cited the fact that an organ dose is required there.
5 And, of course, Dr. Esh indicated why the analysis
6 using TEDE was done, and not organ. But you have made
7 that point twice.

8 And what -- and as Tom says, there is no
9 rule on the table, we are in fact-finding. But your
10 point is a very interesting point, and what we will do
11 is take a good, long look at that as we analyze all of
12 this information we are gathering and try to
13 specifically determine, if we proceed with this
14 rulemaking as we are currently directed to do, is
15 there a need to make some sort of corollary adjustment
16 to Subpart C?

17 Or could it be dealt with under an overall
18 risk-informing and waste classification scheme? We
19 will specifically address that question and try to
20 provide an explanation of where we end up on that,
21 because you have made a very interesting point.

22 I think all of you have done a very good
23 job of expressing the problem that you get into when
24 you start to consider a period of performance. This
25 is a very, very complicated subject. It is not a

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1 subject upon which reasonable people will always agree
2 upon a timeline. They just won't, for a myriad of
3 reasons. But what I would try to do is ask you to
4 answer a couple of specific questions, so that you can
5 be of great assistance to the staff as we proceed
6 ahead and analyze what we have heard here today, or
7 what we might discuss in Utah as well.

8 The first question I would ask you is,
9 this notion of specification in a rule versus
10 guidance. I mean, for example, you could have a rule
11 that has some language that, in essence, said,
12 "Conduct an appropriate period of performance." I
13 mean, that might not be the exact words, but that's
14 the idea.

15 Or you could have -- and then, if you did
16 that, get into a rather elaborate discussion and
17 guidance of all of these various issues we have
18 discussed today -- you know, 1,000 years, 10,000
19 years, a million years, all of these various
20 parameters that have been talked about, so that the
21 licensee and the state implementer, then, are left to
22 try to figure out what is an appropriate period of
23 performance that they want to use in their particular
24 state under their particular scenario.

25 So, or, by contrast, you could specify a

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1 PoP. Dave, in his slide, showed you several examples.

2 A period of performance is specified at 1,000 years
3 in the license termination rule in Subpart E of Part
4 20. Part 60 has a specified period. Part 63 has a
5 specified period of performance. You could specify a
6 period of performance which would contribute to
7 uniformity in all states, and then of course provide
8 some explanation and guidance as to why you chose that
9 particular period of time.

10 So I am looking for -- we are looking for
11 some definitive feedback from the panel, specify a PoP
12 or don't specify a PoP in terms of the number. That
13 would be very helpful.

14 And the second thing is, in the SECY that
15 the staff did, the technical analysis, in the section
16 entitled "Conclusions and Recommendations," the staff
17 said the following. "Considering the technical
18 aspects of the problem, the period -- the performance
19 assessment, staff recommends a period" -- excuse me --
20 "a performance period of 10,000 years for the analysis
21 of DU disposal. However, analyses should be performed
22 to peak impact. And if those impacts are
23 significantly larger than the impacts realized within
24 10,000 years, then the longer term impact should be
25 included in the site environmental evaluation."

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1 And my question to the panel is: given
2 all that you have heard here today, would that be a
3 reasonable approach, given that there appears to be no
4 perfect solution to this question? Is that a
5 reasonable approach?

6 So I would very much appreciate some
7 feedback on those two particular questions. Thank
8 you.

9 MR. MAKHIJANI: Can you state again the
10 last part?

11 MR. CAMPER: Yes. What we said -- sure
12 will, Arjun. What we said, what the staff said in the
13 conclusions and recommendations section, in the second
14 paragraph, it said, "Considering the technical aspects
15 of the problem, the performance assessment staff
16 recommends a performance period of 10,000 years for
17 the analysis of DU disposal. However, analyses should
18 be performed to peak impact. And if those impacts are
19 significantly larger than the impacts realized within
20 10,000 years, then the longer term impacts should be
21 included in the site environmental evaluation."

22 And that is consistent with NUREG-1573, by
23 the way, which is our performance assessment guidance
24 document.

25 FACILITATOR CAMERON: Okay. Let's hear

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1 from David, and then let's get some opinions on the
2 two questions Larry asked. And I want to check in
3 with the audience on any of this. And I think we
4 probably have mined it enough, as much as we can.

5 But let's hear from David, and then let's
6 go to Diane. David?

7 MR. ESH: The first thing I was going to
8 say was reiterate Larry's comment about, should we
9 provide a number and justification for a number? Or,
10 like the current approach, be silent on a number and
11 let it up to the agreement states and licensees about
12 how they implement that? So that is just reiterating
13 his question.

14 And then, the other thing I wanted to say
15 was that in -- if you look at that NEA report, it
16 basically gives a good overview of what people do all
17 over the world that also deal with this problem. So
18 it gives you a good context of what other people think
19 about this problem. It's a difficult balancing of
20 some ethical considerations, some that Dr. Makhijani
21 talked about. Then, there are other ethical
22 considerations that kind of go in the other direction
23 that people talk about or consider.

24 So, but one of the main -- if I had to
25 condense it and generalize it, which is always a

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1 danger, but I will do anyway, it basically takes the
2 approach of acknowledging that these uncertainties are
3 larger with time due to our ability to understand the
4 physical processes that some -- like larger global
5 scales that may happen, and to account for the
6 socioeconomic uncertainties.

7 And it does that in a manner where a lot
8 of groups or agencies specify a compliance performance
9 period where they expect a quantitative evaluation,
10 some longer period where they expect a semi-
11 quantitative evaluation. And then, if they do need to
12 look at very long periods of time, then expect a
13 qualitative evaluation. It is a generalization, but I
14 just wanted to get people's views on that, whether
15 they think that is a reasonable approach or not.

16 FACILITATOR CAMERON: Okay. And that ties
17 to Larry's second --

18 MR. ESH: I think so, yes.

19 FACILITATOR CAMERON: -- question. Okay.

20 Diane?

21 MS. D'ARRIGO: Just conceptually, I know
22 it's not practical when you have such long-lasting
23 waste, but that the performance period should be for
24 as long as the material is hazardous. And if you
25 can't protect, then we have to really question whether

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1 you are going to continue generating waste that you
2 can't protect people from for that period. So the
3 performance period should be the same as the hazard of
4 the longest lasting radionuclides.

5 FACILITATOR CAMERON: Okay. And in this
6 case, radon daughters, a million years, million years
7 plus. And just so that Felix doesn't have to say it,
8 I think probably might want to repeat his comment from
9 earlier about some uniform approach to this.
10 Chemicals perhaps don't have -- go on for -- beyond
11 that. I am just calling people's attention to that.

12 And I think Diane gave you an answer to
13 the two questions that you posed, that it's not going
14 to be acceptable from her point of view to have some
15 sort of a qualitative -- a compliance period that is
16 less than the peak dose, and have some qualitative
17 analysis in the environmental impact statement.

18 Other opinions on that? Peter, and then
19 we'll go to Mike. Or on any -- any of this.

20 MR. BURNS: I said before that, although
21 it is not a certainty, probably the peak impact is
22 many years in the future, much greater than 10,000
23 potentially, perhaps even greater than a million. And
24 I don't think there is any way that we can have a
25 regulatory framework where you can demonstrate, say at

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1 1.5 million years, that you are not going to have a
2 serious problem with this depleted uranium.

3 So it is -- I argue towards a more
4 realistic timeframe of something like 10,000 years
5 with more qualitative assessment beyond that. But, I
6 mean, you don't want the scenario where waste is
7 buried in a place that is certainly going to be
8 eroded, that we know is going to be eroded in 11,000
9 years. That wouldn't make any sense. All right?

10 But if you are going to go to in excess of
11 a million years, you have to go to deep hard-rock
12 burial. Well, maybe you will put it back in the
13 uranium mines you took it out of, but at least those
14 holes are already there. Maybe you could use Yucca
15 Mountain actually, seeing as it is no longer viable
16 for spent fuel. But you would have to go to that kind
17 of scenario is the only way you could ever get into
18 that sort of performance.

19 FACILITATOR CAMERON: And I know you gave
20 Christine some ideas on that one for Department of
21 Energy. And anything on Larry's first question?
22 Should it -- should whatever the time period is, the
23 compliance time period, should it be specified in a
24 rule, or should people be given flexibility in terms
25 of that? Mike?

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1 MR. RYAN: I have been thinking a lot
2 about the timeframe and how do I show I am meeting
3 whatever the requirement is at the timeframe. And,
4 you know, I can be comfortable with 10,000 years with
5 some regulations that I understand of how I am going
6 to demonstrate that.

7 So I think part of that question is it is
8 hard for me to separate what is the period of
9 compliance without knowing what my requirements or
10 obligations are going to be at that timeframe, or to
11 demonstrate now for that timeframe. So I am having a
12 little bit of trouble saying, "Yes, 10,000 is the
13 right number." I don't think I can give you that
14 answer today without understanding what 10,000 means
15 in terms of demonstration of performance.

16 So with whatever number you pick, whether
17 it's 1,000, 10,000, or some other number, or maybe
18 even two numbers with two different things to
19 demonstrate, it would sure be helpful to match those
20 up in a way where the expectation of demonstrating the
21 conformance with whatever the requirement is at a
22 given time is matched up in a reasonable, doable,
23 interpretable passes-the-laugh test kind of way.

24 So I don't think you can separate the
25 dancer from the dance on that. So I would, you know,

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1 and, again, I mean, I appreciate and accept all of the
2 conversations we have had about different time
3 horizons. But until I know what I am going to have to
4 demonstrate at a given time -- I mean, I know what I
5 can demonstrate at 100 years. We are pretty good.

6 And, David, I am getting back to your
7 curve. You know, we can -- I can tell you for 200
8 years pretty much if it is going to happen. I would
9 even be comfortable putting in institutional controls
10 that say an intruder is not going to get there for 200
11 years. But that's just me.

12 So, you know, but when we get out there
13 longer it is -- until I know what I am going to be
14 required to demonstrate, it's hard to say I like the
15 idea of that timeframe. So I would offer that we
16 really need to put both of those thoughts together in
17 some way to say, "Well, you know, this is what we
18 think is a good demonstration at 1,000, 10,000,
19 100,000, a million, and so forth."

