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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 (ACRS)

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7 RADIATION PROTECTION AND NUCLEAR MATERIALS

8 SUBCOMMITTEE

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10 TUESDAY

11 DECEMBER 3, 2013

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13 ROCKVILLE, MARYLAND

14 + + + + +

15 The Subcommittee met at the Nuclear

16 Regulatory Commission, Two White Flint North, Room

17 T2B1, 11545 Rockville Pike, at 8:30 a.m., Michael T.

18 Ryan, Chairman, presiding.

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1 COMMITTEE MEMBERS:
2 MICHAEL T. RYAN, Subcommittee Chairman
3 J. SAM ARMIJO, Member
4 DENNIS C. BLEY, Member
5 CHARLES H. BROWN, JR. Member
6 DANA A. POWERS, Member
7 HAROLD B. RAY, Member
8 GORDON R. SKILLMAN, Member
9 JOHN W. STETKAR, Member
10 DESIGNATED FEDERAL OFFICIAL:
11 DEREK WIDMAYER
12 ALSO PRESENT:
13 EDWIN M. HACKETT, Executive Director, ACRS
14 MIKE BENJAMIN, EnergySolutions, Barnwell
15 Facility
16 PAUL BLACK, Neptune and Company, Inc.
17 BRAD BROUSSARD, TCEQ, Texas*
18 BILLY COX, EPRI
19 BILL DORNSIFE, WCS*
20 LISA EDWARDS, EPRI
21 EARL FORDHAM, DEH, Washington*
22 CHRISTINE GELLES, DOE EM*
23 JOHN T. GREEVES, Talisman LLC
24 RICH JANATI, DEP, Pennsylvania*
25 SUSAN JENKINS, DHEC, South Carolina

1 SCOTT KIRK, WCS
2 MARVIN LEWIS*
3 JIM LIEBERMAN*
4 RUSTY LUNDBERG, DEQ, Utah
5 TOM MAGETTE, PWC
6 ARJUN MAKHIJANI, IEER
7 JEFF MOWBRAY, Portsmouth-Paducah Project
8 Office*
9 GARY ROBERTSON
10 ROGER SEITZ, DOE SRNL
11 DAN SHRUM, EnergySolutions, Clive Facility
12 KEITH SPARKS, Portsmouth-Paducah Project
13 Office*
14 JOHN TAUXE, Neptune and Company, Inc.
15 JACK ZIMMERMAN, Portsmouth-Paducah Project
16 Office*
17 *Present via telephone
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1 T-A-B-L-E O-F C-O-N-T-E-N-T-S

2 Introduction

3 Michael Ryan.....5

4 Sam Armijo.....7

5 Agreement State Representatives

6 Susan Jenkins.....9

7 Rusty Lundberg.....46

8 Brad Broussard.....68

9 Earl Fordham.....82

10 Disposal Facility Representatives

11 Scott Kirk.....100

12 Dan Shrum.....139

13 Industry And DOE Representatives.....220

14 Other Stakeholders.....250

15 Adjournment

16

17

18

19

20

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

2 8:32 a.m.

3 CHAIRMAN RYAN: This is a meeting of the
4 Advisory Committee on Reactor Safeguards Subcommittee on
5 Radiation Protection and Nuclear Materials.
6 I am Dr. Michael Ryan, Chairman of the
7 Subcommittee. ACRS members in attendance include Dick
8 Skillman, Harold Ray, Dennis Bley, Dana Power, Sam
9 Armijo, Charlie Brown and John Stetkar. Anybody else?
10 No, that's it.
11 The purpose of this meeting is to hear
12 presentations from and hold discussions with
13 stakeholders and representatives on the proposed
14 revisions to 10 C.F.R. 61. Today we have
15 representatives from the Agreement States who license
16 the currently operating low-level waste disposal
17 facilities, the operators of those facilities, low-level
18 waste generator organizations, experts in performance
19 assessments, the Department of Energy and other
20 stakeholders.
21 Subcommittee members will recall that in
22 the Committee's last letter to the Commission on the
23 proposed revision of Part 61 dated July 10th, 2013 the
24 ACRS said it would conduct additional meetings on the
25 subject to better understand the technical basis for some

1 of the revisions being proposed by the staff. This is
2 our second of two Subcommittee meetings planned to
3 collect information toward that end.
4 The Subcommittee met on November 19th with
5 representatives from the Department of Energy in the
6 first of the two Subcommittee meetings. The
7 Subcommittee will gather information, analyze relevant
8 issues and facts and formulate proposed positions and
9 actions as appropriate. Then the Subcommittee plans on
10 proposing a letter report on this matter for
11 consideration at its February 2014 Full Committee
12 meeting.
13 Today's meeting is open to the public. We
14 have not received any requests from members of the public
15 to provide comments, however, I understand that there are
16 folks on the bridge line who will be listening in on
17 today's proceedings. And opportunity will be provided
18 at the end of the proceedings for anyone listening in to
19 make a comment.
20 A transcript of the meeting is being kept.
21 It is requested that speakers first identify themselves
22 and speak with sufficient clarity and volume so they can
23 be readily heard.
24 Derek Widmayer is the designated federal
25 official for this meeting.

1 Several of our presenters today will be
2 providing their presentations and participating in
3 discussions via telephone. We'll be connecting with
4 these individuals at appropriate times during the
5 meeting, so we ask your patience while we make these
6 connections. Thank you.
7 We'll now proceed with the meeting. Our
8 first panel of speakers is from the Agreement States.
9 I'll ask each of you to introduce yourselves when
10 beginning your presentation.
11 Our first presenter is Susan Jenkins from
12 the State of South Carolina. Susan?
13 MEMBER ARMIJO: Susan, just before we
14 start, I'd just like to --
15 CHAIRMAN RYAN: I'm sorry.
16 MEMBER ARMIJO: -- make a couple of
17 comments. Mike has provided all the necessary
18 background, but I want to make sure that presenters
19 understand that our focus is on hearing the views from
20 representatives of organizations that have both
21 extensive experience, but also responsibility for the
22 safe disposal of low-level waste.
23 We've met with Department of Energy, and as
24 Mike says, we're meeting today with Agreement State's
25 representatives, as well as operators of facilities. In

1 particular we would like to hear your views on the
2 questions of adequacy of current regulations for the
3 disposal of low-level waste, the safety benefits of the
4 proposed regulations and the additional burdens that may
5 be imposed by the proposed regulations as they currently
6 stand. And those burdens which may have some benefit,
7 fine. Those benefits which have little or no value, we'd
8 certainly like to hear about that.
9 With that, Mike?
10 CHAIRMAN RYAN: Thank you very much for
11 those adding introductory comments, Mr. Chairman. We
12 appreciate that insight.
13 Let me just check on the phone line. Do we
14 have any participants on the phone line now? Please
15 identify yourself.
16 MR. LEWIS: Marvin Lewis.
17 CHAIRMAN RYAN: Marvin? And what
18 organization are you with, Marvin?
19 MR. LEWIS: Me, myself and I. Individual.
20 CHAIRMAN RYAN: Very good. Thank you very
21 much.
22 Is there anybody else on the bridge line?
23 MR. LIEBERMAN: Jim Lieberman.
24 CHAIRMAN RYAN: And thank you, Jim. Who
25 else?

1 MR. SPARKS: Keith Sparks,
2 Portsmouth-Paducah Project Office.
3 CHAIRMAN RYAN: Thank you, Keith. Anyone
4 else?
5 MR. JANATI: Rich Janati, Pennsylvania
6 DEP.
7 CHAIRMAN RYAN: Okay. That was Rich
8 Janati at the Pennsylvania Department of Environmental
9 Protection.
10 MR. JANATI: Yes, thanks. Hello, Mike.
11 CHAIRMAN RYAN: Hi. Good to see you, Rich.
12 MR. JANATI: Thanks.
13 CHAIRMAN RYAN: Anybody else?
14 (No audible response.)
15 CHAIRMAN RYAN: Hearing no one, I'd ask all
16 those participants on the bridge line to put your phones
17 in mute mode, which helps with some of the buzzing and
18 clicking and picking up extraneous conversations that
19 may be occurring any one of all of your locations. So
20 we appreciate that.
21 So with that, I'll turn to you, Susan.
22 You're first on the agenda. Welcome again.
23 MS. JENKINS: Thank you. Again, my name is
24 Susan Jenkins. I manage the Infectious and Radioactive
25 Waste Management Program for South Carolina's Department

1 of Health and Environmental Control and I'd like to thank
2 the members of the Subcommittee for this opportunity to
3 present our perspective on the Part 61 proposed
4 revisions.
5 I'll just start out with a brief overview
6 of the Barnwell Low-Level Radioactive Waste Disposal
7 Facility. The facility started operating in 1971. And
8 here we see an aerial view of the site. This was taken
9 in April of 2012. And as you can see, the majority of
10 the site has been capped. One hundred twenty acres
11 actually have been capped at this point. There are 235
12 acres that are used for disposal and site buildings, but
13 not all of the 235 acres is acceptable for waste disposal.
14 This is a projected timeline of site
15 operations. And the main thing that I want to point out
16 here is that on July 1st of 2008 two very important things
17 happened. One is that it is the date that began compact
18 operations. So the site, as many of you know, is open
19 to Atlantic Compact States only, and those are the states
20 of South Carolina, Connecticut and New Jersey.
21 The other important thing about this date
22 is that was the date when phase 1 closure activities
23 began. The site is scheduled to close in two phases, and
24 the phases are divided based on the area of the disposal
25 site that was used for operations prior to July 1st, 2008