20 FACILITATOR CAMERON: Okay. Thanks.
21 Thanks, Mike.

22 MR. RYAN: Thank you.

23 FACILITATOR CAMERON: Let's go to Tom and
24 Bill and Christine, and then let's finish up with
25 Arjun, and see if anybody in the audience wants to

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1 chime in on this, and then we will go to the next
2 issue. Tom?

3 MR. MAGETTE: I would generally agree with
4 Peter's statement as modified by Mike, which condones
5 Larry's proposal as modified by David.

6 (Laughter.)

7 And by that I mean the notion of a
8 compliance period which is possibly on the order of
9 10,000 years, but with a more qualitative assessment
10 going out further. I think the language in the
11 conclusion of the SECY is close to that, although I
12 think the way David described it embellishes that a
13 little bit more, which clarifies a reasonable
14 flexibility there.

15 So I think that combination is also what
16 Mike was getting at, and I agree that you do have to
17 link this with what it is that you are going to have
18 to demonstrate. And so if I could rest assured that
19 what I am going to say tomorrow morning is going to be
20 accepted, then I might be more comfortable saying,
21 "Yes, I'm good with that now."

22 But the bottom line is I do think you have
23 to link those two things. I do think that this is one
24 of the few things that belongs in the rule. The rule
25 needs to be simple, but the rule needs to say what the

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1 period of performance is.

2 And the flexibility that Mike described I
3 accept, the notion that a licensee can justify this,
4 have a hard time with understanding which licensee is
5 going to have a different period of performance for
6 depleted uranium from any other licensee. So I don't
7 just see any rational path that says a licensee can
8 justify a different period of performance for an
9 individual isotope, or, in this case, waste form that
10 may have several isotopes as part of the daughter
11 products.

12 So I don't think that is okay, unless that
13 is some words that just flowed down from the unique
14 waste stream dialogue. If you are talking about
15 depleted uranium, no, I don't think a licensee can
16 individually justify that.

17 FACILITATOR CAMERON: Okay. And there --
18 I think you are talking about some of the dangers of
19 some licensees having the flexibility to do other
20 things because of the whole competitive nature of the
21 business.

22 Bill, what do you think about all of this,
23 and also about any reaction to what Tom said?

24 MR. DORNISIFE: Well, first of all, I think
25 on this period of performance issues, I don't think

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1 anybody at the table disagrees that a realistic
2 performance assessment for a million years for a
3 shallow land disposal facility is meaningful. Okay?
4 So we can kill that as -- in terms of an issue.

5 I could live with a 10,000-year or some
6 nearer term, 50,000-year period of performance. And
7 looking at, you know, the bounding conditions beyond
8 that, but I guess the concern based on my own
9 experience would be the radon issue. And particularly
10 how erosion at the site relates to that radon issue.

11 So this waste stream creates a very unique
12 situation in terms of long-term performance because of
13 that radon issue and the erosion concern.

14 I was kind of intrigued about David's
15 suggestion regarding, you know, a multi-phase, if you
16 will, performance assessment that looks, you know, at
17 the end qualitative. I would like to hear more about
18 that. And I guess I am totally opposed to the state,
19 you know, just -- the state having general, you know,
20 guidance that would lead to chaos in terms of
21 implementation.

22 So from that standpoint, I agree with Tom
23 that you have to have some sort of a uniform standard,
24 because of the competitive nature of the business.

25 FACILITATOR CAMERON: Okay. Thank you,

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1 Bill.

2 Christine?

3 MS. GELLES: Thank you. I'll be honest
4 and admit that during the course of the last four
5 comments I kept debating, putting my tent down, but
6 now I feel like I want to respond a little bit to
7 everybody. But it began with just wanting to
8 reinforce something that Michael said that I think,
9 while I appreciate Larry's request and need, it would
10 be so great if we could give you definitive feedback
11 on what the number should be, you know, what the time
12 period should be.

13 It is -- these questions are too
14 complicated, and the factors and the issues are too
15 interdependent. So I wanted to second what Mike had
16 said. I also am supportive of some of the thoughts
17 that Tom expressed as well and the need to retain some
18 flexibility.

19 So, and then the question of uniformity
20 came up, or the issue of uniformity or concern of
21 uniformity came up during one of the comments in
22 between the two gentlemen, and I think we just have to
23 keep in mind some points that Bill raised earlier
24 today, that if you come up with a different regulatory
25 period of performance, or performance period for a

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1 specific waste stream or unique waste streams or DU,
2 we need to ask ourselves, you know, is that consistent
3 with the regulatory requirements that exist for other
4 waste streams under other regulations? And if not,
5 why not? And then, what about those exempt quantities
6 that might pose the same hazards?

7 And I also want to recognize some of the
8 comments that Felix made that, I mean, perhaps the EPA
9 needs to be part of a dialogue here as well, because
10 perhaps there are hazards associated with the DU
11 stream that are being missed and not captured in some
12 of our dose questions and calculations.

13 FACILITATOR CAMERON: Okay. Thank you.

14 I want to finish with Arjun, and go back
15 to some of the things that he was talking about
16 earlier. So, Richard, why don't you go ahead, and
17 then we will go to Arjun.

18 MR. HAYNES: Mine is just short, just to
19 answer NRC's question of which -- I think from our
20 perspective we would prefer them specifying a period
21 of performance in the regulation itself, and the
22 reason being is that from our perspective if we -- you
23 leave it up to the state or the -- and the licensee to
24 work that out, you are still going to end up at a
25 default value through the public participation period

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1 process of -- that is just something else you can be
2 appealed upon.

3 So having something in regulation that
4 specifically says, "You shall use this period" would
5 make our life easier from that standpoint.

6 FACILITATOR CAMERON: Okay. Thank you,
7 Richard.

8 Arjun, let's go to you, and then we will
9 go to the audience. And, you know, earlier you talked
10 about not passing the uncertainty on to generations
11 and protecting them like we would want to be
12 protected. And you also raised the point that
13 Subpart C should be on the table of setting the period
14 of performance.

15 I think we know that Subpart C could be on
16 the table in this proposed rule, and I guess I would
17 just look for whatever you have to say, plus your
18 reaction to what people have been saying about --
19 saying around the table.

20 Sorry, Charles.

21 MR. MAKHIJANI: Well, I definitely gather
22 that Subpart C is on the table as part of this rule,
23 because we are discussing period of performance and
24 method of dose calculation. So I will just reserve
25 the right to consult with our lawyers on that, and see

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1 what they have to say.

2 As a non-lawyer, I will simply say that I
3 think you need to go back to the drawing board and
4 tell the public what is on the table and present the
5 basis for that rather than hiding a change of
6 regulations under modern dose calculations. I still
7 have bones, and that hasn't changed.

8 So the point in regard to the specific
9 passage, actually, I will go to the favorite people of
10 the nuclear industry and also my favorite people,
11 since I am married to one of them, the French. The
12 French high-level waste rule is very interesting, and
13 we have studied the French repository, you know,
14 research program and have a 250-page report on our
15 website in French if you want to go look at it.

16 And this is from memory. Their rule
17 recognizes this problem of long-term uncertainty in a
18 different way than what you proposed in your paper,
19 and I would recommend that you consider it. I think
20 it is a better -- it is certainly a better method than
21 what is proposed in your paper. It doesn't abandon
22 the dose limits for the long term, but it abandons the
23 idea that you can have a precision performance
24 assessment in the long term.

25 So they say for the first 10,000 years

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1 where we can have more confidence in our model, we try
2 to select parameters that -- you know, and
3 distribution for parameters that we can have some
4 confidence in. And that is I think what we have been
5 saying is that we can possibly do that, at least for
6 some sites, maybe climate exceptions, and so on. And
7 they looked into all of that.

8 For the one -- 10,000 years, what they
9 said is -- and this is from memory, so you will have
10 to excuse if there is an error in this. I will supply
11 the information to you in writing. Is that they will
12 choose conservative parameters, so that they actually
13 get a conservative result, preserving the dose limit.

14 So that they don't actually have to choose best
15 estimates and distributions, but they can take the
16 worst case that we can imagine for the various
17 parameters and do the calculations that way.

18 I think that would be compatible with what
19 I said earlier. There is -- certainly, you don't have
20 to take my word for it. There is -- you know, the
21 most-referred-to nuclear establishment on planet Earth
22 adopted this as a rule for their high-level waste. So
23 you can maybe start at that point rather than what you
24 have.

25 FACILITATOR CAMERON: Okay. Thank you.

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1 Thank you, Arjun.

2 Anybody out in the audience want to offer
3 anything on period of performance, including whether
4 -- whatever it is, whether it should be set in the
5 rule or guidance? John? And just introduce yourself
6 again for us, please.

7 MR. GREEVES: John Greeves. I would like
8 to thank the people that are on the panel. I thought
9 this has been quite useful. Individually, I think the
10 period of performance needs to be in the rule. It is
11 what we have been struggling with for a long time.

12 It needs to be in the rule, and,
13 individually, I am comfortable with what the staff has
14 used in 1573 and 1854. They have been using 10,000
15 years in their analysis recently, and, looking
16 qualitatively out beyond that, I think that is a
17 default place to begin with, and let people comment on
18 both sides of that. So I congratulate the panel.

19 FACILITATOR CAMERON: Great. Thank you,
20 John.

21 Anybody else that wants to add on this?

22 (No response.)

23 Okay. Can we go --

24 MR. DORNSIFE: Can I make one quick one?

25 FACILITATOR CAMERON: Go ahead, Bill.

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1 MR. DORNSIFE: Following up on Arjun's
2 discussion, you know, a way of looking at it, I mean,
3 we assume that future generations aren't going to know
4 anything. I mean, probably the more likely
5 assumption, if we still have a form of government,
6 there will be records, and we will know.

7 So maybe a way to deal with this long-term
8 issue is to identify in this performance assessment
9 what parameters are important to preserve, if indeed
10 there is institutional control.

11 FACILITATOR CAMERON: So when you say
12 "what parameters to preserve" --

13 MR. DORNSIFE: Like, for example, erosion
14 is a problem.

15 FACILITATOR CAMERON: Yes.

16 MR. DORNSIFE: You know, in terms of the
17 radon, so you'd better make sure, if you are around,
18 you maintain appropriate cover.

19 FACILITATOR CAMERON: So you maintain --
20 what was that? Corporate --

21 MR. DORNSIFE: Appropriate cover.

22 FACILITATOR CAMERON: Appropriate cover.
23 Okay.

24 MR. DORNSIFE: But, you know, I mean, it's
25 a way you identify those parameters that are part of

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1 the performance assessment. That makes a difference
2 in terms of the long-term risk, and you say these are
3 the things you need to focus on society if you are
4 still around. And if you're not around, do we really
5 care?

6 (Laughter.)

7 FACILITATOR CAMERON: Okay. Thank you.
8 Thank you, Bill. Thank you, all.

9 And can we tee up the next issue? Is it
10 -- David, are you doing this next one?

11 MR. ESH: Unfortunately.

12 FACILITATOR CAMERON: Which is exposure
13 scenarios. Okay. Here we go.

14 MR. ESH: All right. Exposure scenarios
15 for the site-specific analysis. We talked about this
16 a little bit.

17 FACILITATOR CAMERON: I see some -- wait a
18 minute. Hold on, hold on. Do we need a break?

19 PARTICIPANT: Yes.

20 PARTICIPANT: Yes.

21 FACILITATOR CAMERON: Okay. Sorry, David.
22 I saw some consternation across the way, so let's
23 take a break and come back at 25 to 3:00,
24 approximately 15 minutes.

25 Thank you.

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1 (Whereupon, the proceedings in the foregoing matter
2 went off the record at 3:22 p.m. and went
3 back on the record at 3:38 p.m.)

4 FACILITATOR CAMERON: Okay, everybody if
5 you could come back to the table, we'll get started
6 with the next to last topic which is Exposure
7 Scenarios. And Dave is going to tee that up. And
8 then we're going to give Dave a break and the last
9 topic, the Source Term Issues is going to be teed up
10 by Dr. Pinkston right here.

11 MR. ESH: Okay, exposure scenarios for the
12 site specific analysis; we talked about this some in
13 the previous discussion and earlier this morning.
14 It's pretty much tied to some of the other components.

15 It's hard to segment a lot of these issues and deal
16 with them individually but we'll do the best we can.

17 So a little bit of overview with
18 background on what we do right now for 10 CFR Part 61,
19 what may be some key considerations and then what
20 would site specific exposure scenarios consider. So a
21 little bit of background here. The development of 10
22 CFR Part 61, the NUREG-0782 and NUREG-0945, took the
23 approach of evaluating residential, agriculture or
24 other activities near a disposable area and then as
25 I've discussed previously, this morning, evaluated

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1 inadvertent intrusion on the disposal area.

2 On the right-hand side of this figure
3 here, which is -- you probably can't see too much but
4 I'll describe to you what it is, why I put it here.
5 Basically, it has a number of different scenarios in
6 the first column, what were called biota access
7 locations in the next column, and then the media type
8 with which people were exposed -- contacted the
9 material through exposed to soil or air and then what
10 the uptake pathways were and these were condensed into
11 Pathway Dose Conversion Factor, a PDCF.

12 So basically, the scenarios at the high
13 level here, this residential or agricultural or other
14 activities near the site and then somebody
15 inadvertently using the site was the regulatory
16 framework for receptors and scenarios that were used
17 in the development of 10 CFR Part 61. What does this
18 look like?

19 Well, we looked at something like this
20 earlier. Actually, this figure is a lot nicer. Karen
21 made this one, so but we have a site boundary. We
22 have people living near the site which have a
23 potential dose from water usage that they maybe grow
24 some plants and get their garden and vegetables from.
25 Potential dose from ingestion of the vegetables. And

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1 this can be a resident farmer or a residents out
2 there. A resident farmer, then they raise animals,
3 too, cows and chickens generally.

4 If they are just a resident, then they
5 have a garden, but they don't have animals. Either
6 one can use potentially contaminated water, though.
7 For the chronic intruder, it's over top of the waste
8 disposal area. The assumption is that people come use
9 the site in the future, as Dr. Ryan said. It's
10 evaluated, can be evaluated at year 100, day zero.
11 The difference being that when they're above the
12 disposal area, especially in the case of depleted
13 uranium, they can get diffusion of radon directly into
14 their house.

15 They also can, if the depleted uranium was
16 disposed shallowly, dig some of it up inadvertently,
17 it's spread on the surface, it contaminates the soil,
18 contaminates the plants and people are exposed to the
19 contamination directly that way. If the depleted
20 uranium was buried more deeply, then we evaluate a
21 potential well being drilled through the material and
22 the material being -- the drill cuttings being exhumed
23 and spread on the surface in the environment in the
24 vicinity of the house, which then contaminates the
25 soil and the plants.

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1 In either case, you can have groundwater
2 contamination and groundwater flow to wells. So
3 that's a little bit of background on the exposure
4 scenarios, both what was used for 10 CFR Part 61
5 development and what we used in the analysis for the
6 SECY paper.

7 So what are some considerations? Well, we
8 can always, of course, use the historical approach,
9 what was done in the past. We can continue to use
10 something similar to that, which is an offsite
11 resident, onsite intruder evaluate acute and chronic
12 effects. What's important to consider, I think, is
13 the relationship of the receptor scenarios to the
14 characteristics of the waste. That being -- as Dr.
15 Ryan pointed out, maybe it's a fairly low likelihood
16 that in 100 years somebody comes right when the
17 institutional control period ends and builds a house
18 on your site or does some other activities, but as
19 time goes on, it becomes probably more and more likely
20 that you lose the institutional knowledge and
21 something inadvertent may occur.

22 So if your waste has a long-live
23 characteristic to it, then that probably needs to be
24 acknowledged in your receptor scenarios and/or
25 regulatory framework. In some programs, like for

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1 mill tailings, the include radon but it's done through
2 a flux limit, so specify a flux limit at the cover
3 above the materials that you have to meet and that's
4 the regulatory criteria for radon. Otherwise radon
5 isn't included and say a dose assessment for somebody
6 living on a mill tailing facility in the future.

7 Radon is ubiquitous in the environment and
8 gives us a large percentage of our background
9 radiation. So should the regulatory limits that you
10 apply for radon be the same as you apply for
11 everything else, should it be a small percentage of
12 the background radiation dose, these are questions
13 that you should probably -- would need to consider in
14 this problem.

15 But then we can have regulatory defined
16 scenarios or site specific. We do this in our
17 decommissioning program where people are able to
18 define site specific receptor scenarios and in some
19 cases justify use of, say, an industrial scenario.
20 That generally applies or we like to see it applied
21 for periods of time that are more recent to when we're
22 making the decision. That being that if you have
23 industrial use of a facility right now, and you have
24 short-lived contamination that you're trying to
25 decommission the site for, then it's probably

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1 reasonable to evaluate an industrial scenario to
2 develop your cleanup goals, in particular because that
3 short-lived radioactivity is going to decay very
4 rapidly and you have the higher confidence that, yes,
5 an industrial scenario is appropriate.

6 But so there is the ability to do some
7 site specific consideration of receptor scenarios or
8 it can be defined in regulation either in rule or in
9 guidance. So that's it.

10 FACILITATOR CAMERON: Thank you, David.
11 Who wants to start us off on exposure scenarios? Is
12 there a basic point that we should hear on this to get
13 us started? Let's go to Tom.

14 MR. MAGETTE: I would suggest that one
15 basic point to consider would be in response to
16 David's last point or his last question that I think
17 exposure scenarios belong in guidance. I don't think
18 they belong in the rule. I do think they also should
19 be site specific which, I think, can be addressed in
20 guidance. So I think both of those are important
21 points. To the extent that anything goes in a rule, I
22 do think that there is a component of the rule related
23 to intruders that should be looked at and it would be
24 a Subpart C thing, I think, that a 500 millirem
25 standard for intruders should be put into the rule

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1 that's consistent with current practice but it's not
2 in the regulations anywhere.

3 So those three points are what I would
4 suggest as a good starting off point.

5 FACILITATOR CAMERON: So if there was
6 anything more stated in the rules then the performance
7 assessment should include exposure scenarios. If
8 there was anything more than that, then you would also
9 recommend putting the 500 millirem limit for intruders
10 into the rule also. But the best thing would be to
11 just have this in guidance. And when you say it
12 should be site specific, how would that work? Could
13 you just explain to me because I'm not sure I
14 understand it about how the exposure scenarios for
15 site specific would be in the guidance.

16 MR. MAGETTE: Well, I think it's reasonable
17 that there are some exposure scenarios that simply
18 wouldn't apply at some sites.

19 FACILITATOR CAMERON: Okay.

20 MR. MAGETTE: For example, at our site
21 groundwater ingestion is not a reasonable scenario
22 because the groundwater is more saline than ocean
23 water. So consumption of groundwater is not a
24 reasonable exposure scenario for Clive. For example,
25 I mean, there would be many others but that's just --

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1 that's the context for my comment.

2 FACILITATOR CAMERON: Okay, great. Great,
3 thank you, Tom. And thank you for addressing the
4 issue we should always be considering for any of this
5 is rule versus guidance. Mike, do you want to --

6 DR. RYAN: Yeah, I just have one additional
7 point and I appreciate what Tom said. I have one
8 additional point. And that's to the extent you're
9 comfortable and it can be practically done, a little
10 bit more realism in the scenarios. The farmer, you
11 know, intruder is one that catches my attention as
12 being unreasonable. You know, exhuming waste, growing
13 food in ground up hardware and stuff, it just doesn't
14 pass the laugh test for me.

15 So I think that reasonable human activity
16 can be superimposed on some part of the materials,
17 but other parts, no. For example, chunks of DU metal
18 in a welded container are not going to end up in the
19 food, really.

20 MR. ESH: So you mean, consider more
21 directly the recognizability of the material based on
22 when you expect the scenario to appear.