1 and post-July 1st, 2008. So we have actually completed
2 phase 1 closure at the facility and are now in a
3 post-closure observational period for much of the site.
4 And I'll just go over the status of the
5 Barnwell site because I think it's important in terms of
6 the proposed revisions of Part 61. As I said, the site
7 is an Atlantic compact operations only, therefore the
8 site is not a candidate for accepting mass quantities of
9 depleted uranium or other long-lived radionuclides.
10 The phase 1 closure activities are complete. In fact,
11 86 percent of the site is in the five-year post-closure
12 observation period. There also is extensive
13 documentation showing that the 16 performance objectives
14 listed in the license have been met for that portion of
15 the site.
16 MEMBER SKILLMAN: Susan, on that slide; I'm
17 Dick Skillman, I would like to ask you what the
18 post-closure observation activity burden is. Is that a
19 great amount of work, or is that a small amount of work?
20 And the reason I ask the question is when we talk about
21 monitoring of a burial site, one of my questions is how
22 long does one conduct that observation? And that leads
23 to how much work is involved in doing that?
24 MS. JENKINS: Right. And one of the
25 advantages of still being an operating site is that there

1 are employees on site that are performing the daily
2 operations. And they go out at least on a weekly basis
3 to survey the entire site visually, walking the caps,
4 looking for any indications of slumping or ponding,
5 vegetation that's growing, those types of things, the
6 fence line, looking at the fence line for animal burrows
7 and things such as that.
8 So during the five-year post-closure
9 observation there have been several cap repairs that have
10 been made, because in the early days of disposal, you
11 know, obviously some of the waste has decomposed and so
12 we've seen some effect on the caps, you know, from that.
13 So there have been some repairs. You know, we keep
14 looking for that. So that's kind of an ongoing process.
15 So I think that since the majority of the site is closed
16 and we're still there, I think that is kind of an
17 advantage to be able to continue to take a look at what's
18 going on. And we're learning a lot about the site, you
19 know, and how it's performing after closure.
20 MEMBER SKILLMAN: Thank you. Thank you.
21 MS. JENKINS: This slide is just a visual
22 illustration to show the status of the Barnwell site.
23 The site has been operating for 42 years and we expect
24 about 26 more years of operation. That number isn't set
25 in stone, but that's the number that is in the current

1 closure plan. And if you look at it, you know, we could
2 say that 61 percent of the operations time at the site
3 has passed with 39 percent remaining. If we look at it
4 in terms of disposal acreage, we see that 86 percent of
5 the site has been used with only 14 percent available.
6 However, thinking about it from another direction in
7 terms of volume capacity, only three percent of the
8 volume of the site remains, and that equates to about 1
9 million cubic feet.
10 So no matter how you look at it, the site
11 is closure to the end of its life than it is to the
12 beginning. And when you think about imposing new
13 requirements, restrictions and regulations for a site
14 like this, at first you may think that there's plenty of
15 time for those changes to be effective, when in fact we
16 have a very small physical area that we can impact by
17 making changes. And of course the volume of waste that
18 we're accepting is even smaller. So the effect of new
19 regulations based on, you know, inventory limits and, you
20 know, other site features would have a very limited
21 impact, I believe.
22 One of the things that I wanted to point out
23 is well is the applicability issues that we see. In 61.1
24 under Purpose and Scope, this is the very first paragraph
25 of Part 61. And I'll read it out loud, if you'll bear

1 with me for those on the phone.

2 It says that "the applicability of the

3 requirements in this part to commissioned licenses for

4 waste disposal facilities in effect on the effective date

5 of this rule will be determined on a case-by-case basis.

6 And they would be implemented through terms and

7 conditions of the license or by orders issued by the

8 Commission."

9 This isn't exactly a grandfather clause,

10 but it does allow for some case-by-case decision making

11 for existing licenses. However, if you look at the

12 language --

13 CHAIRMAN RYAN: Susan, just correct me if

14 I'm wrong --

15 MS. JENKINS: I'm sorry.

16 CHAIRMAN RYAN: -- but if you'd back up a

17 bit. In your case you have that authority that the

18 Commission's talked about as an Agreement State.

19 MS. JENKINS: We do. We have adopted this

20 into our regulations.

21 CHAIRMAN RYAN: Okay.

22 MS. JENKINS: And where it says

23 "Commission," we've changed it to "Department."

24 CHAIRMAN RYAN: All right. And I think

25 it's helpful to understand that the Commission would not

1 be taking direct action under this. That's authority
2 that's now been, you know, given to South Carolina.
3 MS. JENKINS: Yes.
4 CHAIRMAN RYAN: Correct?
5 MS. JENKINS: Yes.
6 CHAIRMAN RYAN: Yes? Okay. Thank you.
7 MS. JENKINS: And more details on that --
8 MEMBER ARMIJO: Susan, since I've never
9 been involved in this sort of work, this may be a dumb
10 question, but does the Commission have oversight on your
11 decisions? Let's say you make a case-by-case decision
12 and someone in headquarters at NRC says, boy, that's the
13 wrong thing to do. How is that handled?
14 MS. JENKINS: That would be done through an
15 IMPEP review.
16 MEMBER ARMIJO: What?
17 MS. JENKINS: Through an IMPEP review.
18 Every four to five years -- well four years is the
19 standard, the NRC comes and does an audit of each
20 Agreement State Program and they would look at all of
21 these types of decisions. So if we were to make a
22 decision, you know, on whether or not to apply certain
23 parts of the regulations to our facility, we would have
24 to of course be able to explain that to the NRC to their
25 satisfaction, I believe.

1 MEMBER ARMIJO: And they retain some sort
2 of override authority or to overrule --
3 CHAIRMAN RYAN: Through the Agreement
4 State Program, yes.
5 MEMBER ARMIJO: -- or reverse your
6 decision?
7 MS. JENKINS: I suppose they could. I
8 think that they do have that authority, yes.
9 MEMBER ARMIJO: Okay.
10 MS. JENKINS: I think that they could deem
11 that our program was maybe not adequate based on those
12 decisions.
13 MEMBER ARMIJO: Okay.
14 CHAIRMAN RYAN: And I guess just to finish
15 that thought, my recollection is that that has not
16 happened since the inception of the program to date.
17 MS. JENKINS: That's correct.
18 MEMBER ARMIJO: Yes, I would expect there
19 would be communications anyway before you took a
20 position, so --
21 MS. JENKINS: Yes.
22 MEMBER ARMIJO: -- you'd know whether you
23 were --
24 MS. JENKINS: That's correct.
25 MEMBER ARMIJO: But I just wanted to know

1 if you understood it that way, that there was an override
2 authority from the NRC.
3 MS. JENKINS: That's the way I understand
4 it, yes.
5 MEMBER ARMIJO: Okay. Is there a way we
6 can --
7 CHAIRMAN RYAN: If you don't have your
8 phone on mute and you're on the bridge line, please put
9 your phone on mute because somebody's putting a horrible
10 hum in the whole system here.
11 MEMBER ARMIJO: Thank you. Okay.
12 MR. LEWIS: Mike, we can barely hear the
13 actual Committee talk on the phone.
14 CHAIRMAN RYAN: Okay. Well, we'll try and
15 speak up. We have microphones at every spot on the
16 table, so --
17 MEMBER ARMIJO: Susan, you can move the
18 microphone closer to you, if you'd like.
19 MR. WIDMAYER: No, they can't hear you.
20 MEMBER STETKAR: No. No, no, no.
21 MEMBER ARMIJO: They can't hear us?
22 MEMBER STETKAR: It's because they can only
23 pick up these two microphones and the central one, their
24 mic. So those of you in the back of the room need to yell
25 a little louder.

1 CHAIRMAN RYAN: Well, we'll do our best to
2 raise our volume.
3 MEMBER ARMIJO: Okay.
4 MS. JENKINS: Okay. So what I wanted to
5 point out on this slide is if you look at the new language
6 that's proposed in 61.13, Technical Analyses, and 61.58,
7 Waste Acceptance, the language is very similar in very
8 both. And what it's saying here is that licensees that
9 have licenses for land disposal facilities that are in
10 effect on the effective date of this sub-part must submit
11 these analyses at the next license renewal or within five
12 years of the effective date, whichever comes first.
13 So this language appears to take away the
14 case-by-case decision making that was afforded in
15 paragraph 1 of Part 61. I don't know if that's
16 intentional, but I will say -- and as we've discussed in
17 -- this is the last slide -- is in South Carolina we have
18 put a license condition into the license for the Barnwell
19 disposal site that says that the licensee must comply
20 with all of Part 61. When we made that decision the
21 requirements of Part 61 it was reasonable to ask the site
22 to comply with those. And so we did and they have.
23 So, you know, thinking about it in terms of
24 -- again, I think that's where it's important that all
25 of the sites are different. All of the sites are kind

1 of at a different stage. So when you're thinking about
2 applying these to a site where most of the decisions have
3 been made, decisions about waste acceptance, decisions
4 about closure, there's really not a lot of value to having
5 these requirements. And we would hope that the NRC would
6 look at that and recognize that and somehow incorporate
7 that into the language in the regulation, because this
8 really is more applicable to either a new site or an
9 existing site that is a candidate for accepting large
10 quantities of long-lived radionuclides.
11 MEMBER ARMIJO: So just to make sure I
12 understand. So the new requirements of Part 61 would
13 really impose burdens on Barnwell, the people who operate
14 Barnwell as well as the state. But you seen no safety
15 benefit or just administrative burden, or what's the
16 bottom line?
17 MS. JENKINS: Well, I think that in terms
18 of -- if you think about what the options are -- and
19 actually, if you don't mind if I go to the next slide,
20 I may be able to answer some of that.
21 MEMBER ARMIJO: Sure. Go ahead.
22 MS. JENKINS: And then if not, I'll
23 expound. I've borrowed one of your comments. This is
24 a comment from a July 2013 letter to the Chairman of the
25 Commission, and it's the comment that states that

1 previously disposed waste should not be subject to
2 additional compliance evaluations as proposed by staff.
3 And we in South Carolina tend to agree with this, because
4 all of the disposals at the Barnwell site have been done
5 in accordance with the regulations that were in place at
6 the time of those disposals. And to require a
7 performance assessment that looks at past disposals and
8 current waste inventory is an unfair burden, I believe.
9 If a performance assessment was done and the
10 results suggested that some sort of remedial action, you
11 know, was advisable, that presented a problem because the
12 site is essentially closed. The majority of it is
13 essentially closed. Site stabilization is complete, as
14 I said. Installation of the caps is complete over 86
15 percent of the disposal area. And if you look at the
16 first two bullets, it's all been demonstrated and
17 approved as part of the Phase 1 closure process. And
18 that's been approved by the Department. So the ship has
19 kind of sailed on that.
20 CHAIRMAN RYAN: Susan, isn't it true;
21 correct me if I'm wrong, but you also have 40-plus years
22 of environmental and on-site monitoring data of the
23 surface system, the sub-service system, the nearby
24 watersheds and all of that on which to base your decision
25 making, if I'm correct.