23 DR. RYAN: Yeah, and if it is, you know,
24 metal chunks, then an external exposure scenario seems
25 pretty reasonable to me, but an ingestion one, you

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1 have to reach a little bit, unless there's some
2 process that, you know, takes the material to some
3 other chemical state. You know, so just the realism
4 and the construction of the individual scenarios that
5 are appropriate to whatever your range of scenarios
6 are, I think, would be helpful and better risk
7 informed as opposed to the old way of thinking 30
8 years ago, "Well, if we use these bounding
9 assumptions, it will be conservative". Well, you
10 know, that's silly at some point, so that's in
11 addition, I think, to what Thomas made is a very good
12 point, so thanks.

13 FACILITATOR CAMERON: Thanks, Michael.
14 Anybody else, anybody want to talk about the more
15 risk-informed suggestion that Mike brought up as well
16 as anything else, but I would just ask people to
17 respond to what they think about that. Bill, and then
18 we're go over to Arjun.

19 MR. DORNIFE: I think in terms of the
20 radon issue, I think we ought to strive for uniformity
21 among standards and certainly the mill tailings
22 emanation rate is the appropriate standard if that's
23 indeed what needs to be in the regulation, 20
24 picocuries per square meter per second or whatever it
25 is.

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1 FACILITATOR CAMERON: So, Bill, again. You
2 know I get to demonstrate my ignorance on this in case
3 anybody else is as ignorant as I am which is probably
4 not true, but when you say -- when you're talking
5 about mill tailings in the context of scenarios, how
6 does that -- what are you saying?

7 MR. DORNSIFE: Well, I'm talking, one of
8 the issues was radon and the needed regulatory limits
9 for radon release. That was one of the issues that
10 was raised. And I'm suggesting that the mill tailing
11 standard be the appropriate standard for radon.
12 However, whatever we're looking for as this compliance
13 period.

14 MR. ESH: I understand the comment, Chip.

15 FACILITATOR CAMERON: Okay, great. Thanks,
16 Bill. Arjun?

17 MR. MAKHIJANI: This discussion is now
18 really centered in Subpart C because we've now talked
19 about putting an intruder dose limit of 500 millirem
20 there which is now not specified. It just says, "We
21 shall protect the intruder". It's a paraphrase. Now
22 we have a radon -- effectively a radon dose limit from
23 what Bill has said and this is a rulemaking -- this is
24 a discussion. It's no longer recognizable as a
25 depleted uranium discussion but rather you know, the

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1 second part of what we were told in the morning we
2 would be doing is after this kind of emergency
3 specific thing so LES can dispose off its waste two
4 years from now or whenever, or the DOE, that we would
5 have a broader risk discussion about risk-informed.

6 But I think we are fully into this risk-
7 informed discussion already. And for one, I just want
8 to say I didn't come fully prepared to discuss this.
9 My preparation would have been a little bit different
10 if I had come to discuss the second phase of this. I
11 just want to put that caveat in there. I will make
12 some written comments but I think if we're going to do
13 a risk-informed discussion, a more -- then we ought to
14 abandon the DU-specific discussion and do the risk-
15 informed discussion in this meeting.

16 Otherwise, I think we ought to limit our
17 discussion to what we're going to do about depleted
18 uranium within the existing rule. And the existing
19 rule says some very specific things. Lots of licenses
20 have been granted based on the existing rule. We're
21 talking about operating under existing licenses with
22 creating a Class A1 and Class A2 basically under
23 61.55(A)(6). We'll have (A)(6) Roman Numeral II and
24 Roman Numeral I basically, and I don't recognize the -
25 - I don't recognize this discussion as being centered

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1 in where the Commission said it should go.

2 I mean, I'm okay with having a broader
3 discussion but I think it's a different discussion.

4 FACILITATOR CAMERON: Okay, thanks, Arjun.

5 MR. MAKHIJANI: Oh, I had a question about
6 the scenario, which is, from your published paper, Dr.
7 Esh, I didn't see the well in the depleted uranium
8 itself. I saw the well on the side, which was the
9 origin of my question in the morning and maybe some
10 clarification.

11 MR. ESH: I believe the text describes that
12 the well can go through the materials even though it's
13 not showing.

14 MR. MAKHIJANI: Can go even, okay.

15 MR. ESH: Even though it's not shown in the
16 figure.

17 MR. MAKHIJANI: Yeah, I just got this, this
18 morning, so I haven't had a chance to read it.

19 MR. ESH: Oh, okay, all right.

20 FACILITATOR CAMERON: Okay. Thank you.
21 Does anybody have any reactions to what Arjun just
22 said? Any of the NRC staff or anybody else?
23 Christine.

24 MS. GELLES: Thank you, Chip. Just to
25 reinforce some of the comments already made, we do

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1 support more realism in the exposure scenarios and I
2 also concur with the idea of site specific exposure
3 scenarios. That is akin to how the Department of
4 Energy conducts our analysis today and we certainly do
5 recognize that unique circumstances of the Clive
6 Facility, for example. So, thank you.

7 FACILITATOR CAMERON: Great, okay. Thanks,
8 Christine for affirming some of that. Yeah, Arjun, go
9 ahead.

10 MR. MAKHIJANI: Can I say something about
11 the site-specific scenarios? I think it's not
12 appropriate to leave too much discretion to the sites.

13 So while I would acknowledge, of course, we're not
14 going to be drinking salty water, there's no reason
15 why such common sense guidance can't be put into
16 national guidance and say you know -- I don't know of
17 any scenario and any model that has assumed people are
18 going to be drinking salty water because you'd die if
19 you drink salty water.

20 And the -- I think I believe that the
21 general pattern of these scenarios should be specified
22 in the NRC guidance. And there's a reason for this.
23 I mean, if we take the Clive site, we showed that
24 under the erosion scenario, if you actually bury the
25 waste, not build pyramids on the site the way they do

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1 now or whatever. That it would be uncovered and that
2 doses, dose limits would be greatly exceeded on the
3 order of 10,000 years. I can give you the exact
4 results of calculations. They're in my computer. So
5 you don't need to go out to a million years.

6 And that dose limits would be exceeded in
7 a few hours with a hunter going on site and just
8 standing there waiting for their prey. And these
9 scenarios were also excluded as unreasonable the
10 people -- there would essentially not be intruders on
11 site. Now, excluding intruders on site in Clive means
12 perpetual institutional control. That might be
13 reasonable for the kind of waste they have there now.

14 I'm not making a comment on that. But I know it is
15 unreasonable for the kind of waste that we're talking
16 about now and I would very strongly recommend that
17 scenarios not be -- that there be very specific
18 guidance about what sorts of scenarios have to be
19 considered. And I don't think anybody's talking about
20 unreasonable ideas like drinking salty water.

21 FACILITATOR CAMERON: Okay, thanks, Arjun.

22 It's -- I'm not sure that -- I think everybody would
23 agree with the idea of having very specific scenarios.

24 I guess I'm testing this out. We heard people
25 talking about more realism in scenarios. And Arjun,

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1 are you saying that that makes sense or are you giving
2 us a cautionary note on that?

3 MR. MAKHIJANI: Well, I've always
4 appreciated the kind of guidance that has come from
5 the DOE and in its own work as national guidance and
6 from the NRC and the EPA about the kinds of scenarios
7 in which how we proceed to calculate doses or
8 exposures so as to protect the public. I mean, you
9 take Subpart A to the Clean Air Act and there's a way
10 to do that, that applies to all facilities. It is a
11 scenario that says, you know, a resident closest to
12 the site boundary.

13 You don't -- Los Alamos doesn't have a
14 discretion to say, you know, "We have an airport over
15 there so we're not going to calculate". They don't
16 have that discretion. And I think -- and I think
17 because you don't know whether that airport is going
18 to be there tomorrow and whether that land is going to
19 be sold off, and it makes sense to create a set of
20 conservative scenarios. I think the federal approach
21 generally has been good although you know, sought to
22 be abandoned from time-to-time in terms of resident
23 farmer and so on being too restrictive as the Yucca
24 Mountain Panel of the National Research Council tried
25 to do.

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1 But I think, overall the federal approach
2 has been good. I'm saying something nice, so take it
3 from me.

4 FACILITATOR CAMERON: Yeah, I realize that.

5 (Laughter)

6 (Off the record comment)

7 FACILITATOR CAMERON: Great. Are we just
8 tired or is -- we're going to have a short discussion
9 on exposure scenarios, I guess. We got it, okay,
10 good. All right.

11 (Off the record comment)

12 FACILITATOR CAMERON: I'm sure you can spur
13 that on for us. Anybody in the audience? Ah, great.
14 And just introduce yourself.

15 MR. CHEN: S.Y. Chen, Aargon National Lab.

16 I just wanted to mention the DU, the uniqueness of
17 the DU that have not been discussed here. As much as
18 we want to think about DU as a waste here, it is in
19 fact, is a source material. Especially with the large
20 quantity disposed of, at some point it's entirely
21 likely that the not too distant future our next
22 generation will feel the heat of having to find energy
23 sources. The big quantity of depleted uranium is a
24 likely source for future power.

25 It's just that we don't use it today. So

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1 I would say this scenario here probably would be
2 advisable to consider that somebody would excavate the
3 site for the reuse of this source, if you consider the
4 waste is not going to be considered the waste in the
5 future generations, that's my point.

6 FACILITATOR CAMERON: Great. Thank you.
7 Any comment from anybody around the table on this?
8 Let's go to Peter.

9 MR. BURNS: I certainly agree with that
10 comment and to give it a bit of context, I've seen
11 credible estimates that the depleted uranium on hand
12 in a breeder reactor design and with recycling could
13 meet the energy needs of the world for 400 years. So
14 perhaps, we should stop calling it waste and start
15 calling it a national treasure and problem solved.
16 We're preserving the national treasure.

17 FACILITATOR CAMERON: Okay, thank you.
18 Thank you, Peter. Now, indeed, I guess that there's -
19 - the option is that some of this may not be declared
20 as waste, is that correct, because of that very
21 possibility? Felix, I think on this issue?

22 MR. KILLAR: It's related in that one of
23 the things that we haven't touched and I think it's
24 appropriate to mention is similar to the point that he
25 just brought up, is that when you start looking at the

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1 depleted uranium out there, or have you, you have to
2 remember it's heavy metal and the characteristics of a
3 heavy metal for toxicity it's out there very similar
4 to lead and gold and what have you.

5 So, you know, we talk about radioactivity,
6 radiation, exposure, but if somebody wants to dig th
7 is up and start eating it, they've got some real
8 problems because as a heavy metal the radioactivity is
9 minimal compared to that.

10 FACILITATOR CAMERON: Okay, that's a
11 warning, guess, huh? Okay, thank you. John, any
12 comments on exposure scenarios? John Greeves.

13 MR. GREEVES: The only comment is this
14 belongs in guidance, not in rule. I think I heard
15 that around the table but if there's somebody who
16 thinks these scenarios belong in a rule, I think you'd
17 better start talking about that and let people
18 understand it. But as far -- what I'm hearing is it's
19 in guidance space, which I think is where it belongs,
20 and that's what the staff has been doing all along.

21 But I'm a little -- I lack confidence that
22 it couldn't creep into the rule. That's all. So the
23 limit is 500 millirem for the intruder needs to be in
24 the rule. The point -- your period of performance
25 needs to be in the rule. The rest of this is in

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1 guidance space. If it's different, let's talk about
2 it. I'm just trying to generate some clarity on
3 what's in the rules.

4 FACILITATOR CAMERON: I think that we heard
5 commentary on put this in the guidance. I think
6 that's what we heard and Arjun didn't -- also said
7 that he thought that federal guidance has been pretty
8 well done. So we can do that and do you want to say
9 something?

10 MRR. DORNSIFE: Just a comment on this
11 resource issue; I think, you know, you could make the
12 argument that other types -- other low level waste
13 categories could be a resource like irradiated
14 hardware. You know, there's some pretty valuable
15 metals there. So I think that gets you down a really
16 slippery slope in terms of how you calculate if
17 somebody was in there two years or 200 years to
18 recover depleted uranium, how are they going to get
19 disposed of depends on how they get it out of there
20 and what's there. You know, where it's been disposed
21 of?

22 If it's down in the bottom of the cell,
23 you're going to get a lot of exposure. So I think
24 that kind of a scenario creates more problems than
25 it's worth because it's not unique to DU.

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1 FACILITATOR CAMERON: Okay. Any final
2 comments? Diane? Okay. All right, oh, sorry, Pete,
3 go ahead.

4 MR. BURNS: This is not entirely serious,
5 but I wanted to respond to Bill by saying that if we
6 have the existing technology in our society in 300
7 years to run breeder reactors and reprocess the fuel,
8 as we do today, they'll be able to handle the risk
9 associated with excavation and we won't need to -- we
10 don't need to worry about that aspect of exposure at
11 all. If they choose to dig it up to use, that's --
12 they deal with that risk.

13 (Off the record comment.)

14 MR. BURNS: We ignore it, I think, because
15 if they choose to dig it up to use it, that's their
16 risk that they're accepting.

17 MR. DORNISIFE: Well, then why consider it.

18 FACILITATOR CAMERON: Okay, I think that
19 some of this is -- Arjun?

20 MR. MAKHIJANI: I think this is actually a
21 little more serious thing than we're giving it due
22 because there is a school of thought that says we're
23 going to have breeder reactors and from a physics
24 point of view, there's no question that depleted
25 uranium potentially converted into plutonium could

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1 supply a lot of energy. I mean, from an economic and
2 proliferation and a lot of other points of view,
3 whether we can handle all the liquid sodium is a
4 different -- you know, it's a been there, done that
5 for me. But it's not that for everybody else.

6 And from the issues of concern at this
7 meeting, I think we do have to grapple with the
8 question that somebody may want to go in there 50
9 years from now and dig it all up and how -- should
10 that be part of why the NRC has to consider because
11 the DOE still has not officially classified depleted
12 uranium as a waste so far as I'm aware. It still a
13 source material in your rules, right? And we're
14 treating it as a waste in licensing proceedings from a
15 conservative point of view to make licensees
16 responsible for the waste financial assurances should
17 it be disposed of. Right, I mean that's my
18 understanding of how all of this is proceeding.

19 And so, I think the scenario question is
20 actually a little bit more serious than we've just
21 been discussing it and perhaps you ought to build it
22 in to what you do.

23 FACILITATOR CAMERON: Thank you, Arjun.
24 Tom?

25 MR. MAGETTE: Christine is here and she can

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1 certainly speak for the Department of Energy but I
2 won't let that stop me from telling you what I think
3 she might say.

4 MS. GELLES: Thank you.

5 MR. MAGETTE: The DOE called it a national
6 treasure for decades and they only recently started
7 looking at it as a waste. They just published an EA
8 that said it might be a resource and it might be a
9 waste. There's plenty of latitude in the Department
10 of Energy to make an intelligent decision regarding
11 whether or not there's going to be a need for blanket
12 material in the existing stockpile of DU. So I don't
13 think that's a decision that we need to contemplate
14 any further than we've already over-contemplated it.

15 And as for the scenario that we would
16 consider that someone might excavate it and we should
17 somehow protect against that, I would agree with
18 Peter, which is if we're going to get to the point
19 where we have a sufficiently advanced technology and a
20 sufficiently well-defined need for this material, I
21 don't think that that's something that will be that
22 big of a problem, although I certainly agree with
23 Bill, it probably will be on the bottom of the cell.

24 There probably will dose associated with
25 excavating it but that is something I would see that

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1 there's perfectly reasonable justification for
2 assuming that the people going after it will not only
3 know but be able to manage. So I don't think that we
4 should do a performance assessment that in any way
5 considers that as a scenario to evaluate.

6 MALE PARTICIPANT: Well, it's no longer an
7 inadvertent intruder.

8 MR. MAGETTE: It's an advertent intruder.

9 FACILITATOR CAMERON: Christine.

10 MS. GELLES: And I'll be brief because I
11 know you want us to move along. I would -- I would
12 just say that I think we do need to retain a
13 distinction between suggesting that we model a
14 scenario of excavation because somebody wants to
15 recover the power source associated with DU if it is
16 ultimately disposed from questions of you know,
17 realistically some of the stockpile that is being
18 considered as part of the disposal problem were here
19 to inform the solution of, may never actually be
20 disposed.

21 Our project in Portsmouth and Paducah will
22 convert the -- our DUF₆ tailings to a potentially
23 reusable form but we're also considering potential
24 disposal requirements that need to be met at the same
25 time. So we are prepared to dispose of it if it

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1 cannot be reused but we're talking about facilities
2 that will be generating this product for you know, two
3 to three decades. So it's quite possible we will
4 dispose of some and ultimately reuse others.

5 So that doesn't, of course, address the
6 entire inventory of DU waste forms that we've been
7 talking about today, so I just wanted to be responsive
8 to Tom's, you know, reference to our projects. He is
9 right and Arjun is right, we have not declared all DOE
10 DU to be a waste form. To the extent that we have
11 decided it has no useful mission, then we do, in fact,
12 declare it as waste and manage it as such. And that's
13 what we've done in the past and that's what we'll
14 continue to do in the future. Thanks.

15 FACILITATOR CAMERON: Thank you, Christine.
16 We're going to go to our last topic, and Karen, are
17 you ready to tee that up? This is Karen Pinkston of
18 the NRC staff who is going to tee up the issue 1.4
19 Source Term issue for a site specific analysis.

20 MS. PINKSTON: Okay, so as Chip said, I'm
21 going to be talking about source term issues for a
22 site specific analysis. The modeling of the source
23 term estimates that amount radio-nuclides released
24 from the waste into the environment over time. And
25 the amount of radio-nuclides release from the waste is

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1 a function of both the total inventory of the radio-
2 nuclides present in this disposed waste as well as the
3 chemical and physical form of the material.

4 And the chemical and physical form of the
5 material can strongly influence the solubility and
6 leachability which then effects the release rate of
7 radio-nuclides into the environment from the waste.
8 And performance assessments are living analyses that
9 evaluate the potential dose from the whole disposal
10 system. So performances estimates should be updated
11 as new information is known about the system such as
12 when additional inventory of radio-nuclides are added
13 to this disposal system.

14 So uranium can be present in a variety of
15 chemical forms. As we will discuss in more detail
16 tomorrow morning, the chemical form of the uranium can
17 greatly effect the release and environmental transport
18 of it. The depleted uranium generated during the
19 enrichment process is commonly stored as uranium
20 hexafluoride. Uranium hexafluoride is unstable in the
21 presence of water and reacts with water to form
22 hydrofluoric acid. Hydrofluoric acid is highly
23 corrosive and would likely cause damage to and
24 instability in a disposal facility and it could
25 possibly cause safety issues.

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1 So for this reason in the NRC screening
2 analysis, it was assumed that the uranium hexafluoride
3 was going to be deconverted to a more stable uranium
4 oxide prior to disposal. So in addition to the
5 chemical form of uranium effecting the release from
6 the source, it can also be effected by the use of
7 stabilizing materials in the disposal.

8 For example, grouting the waste may result
9 in a slower release of radio-nuclides. So there are
10 several important factors to consider when modeling
11 the source term in the performance assessment. The
12 first factor is the physical configuration of the
13 disposal facility such as the size and shape of the
14 disposal cell and engineered features such as is the
15 waste present in a vault or is it in a particular
16 container?

17 The second feature is the inventory or the
18 amount of each of the radio-nuclides present. As
19 discussed on the last slide, the chemical form of
20 uranium can also effect the release. The -- whether
21 or not stabilizing materials are used and the possible
22 effect of these materials on the release should also
23 be considered. And finally, if stabilizing materials
24 are used, the long-term performance of these materials
25 needs to be considered in the performance assessment.

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1 The stabilizing materials may degrade over time and
2 as they degrade, they may not be as able to prevent as
3 much release.

4 So NRC is seeking public feedback on
5 specifying criteria for the source term or developing
6 guidance for the review of source term issues
7 including the inventory of depleted uranium included
8 in the modeling, the physical and chemical forms used
9 in disposal, the use of stabilizing materials and
10 factors to consider when modeling the source term in
11 the performance assessment.