1 MS. JENKINS: Yes.

2 CHAIRMAN RYAN: Is that right?

3 MS. JENKINS: Yes, we do.

4 CHAIRMAN RYAN: Could you talk a little bit

5 more about how that factors in? I mean to me the fact

6 that you have operational data and new hydrologic data

7 and, you know, weather data and all the rest, you've got

8 a pretty powerful database from which to make decisions

9 about what should be done, if anything, in the future.

10 Is that right?

11 MS. JENKINS: Right. We have close to 200

12 monitoring wells located on site and off site. Those are

13 monitored quarterly for alpha, beta, gamma and tritium,

14 because there's a tritium plume at the site. But we have

15 extensive data regarding the site. And at least the

16 groundwater plume at the site -- obviously tritium moves

17 like water, and so we have seen tritium, you know, in the

18 plume and down at the creek. But as far as, you know,

19 off-site mobilization, of course we haven't seen any of

20 the long-lived radionuclides. I mean they're going to

21 be larger and, you know, we don't expect those to move,

22 essentially.

23 Because right now our performance

24 assessment has looked mainly at exposures to individuals

25 at a nearby creek, which is about a half a mile away,

1 because that is what we see as the most likely pathway
2 for a member of the public to receive a dose from the site.
3 And so a lot of our focus is on the groundwater plume and
4 the movement of that plume towards the creek. And again,
5 we've seen tritium, very trace amounts of carbon-14.
6 And that's what we've seen so far. But it appears as
7 though the radionuclides based on, you know, the data
8 that we have, it looks as though it took about 10 years
9 for those radionuclides to travel down to the water table
10 and then another 10 years for them to travel the half mile
11 to the creek, to show up in the creek.
12 CHAIRMAN RYAN: Thank you.
13 MS. JENKINS: And one other I guess
14 potentially difficult part of this, it being an older
15 site, is estimating the source term. You know, the
16 performance assessment of course you would -- that would
17 be an important input parameter. And estimating the
18 source term is a little bit complex because of record
19 keeping, because the manifests that were used, you know,
20 didn't always break out the various radionuclides. It
21 would say, you know, source material, but not necessarily
22 break it out into the individual radionuclides of uranium
23 or thorium, or what have you.
24 So again, it's something that would have to
25 be estimated. So it's not a number. You know, if you're

1 looking at a site that's looking to accept waste in the
2 future, you can limit your inventory and know exactly
3 what you have and keep track of it, whereas we have an
4 older site. And while we've kept track of things as best
5 we could, I mean, you know, things have certainly changed
6 over the years.
7 And then of course the other issue is money.
8 You know, there are not funds that are set aside for this.
9 There is a long-term care fund, but that money is -- I
10 mean the plan for it is to provide maintenance for the
11 site, for the caps that are installed and for other site
12 features that may need maintenance. But certainly, you
13 know, large projects, you know, weren't anticipated.
14 CHAIRMAN RYAN: What's the value of the
15 long-term care fund now?
16 MS. JENKINS: I'm not sure actually of the
17 exact number.
18 CHAIRMAN RYAN: Maybe we can come back to
19 that a little later in the day.
20 MS. JENKINS: Yes, we can.
21 CHAIRMAN RYAN: We could find out that. I
22 think that would be helpful for the Committee to
23 understand what is the magnitude of, you know, the
24 resources ready to, you know, address any issue.
25 MS. JENKINS: Right.

1 CHAIRMAN RYAN: Thank you.

2 MS. JENKINS: And the Budget and Control
3 Board did have an independent review of the long-term
4 care fund, you know, to try to see. And it looked like
5 the main issue with that is it really just depended on
6 how much money that we -- what interest we were going to
7 get off the -- from the fund. That was the biggest
8 variable really in determining whether or not it would
9 be enough. And but I can get back to you with those
10 numbers.

11 CHAIRMAN RYAN: Okay.

12 MEMBER ARMIJO: Susan, I just want to make
13 sure. Now is it your understanding that the new rule
14 would require you to do let's say a comprehensive
15 analysis of the material that's already been disposed of
16 and prepare a report? Is that what you suspect?

17 MS. JENKINS: That is my understanding, you
18 know, in talking with some of the NRC staff. If that's
19 not the intention, I would like to --

20 MEMBER ARMIJO: Be sure. Yes.

21 MS. JENKINS: Yes.

22 MEMBER ARMIJO: Right. Well, we're not
23 sure either, so that's one of the reasons we're asking
24 these questions, because would there be any value from
25 a safety perspective of redoing those analyses perhaps

1 to find some deficiency that could be repaired or --

2 MS. JENKINS: Right. I mean I think, you

3 know, obviously there has been source material disposed

4 on site, but what the options would be -- obviously if

5 you perform an assessment; and I have some slides about

6 that, too, you're kind of looking forward to limiting

7 your inventory. That can't be done. Nobody likes the

8 idea of digging up waste. I mean that's something that

9 we all frown upon.

10 And then, you know, there's the option of

11 possibly adding to the caps or something like that, but

12 I don't know how we can -- especially if you're looking

13 out for, you know, thousands of years, I don't know how

14 that we can assure ourselves that adding soil on top of

15 a site is really going to be helpful.

16 CHAIRMAN RYAN: Well, the part of that,

17 too, I think that you have to consider is that look at

18 the inventory radionuclide by radionuclide and ask the

19 question what's left at 100 years, 300 years, 500 years?

20 And when you get out past say 300, pretty much all the

21 fission products are long gone. All the activation

22 products have decreased substantially and you're left

23 with a few long-lived radionuclides, some of which are

24 a very small total quantity and some of which are larger

25 quantities, like the uranium, for example.

1 MS. JENKINS: Right.

2 CHAIRMAN RYAN: So I think it's important
3 in any conversation like this to understand what is the
4 profile of the inventory radionuclide by radionuclide
5 and what's the remaining fraction of each one, some of
6 which will be trivially small and in essence zero. And
7 so that to me is kind of the foundation that is important
8 to risk assessment --

9 MS. JENKINS: Right.

10 CHAIRMAN RYAN: -- for any remaining
11 inventory at any period of time down the line. Is that
12 a reasonable summary from your point of view?

13 MS. JENKINS: Yes, I think it is.

14 CHAIRMAN RYAN: Okay.

15 MS. JENKINS: Obviously when you have waste
16 in place it's more challenging than when you're looking
17 to place waste.

18 CHAIRMAN RYAN: Yes. But by the same token
19 if you're inventory information is pretty good, you've
20 got kind of a leg up on making that assessment.

21 MS. JENKINS: Right.

22 CHAIRMAN RYAN: And then, you know, of
23 course then the puzzle is can you combine that with your
24 monitoring data to get, you know, some insight into
25 future behavior?

1 MS. JENKINS: And the next couple of slides
2 are just to show how the waste acceptance criteria and
3 operations have evolved at the site. And you can look
4 over those. In 1979 liquids were banned. Of course
5 that was early on in the process. All waste was required
6 to be containerized. Absorbents were banned in 1983.
7 At that time also the waste classification table was
8 included in the license. And in '85 cardboard boxes were
9 banned as packages. 1990 is when we added the license
10 condition to comply with all of Part 61. In 1991 we began
11 placing enhanced caps in all of the trenches to provide
12 some stability to the site and also it's in response to
13 the tritium plume, because that's the year that we found
14 tritium at the creek nearby, as I've mentioned before.
15 And in 1995 we were required that all classes of waste
16 be placed in vaults to promote stability of the entire
17 site.
18 MEMBER BROWN: Excuse me. Was that new
19 waste, or that didn't have anything to do with past --
20 MS. JENKINS: That's right. And this is
21 all new waste. And that really is the point of these two
22 slides is to say that, you know, the operations have
23 evolved. I mean we look at in real time what's happening
24 at the site and try to address those as we go along. And
25 what all of these have in common is that they apply to

1 waste disposed on that date and afterwards. So, yes, we
2 didn't go back to look at waste that was disposed in the
3 past and put into vaults, obviously because --
4 MEMBER BROWN: You have to dig it up.
5 MS. JENKINS: That's right.
6 CHAIRMAN RYAN: Susan, correct me if I'm
7 wrong, but the multilayered capping system does apply to
8 all waste, is that correct?
9 MS. JENKINS: Yes, it does.
10 CHAIRMAN RYAN: So that's the one exception
11 to your point, Charlie.
12 MEMBER BROWN: Okay. Because I was going
13 to ask about what an enhanced cap is.
14 CHAIRMAN RYAN: Stopping of the
15 infiltration applies to all waste, past, present and
16 future. That's how that will work as I understand it.
17 MS. JENKINS: Right.
18 CHAIRMAN RYAN: Yes. Okay.
19 MS. JENKINS: Yes, so when I said that 86
20 percent of the site was capped, all of the disposal areas
21 that were used prior to --
22 MEMBER BROWN: In the past.
23 MS. JENKINS: -- in the past have all been
24 capped. And that started in 1991.
25 MEMBER BROWN: That's an enhanced cap?