12 FACILITATOR CAMERON: Okay, thank you,
13 Karen. Would you join us at the table?

14 MS. PINKSTON: Sure.

15 FACILITATOR CAMERON: And we did hear one
16 remark earlier this morning from Mike Ryan about
17 engineering and waste package and we noted that there
18 would be room for discussion of that during this
19 particular segment of the agenda and let's go to Bill
20 Dornsife, please, lead us off.

21 MR. DORNSIFE: Well, certainly the site
22 specific performance assessment should include any
23 engineering or any affects from the engineering that
24 is included as part of the disposal methodology. And
25 I guess the question I would ask, does NRC think that

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1 there's enough information currently in the literature
2 that would allow, for example, assuming something is
3 disposed of in a concrete canister, and I know there
4 was a NUREG put out many, many years ago that talked
5 about changes in K_D because of that disposal that waste
6 form, now if you will, and even after that container
7 loses its stability because of the concrete still
8 retains its chemical capabilities.

9 I mean, if indeed, that was in part of the
10 performance assessment, is there enough guidance out
11 there to allow one to use to include that?

12 FACILITATOR CAMERON: Karen, do you have
13 any -- do you want to offer anything on that or David
14 or Larry? Karen, do you want to go first or --

15 MS. PINKSTON: So I guess the question was,
16 you're asking is there enough -- do we think there's
17 enough information in the literature to support
18 depending on the chemical properties of the grout
19 lasting long periods of time into the future?

20 MR. DORNSIFE: And what are the K_D effects
21 at all of the -- and what are the K_D effects regarding
22 all of the daughters.

23 MS. PINKSTON: Right. So there's certainly
24 a fair amount of research on you know, time equals
25 zero, what is the effect, the chemical effect on K_D on

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1 the different radio-nuclides? There's also been --
2 we've been supporting our contractors in doing some
3 research of our incidental waste work related to what
4 do we expect a long-term behavior of cementitious
5 materials to be. So that's some information that's
6 out there.

7 MR. DORNSIFE: Larry, do you recall that
8 report that had talked about the K_D 's and -- no? It's
9 pretty old but --

10 MR. CAMPER: When I'm 100 years old, give
11 me a break. I mean, I think if you're asking the
12 staff is there an ample amount of information out
13 there about this particular topic, I think the answer
14 is yes. I think the staff thinks that there is. I
15 mean, Dave can speak for himself or Karen but I think
16 the answer to that is, yes. And so we would proceed
17 reviewing that type of information. I mean, I think
18 the question here before us today, is there something
19 that you -- is there something we've left out in a
20 discussion of the source term here or is there
21 something that we didn't address adequately in the
22 technical analysis that the staff did in support of
23 the SECY? But the simple answer to your question is,
24 yes.

25 FACILITATOR CAMERON: Okay, Bill.

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1 MR. DORNSIFE: Now you have me confused.
2 I mean, my specific question was that if, you know,
3 you ought to -- my specific comment was you need to be
4 able to include engineered barriers or whatever you
5 have as part of the disposal system in your site
6 specific analysis. That ought to be allowed. Now the
7 next question is, is there -- does NRC think there is
8 sufficient technical information out there to support
9 how that engineered barrier, if you will, would
10 perform and what credit could be taken for, for the
11 long term.

12 FACILITATOR CAMERON: And let's make sure
13 we address the first part of Bill's comment/question
14 is that engineered barriers should be considered in
15 assessing source term if Karen, Dave can address that.

16 And also, is there enough information to do that is
17 the second part of the question.

18 MR. ESH: Well, the first part, are you
19 allowed to use engineered barriers? I think, yes,
20 you're allowed to use engineered barriers. You need
21 to provide the technical basis for their performance
22 to use an engineered barrier. The second part of your
23 question, is the existing information sufficient to
24 justify the performance of say the chemical effects of
25 cementitious materials? As Karen said, there's a

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1 decent amount of literature out there. It's much more
2 for specific radio-nuclides.

3 A lot of the research is focused on
4 fission products, strontium and cesium, but there's
5 also some data out there on uranium or plutonium or
6 some other isotopes. But the answer to your question
7 of is it sufficient to justify the use of it, it
8 depends. It depends how much credit you're trying to
9 take for that process or phenomena. So if you came in
10 and said, "Well, my grout is going to retain my
11 material indefinitely", which implies some very large
12 K_D value, you'd have to show the research and/or the
13 literature that supports the use of that amount of
14 credit.

15 So I can't say -- for the second part of
16 your question, I can't give you a firm answer. Yes,
17 there is information out there. Yes, it could
18 influence the results in some cases but it's somewhat
19 disparate when it goes from radio-nuclide to radio-
20 nuclide or the amount of credit that you're going to
21 try to --

22 MR. DORNSIFE: Well, there is, in fact, an
23 NRC NUREG that says that, in the contractor's opinion,
24 that you can take credit for the long-term chemical
25 characteristics of a concrete matrix.

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1 MR. ESH: Yes, yeah, and I'm not saying
2 anything different than that.

3 MR. DORNSIFE: Okay.

4 MR. ESH: I'm saying that this is a
5 relative -- it's a relative question, though. So if
6 you said, well, that means for my humid site, I'm
7 going to try to take a million years of chemical
8 credit for the cement, that might be a stretch. An
9 arid site, then you say I'm trying to take 1,000 years
10 of credit for this chemical performance, that might
11 not be so much of a stretch because it greatly relates
12 to the flow of water through the material and the
13 depletion of the alkalinity in the cement and when you
14 move from high PH to lower PH, et cetera.

15 That process of evolving the material and
16 when you go from one state to another, I think, is --
17 should be considered in the evaluation. That would
18 tell you how much credit you can reasonably take for
19 it.

20 MR. DORNSIFE: Okay.

21 FACILITATOR CAMERON: Okay, thanks, Dave.
22 Karen, did you want to add anything?

23 MS. PINKSTON: No, Dave pretty much
24 captured what I was going to say.

25 FACILITATOR CAMERON: Okay, thank you.

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1 Mike?

2 DR. RYAN: Just to follow on on the --

3 FACILITATOR CAMERON: This is the mike.

4 DR. RYAN: I'm sorry. Just to follow
5 along, David, on your line of reasoning, this is an
6 example where you know, really being explicit in the
7 presentation, in the guidance of what does pass the
8 laugh test and what may not would be real helpful.
9 You know, again, for dry sites, for relatively
10 intermediate periods of time, we'll probably find that
11 cement and that's one example and there's probably a
12 half a dozen or more key things to think about with
13 the long-term sequestration question. You know, even
14 things like, you know, if I'm in a natural analogue
15 where uranium has been held for a really long time,
16 could I create that chemical or physical environment
17 and get to 100,000 years?

18 You know, you might. So I just -- again,
19 I'm saying go forward and do more good along the lines
20 you're talking about but I don't think you can give
21 too many good examples of what you can take credit for
22 or me as a applicant can take credit for and what the
23 range of credit might be. That's very, very helpful
24 information and, you know, you certainly and your team
25 have studied, you know, these questions a lot more

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1 probably than most applicants have and to the extent
2 you can gather that together and say, "Here's a body
3 of knowledge you can draw on", is really very positive
4 through you in the guidance.

5 MR. ESH: I think that is a good comment.
6 I appreciate it. The struggle that we have sometimes
7 is if we put that information in guidance, for
8 instance, then a licensee will just want to do exactly
9 what's in the guidance and they forget about doing
10 their own thinking. We want them to do their own
11 thinking, provide their own justification, provide
12 their own basis, give them enough to hopefully send
13 them in the right direction with that process, but
14 allow them to do the good work themselves and come up
15 with a basis for it, because that way they're going to
16 be able to explain their product to their other
17 stakeholders, et cetera.

18 DR. RYAN: And that's a fair expectation
19 for an applicant. I couldn't agree with you more, but
20 you know, maybe there's a middle ground where you
21 could have workshops with potential applicants or
22 sited facilities or, you know, other interested
23 parties and actually talk about this in more detail in
24 kind of a seminar sort of forum to say, "Here's where
25 we think the literature is", and have other experts

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1 who actually have, you know, expertise in the broad
2 spectrum in this literature come in and talk to
3 stakeholders and interested parties. That might be
4 another way to try and get the message out, not just
5 try and jam it all into one guidance document but have
6 the guidance document and then have sessions to
7 explain it more fully, you know, to folks.

8 So there's lots of ways to get the
9 information out. It's not just in a book or a NUREG.

10 But you know, there might be other ways to try and
11 communicate what your intent is as well as what the
12 technical content is. But I applaud your effort to
13 move in that direction.

14 FACILITATOR CAMERON: Tom or Bill, are you
15 afraid of your creativity being stifled by the NRC?

16 MR. MAGETTE: No.

17 (Laughter)

18 MR. DORNSIFE: No, but what I'm afraid of
19 is how it gets implemented by the state and that --
20 you know, that begs the question, you know, can the
21 NRC, through rulemaking require from a compatibility
22 standpoint a state to use guidance, so there is
23 uniformity in terms of implementation?

24 MR. MAGETTE: But we've had that comment
25 several times but we have an agenda item for that. So

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1 maybe we can address that all at once. Because I have
2 some thoughts on that, too, but I've been kind if
3 holding back. That's hard to believe.

4 FACILITATOR CAMERON: That said, we'll put
5 that one in the parking lot for tomorrow.

6 MR. CAMPER: I mean, we'll talk about that
7 tomorrow at great length but guidance is not a sign of
8 level of compatibility. Typically, what happens is
9 when the states and the Federal Government, the NRC
10 work together on a particular rule, a level of
11 compatibility is assigned and then the state and NRC
12 working groups works together to develop a guidance,
13 but the guidance is never assigned a level of
14 compatibility.

15 FACILITATOR CAMERON: And we'll talk more
16 about that tomorrow. The answer might be the same,
17 but we'll save that. We'll save that. Okay, Peter
18 and then Christine. You want to say something, Peter
19 and then we'll go to Arjun and Diane or Diane and
20 Arjun. Peter?