1 What is that? I'm not --

2 MS. JENKINS: Okay.

3 MEMBER BROWN: -- an expert on any of this,

4 so I'm asking --

5 MS. JENKINS: Right.

6 MEMBER BROWN: -- a dumb question maybe.

7 MS. JENKINS: No, it's not. The enhanced

8 cap is -- the purpose of it is to prevent infiltration

9 of rain water. That's the main purpose of it in this

10 case.

11 MEMBER BROWN: More stuff on top of what you

12 already had there?

13 MS. JENKINS: Yes. There is like a

14 one-foot sand drain layer and you have like a -- there's

15 an extra three to five feet of soil. There's a bentonite

16 mat.

17 MEMBER BROWN: Okay.

18 MS. JENKINS: There's a polyethylene

19 layer. So it's just a multilayered cap that's

20 engineered to -- so when rainwater falls --

21 MEMBER BROWN: I've got it. Okay. That's

22 good. I understand.

23 MS. JENKINS: Right. And it --

24 MEMBER BROWN: You can't do much about the

25 groundwater that's already under -- but you can do the

1 stuff that --

2 MS. JENKINS: That's right.

3 MEMBER BROWN: You're talking about the

4 stuff that -- the rainfall.

5 MS. JENKINS: It takes away the driver.

6 MEMBER BROWN: Yes. Okay. Thank you.

7 MS. JENKINS: Yes.

8 MEMBER POWERS: Can you give us a feeling

9 for how much of the available volume of the site was

10 filled at the times these various changes had occurred?

11 MS. JENKINS: That's a good question. I

12 don't have an answer.

13 (Laughter.)

14 MEMBER POWERS: I only ask good questions.

15 (Laughter.)

16 MS. JENKINS: You ask very good questions.

17 MR. WIDMAYER: There was more in '91 than

18 there was in --

19 (Laughter.)

20 CHAIRMAN RYAN: Yes, we got that.

21 MEMBER POWERS: I suspected that, but I'm

22 gratified to have --

23 MS. JENKINS: Well, I will say that since

24 -- even in the time leading up to 2008 when compact only

25 operations began, the volumes accepted at a site were

1 ramped down over like a 10-year period or so. So
2 certainly the vast majority of the volume almost disposed
3 in the earlier year. So I would say it would be heavily
4 weighted towards the earlier years of disposal. You
5 know, and the fact is over time waste generators have
6 become very good at reducing waste and reducing volumes.
7 MEMBER POWERS: Yes.
8 MS. JENKINS: And so, you know, that plays
9 into it as well. But I can attempt to get that
10 information for you afterwards. I'd be happy to do that.
11 CHAIRMAN RYAN: Well again, I think it's
12 important to point out that all the waste disposed from
13 day one until now still has the benefit of a very
14 important isolation feature, which is this multilayered
15 cap that drains water off to the sides. So that's one
16 feature that I think applies here.
17 MEMBER POWERS: Well, and it also all
18 benefits from radioactive decay.
19 CHAIRMAN RYAN: And from radioactive decay
20 of course would apply to the inventory, which is
21 substantial.
22 MEMBER POWERS: And I mean I think you can't
23 neglect those. On the other hand, we have to concede
24 that some substantial fraction of the volume is not what
25 we would like now.

1 CHAIRMAN RYAN: Well it would not be
2 acceptable now from what I think Susan has said. So, you
3 know, that kind of early waste disposal -- again, my
4 recollection is that in some of those earlier wastes
5 because disposal costs were relatively cheap, there was
6 no effort, much, to concentrate it or to compact it or
7 to make the amount of material in one container as tight
8 as possible. So the good news is I think that the
9 fraction of the inventory that's in that older category
10 is small compared to the total of the inventory. That's
11 just my, you know, kind of a qualitative thought about
12 it.
13 MS. JENKINS: Right.
14 MEMBER POWERS: I have to think about that,
15 because its concentration is low, but as it escapes the
16 containment do you have in the hydrolytic processes a
17 reconcentration mechanism there? You know, some things
18 bind naturally to the soil. Some things remain in
19 solution. And so you get a reconcentration there.
20 CHAIRMAN RYAN: I would say the rates of
21 release from, you know, disposable terra are relative.
22 My own personal view is --
23 MEMBER POWERS: Well, you have -- because
24 you're capped it.
25 CHAIRMAN RYAN: Yes.

1 MEMBER POWERS: And so you get less
2 infiltration.
3 CHAIRMAN RYAN: And you get less
4 infiltration. The contact time is probably not all that
5 long and the fraction of release is probably fairly
6 steady based on the fraction of the inventory. So if
7 you've got lower concentrations in the waste, you
8 probably have a little lower concentration in
9 any --
10 MEMBER POWERS: That may be true. I simply
11 don't know because I've not looked at the performance
12 assessment on this --
13 MS. JENKINS: Right.
14 MEMBER POWERS: -- in any kind of chemical
15 detail. And I'm willing to bet that the ground in South
16 Carolina is a good deal wetter than it is in New Mexico.
17 CHAIRMAN RYAN: I would say that's a good
18 assumption, Dr. Powers.
19 (Laughter.)
20 MS. JENKINS: But I will say that the trench
21 standpipes that we have that are used to monitor liquids
22 in the trenches are dry and have been for quite some time.
23 CHAIRMAN RYAN: Yes, and back to the cap
24 probably doing the lion's share of that work.
25 MS. JENKINS: Right.

1 CHAIRMAN RYAN: Yes.

2 MS. JENKINS: And we believe that the
3 reason that the plume -- obviously, you know, you
4 continue to have that source term. And we believe that
5 the groundwater is essentially rising up at times, you
6 know, capturing some of that and then carrying it on.
7 But we think we've eliminated the driver from the top.

8 And I'll just go over this quickly. In 61.7
9 the Concept section, just looking at the language here,
10 particularly in 61.7.c.5 where it says that the
11 performance period analyses are used to evaluate the
12 suitability of long-lived waste for disposal on a
13 case-by-case basis, and 61.7.e that says that you may
14 want to establish a maximum disposal site inventory,
15 again, it's just back to this whole idea that the concept
16 section appears to have language that where we're looking
17 forward to future disposals, because as we all know, the
18 reason that we are looking at these proposed provisions
19 is to find a place or a way to dispose of some known waste
20 that's out there. But then if you look back at the
21 language that I pointed out in 61.13 and 61.58, it's
22 saying that existing licenses must do this. So to me
23 there's a little bit of a contradiction there. I mean
24 just reading it, it just doesn't seem to mesh.

25 And as for the period of compliance, I think

1 we have some of the same concerns that others do regarding
2 the uncertainties associated with the time frame, not
3 only those of, you know, human behavior and natural
4 processes in the future, but also of any design features
5 that someone would attempt to employ and whether or not
6 those manmade elements, if that's what they are, could
7 stand the test of time and whether or not you could show
8 that you could be compliant for that long. And so it does
9 seem that a time frame on the order of 1,000 years is more
10 reasonable in that regard.
11 MEMBER POWERS: I mean what you're saying
12 is it's easier to predict 1,000 years than 10,000 years.
13 MS. JENKINS: Right, because I mean
14 obviously the further you go out, the more choices there
15 are as far as what's going to happen.
16 MEMBER POWERS: My ability to predict 1,000
17 years and 10,000 years is identical. I can do neither.
18 MS. JENKINS: Well, I mean I just -- not
19 that it's a great analogy, but just thinking about, you
20 know, a cannonball coming out of a cannon, I mean
21 obviously the closer you are to the original action, the
22 less options there are.
23 CHAIRMAN RYAN: Right. If you're right in
24 front of it, you know where it's going to land.
25 (Laughter.)

1 MS. JENKINS: That's right. So I mean
2 1,000 years I think has some difficulties as well, but
3 I think it's a little more palatable than 10,000.
4 MEMBER ARMIJO: Well, 10,000 years, you
5 know, we've commented on that in our letter, and that's
6 of really no value. It's so hypothetical and there are
7 so many uncertainties and there's no way in the world that
8 we can assure that we'll even exist as a nation, much less
9 as regulators. And so, you know, the idea is let's keep
10 it safe for a reasonable time period that we have some
11 chance of providing confidence.
12 MEMBER POWERS: Well, I mean shouldn't we
13 make a distinction? We have here human behavior and
14 natural processes. It seems the first is problematical.
15 The second one looks more tractable to me.
16 CHAIRMAN RYAN: Yes, sure.
17 MEMBER POWERS: Certainly for 1,000 I can
18 imagine, and I think we have proof. I hearken back to
19 when we looked at Vogtle. There was some pretty
20 persuasive evidence that the land in the general region
21 of Vogtle had not changed for a substantial period of
22 time. And so natural processes, certainly we can think
23 about in either of these time frames. It's the human
24 behavior that's implausible here because we don't have
25 good models for human behavior over that time scale.