21 MR. BURNS: So I'm a director of this newly
22 funded Department of Energy Center and it's mostly
23 actinide materials, a big part of it a actinide waste
24 forms.

25 MS. D'ARRIGO: Can you start over again? I

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1 didn't hear the beginning of what you were saying.

2 MR. BURNS: I'm sorry.

3 MS. D'ARRIGO: You're a director of a --

4 MR. BURNS: I'm the director of an energy
5 frontiers research center on actinide materials that
6 was just funded in August. That's the only such
7 center on actinides in the country. So I have some
8 pretty strong views, I think, so I want to preface my
9 comment by that, with that on what a waste form is and
10 what the role of a waste form is in disposal and so
11 on.

12 So the first point I wanted to make was
13 that I hear -- throughout the conversation I didn't
14 make any comment about it earlier, but people are
15 using the term "waste" and "waste form" entirely
16 interchangeably in this discussion. Depleted uranium
17 is definitely not a waste form, it's a waste. And
18 the debate might center around what would the
19 appropriate waste form be for depleted uranium, but of
20 course, depleted uranium itself is the waste.

21 Now, when it comes to putting it in a
22 disposal setting, there are really three things, I
23 guess that you're considering in your model and you
24 should be; the waste form performance, the engineered
25 barriers that you may or may not have in such a model

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1 -- in such a system that would be modeled, and then
2 ultimately the geology once you've gotten past your
3 engineered barriers.

4 It happens to be a very strong view of
5 mine that there's nothing much more important than the
6 waste for geology match. If you get that right, life
7 is very, very good in terms of your performance
8 assessment. Now, I know that that's not your --
9 that's not NRC's role to necessarily seek that match,
10 but the point I wanted to make is that the companies
11 and so on that wish to construct these disposal
12 facilities need to be encouraged in my view to think
13 very hard about the compatibility of the waste form
14 with the geology and with the engineered barriers, and
15 I think I heard somebody mention, I wrote it down, a
16 certain durability requirement for the waste form and
17 I think that is in the realm of potentially in the NRC
18 rulemaking or rule, is that there's a certain -- in my
19 view, there should be a certain minimum standard for
20 waste form performance under whatever environment one
21 wishes to put it in and that, of course, is -- it
22 varies considerably depending on the depth of burial,
23 the groundwater regime, the -- whether it's oxidizing,
24 et cetera.

25 But there's certainly not a one size fits

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1 all scenario and uranium hexafluoride is absolutely
2 not an acceptable waste form, I would think in any
3 scenario. It's a waste but not a waste form. So if
4 one is going to go into converting, and that's the
5 first time I heard the word but it's probably common,
6 deconverting the uranium hexafluoride in to some other
7 form, why not just go right straight to a reasonably
8 economical waste form that's going to have a very high
9 durability in the waste environment you intend to put
10 it in? So this could be encouraged by the rulemaking,
11 I would think.

12 FACILITATOR CAMERON: And we're going to go
13 to Christine and then Diane and Arjun, but it might e
14 useful to hear some comment on Peter's suggestion
15 about this durable -- why not go to this durable waste
16 form in terms of a requirement perhaps? Christine?

17 MS. GELLES: Yeah, my comments actually may
18 be somewhat responsive to Peter's comments. I just
19 wanted to respond to the request that Karen put
20 forward, which was requesting some public input on use
21 of stabilizing materials in physical and chemical
22 forms and I know you are well aware of it, but for the
23 record I just wanted to state that the Department of
24 Energy has been looking into questions of waste form
25 as it pertains to the potential disposal of our DU

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1 streams that would produced the U308 waste form
2 specifically is what we selected to be produced by our
3 conversion facilities or deconversion facilities,
4 we've called them both at Portsmouth and Paducah and
5 there are published reports.

6 Those reports are referenced in the draft
7 supplement analysis which Tom eluded to before which
8 we're in the process of finalizing that we'll
9 ultimately make the disposal decision on that specific
10 waste stream. And again, that's just one stream of
11 the potential inventory of DU waste forms or waste
12 streams that we will have.

13 In response to Peter's question, I think
14 it's --first off, I want to say the Department of
15 Energy completely concurs that there is a very
16 important relationship between waste form and the
17 geology of the facility that it's going to be placed
18 in and we recognize that interdependence and that is
19 one of the things that factored into our selection of
20 the U308 form for the DUF₆ tailings that is the subject
21 of this draft supplement analysis.

22 But I also want to be responsive and say
23 that we have not, repeat, that we have not determined
24 that all DU that the Department of Energy owns is, in
25 fact, a waste and for that reason, we selected a form

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1 that still proves for its potential reuse but at the
2 same time is an acceptable waste form in the event
3 that we do ultimately dispose of it in your surface
4 disposal facility. So, yes, we did consider grout but
5 that would certainly complicate any potential reuse
6 options and so we -- it was a factor that led to our
7 selection of the U308 form. Thanks.

8 FACILITATOR CAMERON: Thank you. Thank
9 you, Christine. Diane?

10 MS. D'ARRIGO: I think I'm going to wait.

11 FACILITATOR CAMERON: Okay. Arjun?

12 MR. MAKHIJANI: Just to respond to this
13 waste form question; I really agree with Dr. Burns
14 that if you're going to deconvert maybe U308 which has
15 been the general assumption, that would be the best
16 idea. We argued this thing at some length in the LES
17 case because UO_2 would be more compatible with -- than
18 going to more durable waste form like zircons and so
19 on; whereas U308 is not. And we were overruled out of
20 hand because -- there wasn't any good reason, because
21 it was simply assumed that U308 would be the final
22 disposal form without really more serious
23 investigation at least in that proceeding.

24 There had been some investigation before.

25 The other thing is, just on the presentation that you

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1 made, I would add one factor that you didn't put up
2 which is the waste concentration. This came up
3 earlier. I think the waste concentration will effect
4 the geometry of disposal. The geometry of disposal,
5 you know, if you have a very high waste concentration,
6 the volume required would be lower. If the specific
7 activity of the waste total as disposed is lower,
8 you're going to require a larger volume, a larger
9 infiltration, you know, present a different face to
10 the environment.

11 And so I think it's very important to take
12 that into account. The specific example in this case,
13 you know, which I brought up in my introductory, so
14 when I introduced myself, was it's very important to
15 check on what the concentration, allowable
16 concentration results are because in the 1990
17 technical analysis done for the Clive, Utah site,
18 there were a number of results for allowable
19 concentration that were wrong. That allowable
20 concentration, as I mentioned exceeded the weight of
21 the earth, in program exceeded the weight of the earth
22 in one case and that wasn't the only case. It wasn't
23 a typo.

24 And so I think while the factors that you
25 mentioned are fundamental, paying attention to

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1 concentration is very important and I'd like to put on
2 the record that I think the underlying document, the
3 license that Clive, Utah site which the NRC staff said
4 in the LES proceeding was scientifically sound. It's
5 at least partially not scientifically sound and it
6 should be fixed. I don't think that we should allow
7 sites that have defective underlying technical
8 documents to proceed to do analysis themselves for
9 their sites without fixing the documents that exist
10 currently.

11 FACILITATOR CAMERON: Okay, Charles, you
12 captured all of that? All right. Does NRC staff have
13 any questions for Arjun about his concentration
14 remark? Is that understood? Okay, thank you. Felix,
15 and then we'll go to Tom.

16 MR. KILLAR: Yeah, I just want to put a
17 plug in for DOE. I think Christine has been very I
18 guess humble or bashful or what have you but I think
19 that the work that they did on the supplementary
20 analysis for the location of disposal depleted uranium
21 oxide conversion products from generated from DOE's
22 inventory depleted uranium hexafluoride, DOE EIS-0359-
23 SA1 and DOE EIS-0360-SA1 really lays out what the
24 issue is that we were talking about here.

25 They looked at different forms. They

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1 looked at whether it's grouted or ungrouted. They
2 looked at arid sites versus humid sites, what have
3 you. And I think if you look through there, you'll
4 see that it really lays out a pretty good reason for
5 why you want to use U308. I don't recall if it
6 specifically in here, I know that there are some other
7 analysis that there was a minimal benefit to go to
8 uranium metal and the cost wasn't justified. I don't
9 recall if that was in the EIS or not. One of the
10 things that they demonstrated in here is that even if
11 you have field site that's in an arid site, after
12 1,000 it still meets the performance criteria.

13 So I think there's a lot of good
14 information here. I think the -- for bringing it up
15 because I think some of the NRC may want to look at
16 that work and talk to DOE to get some more details on
17 it.

18 FACILITATOR CAMERON: Okay, and he repeated
19 that title and number of the document from memory.
20 That's very good. Tom?

21 MR. MAGETTE: I have a question for you,
22 Karen, about what you're asking for here in part, but
23 before I ask that, let me just say, since we are
24 keeping a record, I will say for the record that we
25 absolutely do not agree with the notion that the

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1 licensing basis for Clive is in any way incorrect or
2 unscientific.

3 My question is, it's not clear to me just
4 from the reading of the slide and also it's not clear
5 to me from reading the Q&A that you all published in
6 the Federal Register, if you're asking for feedback on
7 criteria of physical and chemical forms used, in other
8 words, are you talking about disposal criteria or are
9 you asking for a feedback on taking credit for those
10 criteria in the performance assessment?

11 MS. PINKSTON: Yeah, I think the way it was
12 written in the Federal Register notice was that we
13 were interested in feedback both on criteria for
14 whether or not it would be appropriate to specify the
15 forms and/or ad mixtures used and also how you would
16 go about taking credit for them in the performance
17 assessment and what factors to consider in the
18 modeling.

19 MR. MAGETTE: Because I would agree with
20 the latter. I think it would be appropriate in this
21 context and we would definitely be interested in
22 seeing criteria in your published guidance at the risk
23 of stifling our creativity, I think, as Chip put it,
24 but I don't think it would necessarily be appropriate
25 in this context to have that same guidance in some way

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1 limit disposal criteria, notwithstanding the
2 discussion that's been going on about disposal forms.