1 Over that time scale this particular region has gone
2 through a very substantial change in human behavior and
3 there's no reason to think that rate of change will
4 continue, but it's imponderable on the human behavior.
5 The natural processes maybe we could handle. I mean it's
6 an analysis I'd be willing to undertake, whereas the
7 human behavior part I'd just throw up my hands and walk
8 away.
9 CHAIRMAN RYAN: Well, the other part, too,
10 in 1,000 years is if you look at the radionuclides that
11 have gone through 10 half lives, that's a convenient
12 rule. It's 10 times the half-life and it's pretty much
13 done. And it's mostly the inventory. There's a little
14 chlorine-36, uranium, a few little odds and ends here and
15 there, but that's it. So I think the ability to get your
16 hands around it at that 1,000 period or something close
17 to that, I agree with your point about 10,000.
18 MEMBER POWERS: Well, I mean you're exactly
19 right that you have to look at what your source term is
20 going to look like at that time and if your source term
21 -- I mean I am used to treating natural uranium as a
22 chemical hazard and not as a radiological hazard, so once
23 you get down to that kind of level, it's difficult. I
24 mean I live normally on a hot huge pile of natural
25 uranium, so I --

1 (Laughter.)

2 MEMBER ARMIJO: Hasn't done you any harm.

3 MEMBER POWERS: Well, I don't know whether

4 it's done me any harm or not, but --

5 (Laughter.)

6 CHAIRMAN RYAN: Okay.

7 MEMBER POWERS: -- not enough for me to

8 move.

9 CHAIRMAN RYAN: We've got a lot of ground

10 to cover and --

11 MS. JENKINS: Yes, and I'm almost --

12 CHAIRMAN RYAN: -- Susan's got her last

13 slide coming up.

14 MS. JENKINS: Yes, I am, and I'll try to

15 hurry this along.

16 Just in terms of the inadvertent intruder

17 analyses, I just wanted to point out again in terms of

18 the perspective of South Carolina and the site that we

19 have there all classes of waste have been disposed in

20 vaults since 1995. Actually it's a regulatory

21 requirement to use engineer barriers for all classes of

22 waste, and it's additionally in the license. I mean of

23 course the vaults improve the ability of the site to meet

24 the performance objectives. They enhance the site

25 stability because they help support the caps, the

1 enhanced caps that we talked about. And of course they
2 also act as intruder barriers.
3 So again, it just goes back to the idea that
4 all of the sites are different. We're using intruder
5 barriers for all classes of waste, for all future
6 disposals, not a candidate for large quantities of
7 depleted uranium. It would be cost-prohibitive in any
8 way you look at it because you have to containerize it
9 in all these vaults and it would use up a lot of volume
10 that we were hoping to save for Subcommittee generators
11 and the generators of Connecticut and New Jersey as well.
12 And I think I just had a summary slide and
13 I don't think I need to verbalize that, especially since
14 we're running short on time.
15 CHAIRMAN RYAN: I guess I'd offer a point
16 about the inadvertent intruder. At some point an
17 inadvertent intruder becomes an advert intruder.
18 MEMBER POWERS: As soon as he hits the first
19 barrier.
20 (Laughter.)
21 CHAIRMAN RYAN: So I wrestle with how does
22 an inadvertent intruder not ultimately at least at some
23 point in the excavation process recognize a hazard?
24 MS. JENKINS: Right. And the vaults do
25 have -- of course it's in English, but the vaults do have

1 a warning --

2 CHAIRMAN RYAN: In brass plaques.

3 MS. JENKINS: -- on the top.

4 MEMBER POWERS: The advert intruder may be

5 after that brass.

6 (Laughter.)

7 CHAIRMAN RYAN: Could be.

8 MS. JENKINS: Well, actually it's stamped.

9 There's nothing to take but the lid. You could take the

10 whole lid.

11 CHAIRMAN RYAN: Susan, thank you very much

12 for an informative update on Barnwell. We really

13 appreciate your coming today and we appreciate your

14 presentation.

15 MEMBER POWERS: Yes, that was an excellent

16 presentation.

17 MEMBER ARMIJO: I'd like to just also thank

18 you, but you know, the impression I get from your

19 presentation is that there's a lot of uncertainty in what

20 the rules would require from your standpoint. So

21 they're either ambiguous or not clear. In addition

22 there are things that you think, you believe should not

23 even be in the rule or some clear statement that says,

24 you know, pre-sites that have been in operation, waste

25 that's already been disposed of is not subject to these

1 rules, or something that's clear and doesn't leave you
2 hanging for the decision of some future regulator. Then
3 you'll make a subjective decision and say, well, you
4 ought to do that. So, you know, if that's really a good
5 summary of your concern, let me know. If it isn't --
6 MS. JENKINS: It is.
7 MEMBER ARMIJO: Okay.
8 MEMBER POWERS: Don't tell us, because --
9 (Laughter.)
10 MEMBER POWERS: No, don't tell me because
11 I don't want to --
12 CHAIRMAN RYAN: I think all the members
13 understand that, you know, it's not just what's in a
14 regulation. A regulation has to be handed from the NRC
15 to the Agreement State and the Agreement State has to do
16 something with the licensee. The licensee then has to
17 develop lots of infrastructure to implement all of those
18 requirements and you have to agree with how they're
19 implemented. So there's a lot of language and guidance
20 and implementation detail that can have some differences
21 if you looked at one site versus another, because some
22 things are more important at one site versus another.
23 That doesn't mean they're wrong or right in either one.
24 It means they're implemented for the circumstances that
25 are there.

1 So I think there is some positive aspect to
2 the fact that the regulations are a little bit generic
3 but can be implemented on a site-by-site basis. So we
4 should never lose the sight that that kind of
5 implementation scheme has a great advantage when you're
6 looking at dry air and eastern moisture, you know, all
7 the other things. You can focus on what's important
8 versus what's not. Would you agree with that?
9 MS. JENKINS: Yes.
10 CHAIRMAN RYAN: Yes. Thank you. And,
11 Rusty, you're nodding yes.
12 MR. LUNDBERG: I would agree with that,
13 too. Very much so.
14 CHAIRMAN RYAN: I appreciate that. And
15 I'm reacting kind of to both Dana's comment and to Sam's
16 comment that I think that's a very important part of what
17 has to get done no matter what the basic one paragraph
18 in the regulations say. You have to implement it. And
19 there's a lot more formality in writing and in direction
20 and, you know, agreements between regulator and licensee
21 on how that gets done.
22 MEMBER ARMIJO: Yes, what I'm concerned
23 about is ambiguity that could lead to pretty much
24 subjective decisions that just didn't make sense.
25 CHAIRMAN RYAN: And what I'm saying is, you

1 know --

2 MEMBER ARMIJO: And so you want

3 flexibility. You've got to have flexibility in this

4 activity, but there are some things that should be

5 clearly stated and some things that should give you

6 flexibility. And there is no clear statement as far as

7 I can tell about the applicability of the new Part 61

8 rules to a facility such as Barnwell. There's no clear

9 statement. Either it's applicable and you'll have to do

10 all of these things that we're proposing or it's not.

11 And I suspect that you would prefer that it's not, but

12 I won't put words in your mouth.

13 MS. JENKINS: Okay.

14 MEMBER POWERS: I mean it seems to me the

15 conundrum here -- I mean there was an attempt it seems

16 to me to impart flexibility in the language of the rule

17 when it says case-by-case basis. And you could imagine

18 a case that says, here, I've got a disposal facility

19 that's some sort of a time bomb and it's just waiting to

20 release huge clouds of plumes of noxious materials and

21 I want to remediate that. In other places, okay, it

22 wasn't done to today's standards, but when I take into

23 account both the geological or hydrological properties

24 and the decay rate, it's not. And somehow you have to

25 make a distinction between those two. And it seems to

1 me that that's why the language "case-by-case" might be
2 in there.
3 The problem identified by our speaker was
4 that in subsequent paragraphs it's not entirely clear
5 what is case by case and what is mandatory, and that needs
6 to be clarified. Inherently I think we've got a problem
7 that there's not a good metric on what case by case -- how
8 you distinguish between a case I need to remediate and
9 a case that I don't need to remediate and we end up doing
10 very conservative kinds of analyses because we don't have
11 good standards there.
12 CHAIRMAN RYAN: Well, of course then the
13 focus then needs to turn on the performance assessment
14 of predicted future behavior in the system, however it's
15 cast, you know, whatever features, events and processes
16 that define that system. And it's only through that
17 rigor that you can get to I think a better answer.
18 MEMBER POWERS: Yes, and that in itself is
19 problematical because the rigor that we demand in
20 performance assessments today is so much greater than
21 what was done in the past. But redoing things is itself
22 a challenge.
23 CHAIRMAN RYAN: Right. Thank you.
24 With that, Susan, anything else, or are we
25 good?

1 MS. JENKINS: No. Thank you.

2 CHAIRMAN RYAN: Okay. Next up is Rusty

3 Lundberg from the Utah Division of Radiological Control.

4 Rusty, welcome. Thanks for being with us

5 today.

6 MR. LUNDBERG: Thank you, Dr. Ryan.

7 Again, my name is Rusty Lundberg. I'm the director of

8 the Division of Radiation Control within the Department

9 of Environmental Quality in the State of Utah.

10 And again, like Susan, I want to express my

11 appreciation to Subcommittee members for this

12 opportunity to share this time with my colleagues from

13 state programs I think to provide this perspective. And

14 I think the value that you have here on balance is is that

15 while Susan indicated that they're long-term waste

16 management and how they've been through the years

17 adjusting those waste management procedures and

18 techniques I think is reflective of what we're trying to

19 look at in looking forward looking as well, because we

20 are facing the decision regarding long-term disposal of

21 large quantities of depleted uranium. So we're kind of

22 on the other side of this. And I hope that in part you'll

23 see some of that perspective in what I'm bringing to the

24 table today.