3 I'm not taking exception to that or suggesting that
4 we want to roll a bunch of DUF₆ cylinders into the
5 site, because obviously, we don't. But that's a
6 different question, I think.

7 MR. ESH: I think that was part of the --
8 part of the subject of the comment. If you look at
9 the low level waste regulations, there are waste
10 characteristics that are in there that are prohibited
11 for instance. So you could, in theory, specify
12 characteristics for a unique waste stream that you
13 would say, "I don't care what you do, you can't put
14 this type of material in".

15 MS. PINKSTON: And also with considering
16 the criteria for what types of forms and this goes
17 back to the guidance versus rule issue, it maybe would
18 be -- would it be appropriate to put in guidance, for
19 example, that UF₆ would make a terrible waste form,
20 don't ever use it, you know, that type of -- or, you
21 know, to alert people to -- these are the pros and
22 cons, these are possible forms of uranium, so that
23 when someone is doing the review they're aware of what
24 to look out for?

25 MR. MAGETTE: I guess I would say in the

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1 context of the performance assessment, you would get -
2 - you might get a different answer depending on how
3 you addressed that question. In other words, you --
4 it might be logical for you to say you're not going to
5 be able to take credit -- you're going to have a more
6 difficult time with your performance assessment if you
7 use certain waste forms than if you use other waste
8 forms. But I do think going beyond that, you're going
9 to certainly complicate this rulemaking if you start
10 making it about waste forms.

11 FACILITATOR CAMERON: Thank you. Thank
12 you, Tom. And Peter?

13 MR. BURNS: I don't think I'd favor the
14 rulemaking specifying, "Here's your list of possible
15 waste forms. Choose one of these pre-approved things",
16 but rather a certain minimum durability standard for
17 the waste form that is intended to be disposed in that
18 particular environment seems appropriate. And it's --
19 U308 might well fit the bill in many different
20 environments. I don't think uranium hexafluoride
21 would probably in any environment, but here are
22 potentially a variety of other materials.

23 Uranium metal is probably not one of them
24 that would also fit in an oxidizing environment. I
25 don't think this was done, for example, in the Yucca

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1 Mountain program so far as NRC regulations were
2 concerned. I don't think there was any NRC
3 requirement that there be a certain durability of the
4 waste form. But it seems to make -- it makes sense
5 to me at least that it's -- I'll tell you if your
6 waste form holds up there's absolutely no other
7 problem in the world, I mean, unless somebody blows it
8 up. Right.

9 But if your waste form is stable, you're
10 golden. So that should seem to be where a fair bit of
11 emphasis is placed in securing, you know, minimizing
12 the contamination exposure.

13 MR. DORNSIFE: You're using durability and
14 stabilities synonymously or are you using durability
15 to mean something else?

16 MR. BURNS: I would use durability to
17 capture -- would include stability in --

18 MR. DORNSIFE: What else because once you
19 get beyond stability, you're talking about something
20 that's beyond Part 61, other than the minimum
21 requirements. All that's required is stability.

22 MR. BURNS: I don't carry a burden of
23 knowing anything about what's in 61 other than 6 and
24 1, so I can't comment on that, but what I mean is how
25 the waste form performs in the particular environment

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1 you wish to place it in. That's what I mean by
2 durability or we can say stability. I assume that
3 this doesn't -- this is not relevant to the
4 relatively, perhaps, low probability event of an
5 intrusion but is relevant to the much higher
6 probability event of water leaching, an event that --
7 a probability that's presumably 100 percent if you go
8 out far enough in time. So I think I'm more thinking
9 of solubility, the waste forms in the geofluids that
10 will be present.

11 MR. DORNSIFE: Well, in practice, okay, in
12 the current disposal facilities, that durability, if
13 you will, is handled in many cases by disposal in a
14 container, you know, typically a reinforced concrete
15 container. It doesn't necessarily involve doing
16 something with the waste form.

17 MR. BURNS: Right, right. The -- and
18 that's -- well, I mean, that's the -- part of the
19 engineered barrier which is fine and I wouldn't
20 suggest that you rely wholly on a waste form. You
21 certainly have to have an engineered barrier and put
22 it in an appropriate environment as well. But well,
23 it depends on what our regulatory time frame is. If
24 we get to the point where after -- so NRC comes up
25 with 10,000 years in the rulemaking and it goes to

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1 court and the next thing you know you're dealing with
2 500,000 years or something, then you can't rely on
3 your engineered barrier any more and but your waste
4 form is still the source.

5 MR. DORNISIFE: Well, maybe. That's hard to
6 prove, too.

7 MR. BURNS: Well, I mean, you probably want
8 me to stop.

9 FACILITATOR CAMERON: No, that's okay, go
10 ahead.

11 MR. BURNS: It's -- well, the waste form is
12 the source term of the radioactivity that's going to
13 be released. We can agree on that.

14 MR. DORNISIFE: Well, including
15 leachability. It's hard to prove that over a long
16 time.

17 FACILITATOR CAMERON: Tom, Bill, and I know
18 Tom cautioned about don't make the rule about the
19 waste form. When you hear Peter's comment about there
20 should be some minimum durability standard and
21 assuming that he's talking about the concept of
22 stability. Any comments on that?

23 MR. DORNISIFE: As long as it's something
24 that's already required by Part 61, I have no problem
25 with it.

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1 FACILITATOR CAMERON: Tom?

2 MR. DORNSIFE: I mean, if it we're going --
3 if we're going to a waste characteristic that
4 currently isn't covered by Part 61, then I have a
5 problem with it.

6 MR. MAGETTE: I'm not sure I heard Peter
7 say anything that's inherently inconsistent with
8 existing requirements in Part 61 as he knows them not
9 to be. So I think his comments are very well taken
10 but they're not novel, I guess would be part of my --
11 and I agree with a lot that's been said about the
12 importance of the waste form and I don't want my
13 comments to be misconstrued as suggesting that those
14 are in any way unimportant, but remember, here again,
15 we've been focused on a performance assessment and
16 that's only one piece of the puzzle.

17 We have waste acceptance criteria, license
18 conditions and a lot of other factors that address
19 these things. So this is not somehow unique to the
20 discussion of a performance assessment. But I don't
21 really have any problem with any of the comments that
22 Peter has made. I think they're all very valid.

23 FACILITATOR CAMERON: Okay, thank you.
24 Audience, anything to add on the idea of source term
25 generally or specifically about waste form? Anybody

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1 want to add anything on that? Okay, and Diane, go
2 ahead.

3 MS. D'ARRIGO: I'm just not quite sure
4 where on the agenda to insert this thought which is
5 you know, having tracked the low level radioactive
6 waste siting issues over the decades and you know,
7 it's pretty clear that the reason for public concern
8 about new low level radioactive 10 CFR 61 sites is
9 that the length of the radioactive hazard is longer
10 than the time that the waste will be either
11 institutionally controlled or projected to be
12 isolated.

13 And so by putting in something -- putting
14 depleted uranium in which you know, is so very, very
15 long-lasting it exacerbates that concern and
16 obviously, the form of it is important, the potential
17 for synergistic effects with this waste and the other
18 wastes that are already in the A, B, C categories are
19 something that needs to be looked at and if it's going
20 to go to mixed waste facilities, then that also would
21 require some evaluation.

22 I think that it's better to attempt to
23 isolate this material than to use it as a -- you know,
24 as it is being used in some cases for armaments and
25 other uses, so that it disperses in the air and in the

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1 environment because that's the worst way to be exposed
2 to it. So the goal of isolating it is a good one.
3 And I believe that the effects, the health effects
4 that are in 10 CFR 61, they are limiting based on
5 fatal cancers. There seems to be open concern,
6 discussion, uncertainty about what the health effects
7 are of depleted uranium, non-fatal health effects on
8 thyroid, on immunity, and on other teratogenic,
9 carcinogenic effects that may not result in fatal
10 cancer. So that's another piece of concern.

11 These are just some of the general issues
12 with a long-lasting material like depleted uranium and
13 as I'm raising them, I'm not really clear at which
14 point it's appropriate to do that, but I think it's
15 important that that be taken into consideration.

16 FACILITATOR CAMERON: Okay, thank you,
17 Diane, and I think that this is an appropriate time to
18 raise those and as I understand just shorthand, two
19 issues the synergistic effects and also the full range
20 of health effects and I guess I would ask Dave for
21 starters, how does this fit into the site specific
22 performance criteria rulemaking? Do you have anything
23 to respond to Diane's concerns?

24 MR. ESH: Yeah, I think synergistic effects
25 need to be considered compatibility of waste with

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1 other waste, compatibility of waste with the system,
2 compatibility of the system with the waste. Those all
3 need to be considered. I believe in NRC, the waste
4 characteristics part of the regulation. It already
5 mentions an idea like that. It says something to the
6 effect of not disposing the chelating agents, maybe.
7 I think chelating agents are referenced but it's
8 getting at that idea. So I agree with that.

9 As to the health effects, I'm not an
10 expert on the health effects but it's a good comment.
11 We'll take it under consideration.

12 FACILITATOR CAMERON: Anybody else want to
13 -- and so the compatibility with other waste forms,
14 these types of synergistic effects is something that
15 would be considered in doing the performance
16 assessment?

17 MR. ESH: Sorry, say that again?

18 FACILITATOR CAMERON: Is that -- would that
19 be something that would be considered in doing the
20 performance assessment and Karen is nodding
21 affirmatively on that one.

22 MR. ESH: In terms of the synergistic
23 effects of the -- yes, yeah.

24 FACILITATOR CAMERON: All right. Okay,
25 well, thank you all for your attention and your

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1 discussion today and we did finish on time and
2 tomorrow we're going to start at 8:30 and we're going
3 to go into some other things that Karen is going to
4 tee up for us on modeling. We're going to talk about
5 unique waste streams generally. We've already heard
6 some on that. Agreement state compatibility, the
7 long-term rulemaking which has been a subject of
8 discussion today and then other considerations.

9 So, with that, if no one has anything
10 else, we'll adjourn. Thank you. Thank you, all.

11 (Whereupon, at 4:54 p.m. the above-
12 entitled matter recessed, to reconvene at 8:30 a.m.
13 September 3, 2009.)

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