25 I would also like to just quickly note your

1 discussion about regulatory oversight and the value that
2 should be played into both balancing flexibility as well
3 as some kind of predictability or consistency in how you
4 not only see the regulations but implement them I think
5 is something that we take seriously, too. It's
6 something that's integrated throughout our entire
7 department, not just our Radiation Control Program. So
8 we also look at this as the importance of trying to look
9 at predictability for those that we regulate, as well as
10 the public, so that they understand the framework and the
11 regulatory boundaries that we have that allow that
12 flexibility to look at site-specific in Utah or
13 state-specific kinds of concerns as well.
14 So that's why I just wanted to start out
15 today with kind of that perspective, that over the long
16 term we have been looking at again the value of low-level
17 radioactive waste from the standpoint of how we classify
18 it, looking at it both from the standpoint of long-lived
19 and short-lived radionuclides.
20 So with that perspective, the bottom bullet
21 for me is what's more important and what's on the table
22 for our discussion today is that the game has changed
23 somewhat from that 30-year-plus perspective and view of
24 what was being envisioned as the potential waste streams
25 going for long-term disposal for low-level radioactive

1 waste. So again, I value that the Subcommittee has an
2 interest in this today and allowing for a real broad
3 perspective of all stakeholders today for this.
4
5 So next slide, please. So with that I think
6 one thing that will help you today from our standpoint
7 is to put into perspective where we are as a state and
8 our particular rules. We think that we have been moving
9 forward actually somewhat in advance of the NRC just
10 because of what's facing us and the decisions that are
11 before us. So because of that we have our Radiation
12 Control Board, which is a board appointed by the governor
13 of different perspectives and interests, and they are a
14 rulemaking authority. As an agency we don't have
15 rulemaking authority. We rely upon the Radiation
16 Control Board to serve as that function for us.
17 So in terms of the rationale, the basis,
18 whether it be adopting NRC requirements and regulations
19 or whether it be expanding on those to serve our interests
20 within the state, is all vested in our Radiation Control
21 Board. I bring that out just so that you have that
22 perspective as an agency here.
23 So the first thing I want to talk about is
24 our performance assessment rules. We see this from the
25 standpoint of two perspectives. The first one is about

1 what we've done for addressing specifically large
2 quantities of depleted uranium disposal in a shall land
3 situation.
4 The next bullet is a newer rule that came
5 into play over a year or so ago, and that is if you're
6 not looking at depleted uranium but you also have a waste
7 stream that again wasn't contemplated about 30 years ago
8 when the initial view of the low-level radioactive waste
9 construct was set up, then what happens, when do we want
10 to evaluate the site again under performance
11 assessments? So the Radiation Control Board undertook
12 that initiative, identified four kind of triggers, as we
13 call them, that would again allow us the opportunity to
14 conduct a performance assessment.
15 MEMBER BLEY: And these you say are not for
16 DU?
17 MR. LUNDBERG: That's correct. These are
18 would be outside of that because we have a rule
19 specifically addressing depleted uranium. Thank you.
20 Okay. Next slide, please. So with that in
21 mind I want to just focus now on the performance
22 assessment rule that we have in place that is directed
23 to depleted uranium to give you that perspective. We see
24 this as similar in nature to some of the construct and
25 the framework that the NRC has developed as they've gone

1 through and looked at their proposed changes to Part 61.
2 We also have a two-tiered analysis as we see
3 this. The first one is based upon doing a quantitative
4 analysis to at least 10,000 years. And we do that
5 primarily through computer simulation models to be able
6 to predict some of those variables that we've already
7 talked about, some that are a little more with certainty
8 and some with greater uncertainty.
9 MEMBER RAY: Can you quantify the
10 uncertainty?
11 MR. LUNDBERG: In some regard you can.
12 When you get into some of the societal and human behavior
13 areas you have to make certain assumptions, but some of
14 those assumptions are fairly certain as you look at that.
15 As you look at the time horizon that we've already been
16 through on this planet, you know, a 10,000 year you can
17 kind of make some judgments from past history in some
18 regard. Moving forward it's a little more defalcate,
19 but if you rely somewhat on your past, you can at least
20 look at some certainty as you move forward. Obviously
21 technological changes have a great impact on this as well
22 --
23 MEMBER ARMIJO: Yes, Rusty --
24 MR. LUNDBERG: -- because of the
25 acceleration as we've seen in technology.

1 MEMBER ARMIJO: -- the greater than 10,000,
2 exactly when do you stop? I mean you could go to the
3 half-life of --
4 MR. LUNDBERG: Of uranium?
5 (Laughter.)
6 MEMBER ARMIJO: That's a big number.
7 MR. LUNDBERG: That is a very large number.
8 And the board chose as they promulgated and finalized
9 this rule is to not set up a boundary for that. It does
10 make it a little more difficult to -- and so that's why
11 I'm going to talk about next here in the next slide is
12 that that's more picked up in more of the qualitative view
13 rather than a quantitative view. But there are some
14 aspects in the simulation predictions that help with
15 that.
16 MEMBER ARMIJO: Yes. Well, you know, the
17 question I have is again to Mr. Ray's question about
18 uncertainty. I'm a materials guy, so I know that you
19 haven't got a chance of doing anything predictable for
20 10,000 years on materials unless you're talking about
21 gold or copper or something like that, or ceramics. So
22 the question is is that model subject to challenge? Has
23 it been challenged to say, boy, you guys are just -- I
24 mean you can't prove this or you can't prove that? You
25 know, ultimately some of these things wind up in court

1 and I can't see how you can defend a model that goes out
2 to those times and presumably is used to protect health
3 and safety of the public. And so, that's a concern I have
4 whether it's 1,000 years or 10,000 years, but much more
5 for 10,000 years.
6 MR. LUNDBERG: Certainly I think you raise
7 a very valid point, and that is, particularly from the
8 public's perspective of this, as you see uncertainty and
9 as that grows and you're less predictive of and certain
10 in your predictions as to what can happen, the public
11 generally views that as an opportunity to be more
12 conservative about what you're looking at. And so I
13 think that's the value of these predictions, at least
14 relying upon computer models, is that it's intended to
15 inform your decision and not have the decision just
16 printed out on the sheet on your computer runs.
17 So I think you have a valid point that it
18 does make it more difficult. It makes the decision
19 making much more complex and to weigh this in, as well
20 as what I'll bring up on a future slide as well. So think
21 we see this as somewhat of an analog to the proposal as
22 far as a compliance period for us and our rule in the State
23 of Utah. And also the fact that it can apply to certain
24 compliance criteria as well throughout this period.
25 You are bringing up about certainty and

1 quantitative certainty. I think we can with some of the
2 standards and rule requirements that are in play here
3 that you can do that.
4 Next slide, please. So the second tier is
5 more of a qualitative because you factor in more
6 uncertainty. And as you do that, even though you still
7 have the computer model predictions to look at, you
8 certainly look it more as, as I just stated, an
9 opportunity to inform a decision rather than make that
10 decision. So that's what weighs on us as we look at the
11 long-term performance of a site.
12 As we look at the Clive Facility in Utah
13 that's operated by EnergySolutions, this comes into play
14 as we evaluate some of the long-term engineering designs,
15 the manmade aspects and more of the natural site
16 characteristics that are in play, not only in the
17 short-term horizon that we can have some certainty or at
18 least some confidence in, but as you weigh that look to
19 a longer time horizon what happens including some of the
20 climate aspects. So that's a real concern as we look at
21 this as well.
22 Next slide, please. Moving onto the
23 intruder aspect of this, we see that this is a positive
24 move forward as we look at the proposed rule because it
25 allows for analysis across the spectrum of all classes

of waste. In my initial introductory I was going to just lay out a little bit of a background on Clive itself so you have the perspective of that, and I'll just infuse that right now to help with this slide. And that is is that the Clive Facility is not the official compact site for the Northwest Compact. And so that's a unique nature of the facility. Also unique to the site is that there's a state law that prohibits the disposal of greater than Class A waste, received and disposed of at the site. So those two -- and there are other unique characteristics about it as well, but those two are primary as far as some of our view of this as a regulatory agency.

So as we look at the ability for an intruder analysis to not just be exclusive to say a Class C waste situation and being broader in its perspective, we see that that's a positive step.

The other part to this is that it does factor again; and I think this is a thread that will be integrated throughout the discussions today, is how do you really address the uncertainties even though you see value in looking at intruder analyses? How do you account for that?

Now for us, one of the major concerns here, or at least points of focus for us, is about the significant in-growth that occurs for depleted uranium.

1 To me that is one of the more salient points in the
2 discussion. And I'll move that even to more of a
3 technical evaluation even. I think that covers both the
4 aspects of long-term concerns and public perceptions
5 when you have to account for significant in-growth,
6 progeny in-growth, and as you look at the technical
7 aspects of that.
8 Dr. Ryan?
9 CHAIRMAN RYAN: Rusty, you in Utah have
10 uranium deposits.
11 MR. LUNDBERG: Correct.
12 CHAIRMAN RYAN: Naturally occurring
13 uranium deposits.
14 MR. LUNDBERG: Correct, we do.
15 CHAIRMAN RYAN: Have you taken any insights
16 from fully equilibrated uranium deposits and kind of
17 said, well, what's different about fully equilibrated
18 uranium deposits versus the disposal that we want to make
19 of depleted uranium?
20 MR. LUNDBERG: I wouldn't say directly at
21 this point, but those are parts of the analyses that may
22 have some bearing and interest as we look at that and
23 broaden our view and our performance assessment.
24 Because I think you're right. Right now we're primarily
25 focused on the changes that would occur to get back to

1 equilibrium, so to speak, as you have the change --
2 CHAIRMAN RYAN: And you've got that
3 schoolhouse already and other deposits around the state.
4 Why not go to school there?
5 (Laughter.)
6 MR. LUNDBERG: It does make sense to do
7 that. You're right.
8 CHAIRMAN RYAN: Okay. Thanks.
9 MR. LUNDBERG: Thank you. So again in
10 terms of intruder objectives and the analyses associated
11 with that, we do see some steps moving forward in the
12 proposed Part 61 changes that are positive in nature.
13 Next slide, please. So one of the benefits
14 here is that we're moving away from the general view of
15 a humid, and in the next slide, versus the arid aspect
16 of a generic view of what's at play here. And I think
17 that we always have seen the site-specific nature and
18 evaluations as being a real step moving forward with this
19 whole effort.
20 Next slide. Another aspect, and again this
21 is unique because of our state law prohibiting disposal
22 of greater than Class A and --
23 (Voice coming over bridge line.)
24 CHAIRMAN RYAN: Could you guys put your
25 phones on mute who are in the bridge line, please? Thank

1 you.

2 MR. LUNDBERG: Anyways, I just wanted to
3 draw the association of our perspective on this somewhat
4 as it relates to the waste acceptance criteria and how
5 that's moving into the proposal for this as well. It is
6 important from our perspective and we don't see that this
7 is necessarily changing by the proposed changes, but we
8 want to offer the opportunity to preserve the value of
9 waste classification, because again for us that is what
10 we depend on as far as what's allowed for disposal at the
11 Clive Facility.

12 So the next slide, I just want to further
13 elaborate on that is that it is important for that
14 classification to preserve that kind of structure in its
15 concept, but also; and this was brought up earlier as far
16 as what are the added burdens, as you move towards waste
17 acceptance criteria, perhaps the basis to make decisions
18 regarding acceptability of disposal of low-level
19 radioactive waste, what you also do in turn is move the
20 burden or shift that burden verifying that that can
21 happen, whatever waste.

22 We see this just shifting a little bit of
23 the burden and responsibility of waste generators to our
24 agency as the oversight or regulatory agency of the
25 disposal facility. They're going to be less inclined to

1 be maybe attentive about what they're putting in their
2 packages if they're just basing it upon waste acceptance
3 criteria. In other words, they're going to leave it up
4 to the facilities to make sure that it meets their
5 criteria, whether it be Utah, whether it be Texas or some
6 other facility.
7 So by default we see somewhat of a shift in
8 burden and responsibility, not that that's necessarily
9 a negative for us, but we just want to note that we see
10 this as an opportunity for us to make sure that we fulfill
11 our responsibilities to validate, verify and to serve in
12 that regulatory capacity
13 that's --
14 CHAIRMAN RYAN: Can't you counter that
15 concern, which I appreciate., by things like split
16 sampling or, you know, on-site inspection or other, you
17 know, activities on your side to gain higher confidence
18 that what you're expecting is what you're getting?
19 MR. LUNDBERG: You're very right. And
20 we're trying to move more into that direction, and I think
21 that there is some value in seeing that. We are limited
22 obviously if we go out of state to conduct an on-site
23 inspection as to what we're there for in terms of our
24 jurisdictional role, but we recognize that. We've made
25 that statement of commitment to the NRC that we're not

1 going to try to move beyond that or usurp an Agreement
2 State or even the NRC in terms of their jurisdictional
3 role of a given facility or a generator site. But we do
4 see this as an opportunity. And what I'm saying here is
5 that we also have to evaluate what are the financial or
6 other resources that would be necessary to accommodate
7 that also? So we're kind of in the early stages of this
8 adjustment for us and we think that we're moving forward
9 in a positive direction to help address this.
10 CHAIRMAN RYAN: It sounds like you've got
11 all the variables at least well lined up.
12 MR. LUNDBERG: Yes, we do.
13 CHAIRMAN RYAN: Yes. Okay.
14 MR. LUNDBERG: We kind of know the
15 landscape and what we're facing.
16 CHAIRMAN RYAN: Yes. Great. Thank you.
17 MR. LUNDBERG: All right. And of course
18 the last part of this as far as waste acceptance criteria,
19 and we move towards that. That is the functioning or
20 driving factor here is that we still want to coordinate
21 with what we are limited in the State of Utah in terms
22 of Class A limits.
23 Next slide. The last part of this is I want
24 to just address compatibility. You had an interest in
25 this somewhat. We've always, and I think collectively

1 some of the other Agreement States have asked for
2 flexibility. I think it goes hand-in-hand and fully
3 integrates with the concept of site-specific analyses.
4 We also understand; and this goes to my earlier
5 statements about predictability and consistency, you
6 also want to be able to balance that. So how do you do
7 that if you're asking for flexibility? Can you preserve
8 and really provide some kind of level of predictability
9 and consistency?
10 We think you can, particularly as it relates
11 to just what you've seen between South Carolina and Utah.
12 There is no likelihood of long-term disposal of large
13 quantities of depleted uranium, where in Utah we have and
14 faced that. So I think that just with those kinds of
15 differences that that's where flexibility comes into
16 play. But where you might have the floor of consistency
17 come in is what kind of standards and criteria would help
18 you get there regardless of whether a state is
19 considering or not considering? So I think that that
20 plays to both.
21 CHAIRMAN RYAN: Rusty, you haven't
22 mentioned this yet, but have you taken any guidance or
23 insights from uranium mill tailing disposal, which has
24 been on the ground and covered by a thin layer and then
25 vegetated and that's it?

1 MR. LUNDBERG: Right. And we do have that
2 because we have a facility in Utah. In fact, we have the
3 only operational conventional mill in the United States
4 with the State of Utah. So we do have that direct
5 association and experience and expertise that we can draw
6 on as well. Again, what we see the difference here in
7 this discussion particularly is about the long-term
8 disposal of depleted uranium. We think that that's a
9 different need and different perspective. And I think
10 that you would agree with that. So we're not trying to
11 -- Susan brought out in her presentation, we're not
12 trying to tip everything over just at the expense of
13 depleted uranium. We think we're just wanting to add to
14 that and not be limited by the current construct that
15 we're under and allow that responsibility to account for
16 long-term concerns.
17 MEMBER ARMIJO: Well, you know, I've been
18 worried about that since we've started reviewing this
19 Part 61, that depleted uranium concerns seem to drive the
20 whole issue and would there be value in having just a
21 separate rule for the disposal of large quantities of
22 depleted uranium? You know, if you didn't have large
23 quantities of depleted uranium, you're not subject to the
24 rule. You don't have to document and write reports and
25 have inspections on your conventional waste. And I

1 don't know if the staff would even entertain such a
2 thought, but it seems that this issue of the very life
3 of depleted uranium is really distorting the language in
4 the rule. And I'd like your comments on that.
5 CHAIRMAN RYAN: And in addition, Sam, I
6 think it's important that the mill tailings has its own
7 regulation.
8 MR. LUNDBERG: It does.
9 CHAIRMAN RYAN: And it's completely
10 separate in just exactly the way you've described.
11 MEMBER ARMIJO: Somewhere. Maybe we ought
12 to put the depleted uranium under a mill tails regulation
13 as opposed to -- or some other rule that says, hey, look,
14 we're going to treat it differently, we're going to bury
15 it deep or whatever it is, but we're not going to confuse
16 the conventional low-level waste, if you can use the
17 term, Part 61, by stuffing in all of this stuff and really
18 distorting the whole regulation.
19 MR. LUNDBERG: And I think that's a very
20 valid point. I believe that that was one of the drivers
21 for our Radiation Control Board to move forward with
22 developing a separate rule that would trigger
23 performance assessments specific to depleted uranium.
24 And I think that that's what we've done in the State of
25 Utah is we have established that. Again, as you pointed

1 out, there are some aspects of that that still are largely
2 subjective. The qualitative versus the quantitative
3 kinds of periods. At what point do you cease one and
4 begin another? It's not a clear bright line by any
5 means.
6 So because of that lack of having some
7 certainty in terms of establishing when you start one and
8 end another I think does add to the complexities, but at
9 the same time underscores the unique nature of it. And
10 I believe that's why we've moved forward in the State of
11 Utah as we have.
12 MEMBER ARMIJO: You're contemplating or
13 are disposing of large quantities of DU right now?
14 MR. LUNDBERG: Correct.
15 MEMBER ARMIJO: Is it always in the form
16 let's say of an oxide, a uranium oxide or metal? Or
17 what's the form that you're --
18 MR. LUNDBERG: That's the primary form
19 right now. I would imagine as you look towards -- that's
20 the legacy stockpile, so as you look to other future
21 opportunities, it may expand beyond what we see now as
22 that legacy waste form and construct. So right now
23 that's our focus in terms of the performance assessment,
24 because that's at the doorstep, so to speak. The
25 to-be-generated or currently under the commercial

1 enrichment facility and maybe future facilities
2 certainly bears out future discussions if that changes.
3 MEMBER ARMIJO: You wouldn't be accepting
4 anything like UF6 or anything like that?
5 MR. LUNDBERG: I think we're relying upon
6 the conversion of that. A de-conversion, I should say
7 and then -- yes.
8 MEMBER ARMIJO: Yes. And do you have
9 requirements that are different? Let's say shallow
10 disposal is unacceptable. It's got to be deep disposal.
11 Or is there something that says, okay, in order to reduce
12 uncertainty I want to treat this material differently?
13 I'm going to bury it deeper or I'm going to contain it
14 differently. What does the State of Utah require?
15 MR. LUNDBERG: Well, one way we're looking
16 at that in part is is that we are bounded by some of the
17 natural characteristics or physical characteristics of
18 the site there at the Clive Facility. One of those is
19 the shallow groundwater. It's highly saline, so it's
20 non-potable, but even in light of its high salinity, we
21 are still looking at it as a source of groundwater that's
22 worth protection. And so we rely upon our groundwater
23 protection standards in part to address that. So
24 looking at the boundary of a shallow groundwater
25 condition, we are somewhat limited in terms of how deep

1 or how shallow, depending on your point of view as to what
2 we're bounded by.
3 But, yes, as you look at performance
4 assessment you can look to certain aspects of
5 requirements. If it's fully above grade or below grade,
6 what are results of that assessment?
7 MEMBER ARMIJO: Okay. Thank you.
8 MR. LUNDBERG: I would just -- there's one
9 other slide about compatibility is all, and that is the
10 fact that we are in progress of a performance assessment.
11 So if you look at some of the changes in Part 61, not only
12 is flexibility important is that we need to assure that
13 we're not going to have to do a restart as we go through
14 our performance assessment and complete that out.
15 CHAIRMAN RYAN: Great. Thank you, sir.
16 MR. LUNDBERG: I think at pretty much
17 summarizes everything that I have.
18 CHAIRMAN RYAN: Thank you, Rusty.
19 Appreciate that.
20 MEMBER ARMIJO: One last quick question.
21 If in the course of the rulemaking process the Commission
22 decides that a compliance period of 1,000 years is
23 adequate, would that give the State of Utah heartache?
24 MR. LUNDBERG: Well, I think the value
25 -- and this goes at the heart of compatibility. If it's

a compatibility like a Level C, we would have the flexibility to be able to maintain our 10,000-year time frame. If it's a B, then we'd lose that flexibility. So that's why from one perspective flexibility for compatibility purposes is very important for us so that we can maintain -- as we've discussed here, the longer term time horizon is so critical to the discussion on depleted uranium you really can't short-side that by simply staying with the 1,000-year period. I mean it's helpful, but it's certainly not going to be one that will gain public confidence if you limit yourself that way.

MEMBER ARMIJO: Okay. Thank you.

That's all I have, Mike.

CHAIRMAN RYAN: Okay. Great. Any other questions from members at this point?

(No audible response.)

CHAIRMAN RYAN: We have two participants on the phone. Brad Broussard from TCEQ in Texas. Brad, are you with us?

MR. BROUSSARD: Yes, I am. Good morning.

CHAIRMAN RYAN: Good morning. You have the floor.

MR. BROUSSARD: Okay. Thank you. Can everyone hear me okay?

CHAIRMAN RYAN: Just fine.

1 MR. BROUSSARD: Okay. Well again, I'm
2 Brad Broussard, a representative from the State of Texas
3 and I'm a technical specialist and health physicist for
4 the Radioactive Materials Division of the Texas
5 Commission on Environmental Quality. I'd like to thank
6 the Committee for allowing states to provide perspective
7 on the proposed revisions.
8 What I'll try to do is talk about a couple
9 of things, the time of compliance, performance period,
10 the 500-millirem intruder dose, compatibility and maybe
11 touch a little bit on waste acceptance if we have enough
12 time.
13 PARTICIPANT: Okay. First of all, what
14 was the appointment for?
15 CHAIRMAN RYAN: Hello?
16 MR. BROUSSARD: Pardon?
17 CHAIRMAN RYAN: That was not us talking.
18 There's somebody else on the phone lines has their
19 microphone open. Please close it at this time.
20 PARTICIPANT: Okay.
21 CHAIRMAN RYAN: Brad, go ahead.
22 PARTICIPANT: He said that --
23 CHAIRMAN RYAN: I'm sorry, your microphone
24 is still coming through.
25 PARTICIPANT: I'm sorry, Bruce. Excuse

me.

CHAIRMAN RYAN: Whoever is speaking other than Brad, your microphone is coming through.

MEMBER BLEY: It think you got it.

CHAIRMAN RYAN: Okay. Back to you, Brad.

PARTICIPANT: We just spoke with GE yesterday and --

CHAIRMAN RYAN: I'm sorry, we're going to have to stop talking.

MEMBER STETKAR: Who is speaking about GE? Whoever is speaking about GE, either stop speaking or turn your microphone off.

PARTICIPANT: So we're going to --

MEMBER BLEY: He's not listening to the phone.

MEMBER POWERS: He's turned off his receiver.

PARTICIPANT: I don't need to lose board time.

CHAIRMAN RYAN: Brad, let's try it. You're going to have to just raise your voice a bit to overpower the person that's challenged by the phone.

MR. BROUSSARD: Okay. To reiterate what I was saying, I'm going to try to go over time and compliance, performance period, the intruder dose,

1 compatibility.

2 MEMBER ARMIJO: Maybe we want to take a

3 10-minute break so we can --

4 CHAIRMAN RYAN: Yes, that's a great idea.

5 MEMBER ARMIJO: We've got to fix this

6 problem. We can't have a presentation.

7 MR. BROUSSARD: I'm saying the performance

8 that we have regarding --

9 MEMBER ARMIJO: Tell Brad.

10 MR. BROUSSARD: -- performance and --

11 CHAIRMAN RYAN: Brad?

12 MR. BROUSSARD: -- compliance period.

13 CHAIRMAN RYAN: Brad? Brad? Brad?

14 MR. BROUSSARD: The performance period

15 either needs --

16 CHAIRMAN RYAN: Hey, Brad?

17 MR. BROUSSARD: -- to be better defined --

18 CHAIRMAN RYAN: Brad? Brad, hold on.

19 MR. BROUSSARD: -- as far as --

20 MEMBER ARMIJO: He's not hearing us.

21 MR. BROUSSARD: -- because the way that

22 it's stated now is just --

23 CHAIRMAN RYAN: Brad?

24 MR. BROUSSARD: -- the time after

25 compliance period.

1 CHAIRMAN RYAN: Excuse me, Brad?

2 MR. BROUSSARD: Yes?

3 CHAIRMAN RYAN: We're going to hold your

4 presentation until we can get the other party to mute

5 their phone or stop talking or something.

6 MR. BROUSSARD: Okay.

7 CHAIRMAN RYAN: So what we'll do is we will

8 probably disconnect you and ask you to call back in at

9 say 10:00. All right?

10 MR. BROUSSARD: Okay.

11 CHAIRMAN RYAN: I thank you for your

12 patience. So sorry for the trouble. All right.

13 MEMBER ARMIJO: Somehow we either got to

14 get that guy off the phone or hang him up or do something

15 so that he stops talking.

16 (Whereupon, at 9:51 a.m. off the record

17 until 10:05 a.m.)

18 CHAIRMAN RYAN: All right. Let me make one

19 mention. I worked with low-level waste at Barnwell for

20 about 12 years in the late '70s and '80s. So I just want

21 to let everybody know I used to work there, but I haven't

22 and have no interest in it.

23 MEMBER POWERS: Does this explain the

24 various peculiarities of your personality and decorum?

25 CHAIRMAN RYAN: If you say so, Dr. Powers.

1 I'll accept that diagnosis.

2 (Laughter.)

3 CHAIRMAN RYAN: Yes, otherwise I'm okay.

4 With that, I think we have Brad Broussard

5 from Texas CEQ. Brad?

6 MR. BROUSSARD: Yes, I'm here.

7 CHAIRMAN RYAN: Congratulations. Welcome

8 aboard and the floor's all yours.

9 MR. BROUSSARD: Thank you. Okay. We'll

10 try this again.

11 Again, I'm Brad Broussard, a representative

12 from the State of Texas.

13 What I'll do is -- I apologize for not having

14 slides. We've got a lot going on here and didn't have

15 any time to pull it together.

16 CHAIRMAN RYAN: That's fine.

17 MR. BROUSSARD: Well, what I'm trying to do

18 is go through some of the main proposed provisions in a

19 somewhat orderly fashion.

20 The first is the time of compliance of

21 compliance period and the performance period. Next I'll

22 try to talk a little bit about intruder dose and

23 compatibility issues.

24 Here in Texas we have a similar rule

25 requirement to what's being proposed, but it's not

1 exactly the same. Our rules require that analyses be
2 conducted for a minimum of 1,000 years or out to the time
3 frame when the peak dose occurs. And that was one of our
4 comments on the proposed definition of performance
5 period is that it may be helpful to either -- to expand
6 that definition to include maybe some things like when
7 the peak dose occurs, you know, which uncertainty in the
8 model renders the results meaningless, you know, or
9 cost-benefit analysis shows that there's no further
10 benefit?
11 As far as compliance period goes, what we
12 did here in Texas during our review of the license
13 application was we determined the compliance period from
14 our modeling. The compliance period we chose 50,000
15 years. And during that time we started to see some
16 in-growth and some other factors, site-specific things
17 affecting dose. So that's where we decided to say, okay,
18 evaluate out to 50,000 years as the compliance period.
19 CHAIRMAN RYAN: Brad, just a quick
20 question. You say at 50,000 you saw a lot of things
21 coming in. Well, radioactive decay is taking things
22 out. What was making things increase?
23 MR. BROUSSARD: Well, there were some other
24 -- you know, site -- and it will be different for each
25 site, but an example would be erosion. Because erosion

1 is very hard to model long term, we decided to just cut
2 it off right there and put certain provisions in the
3 license to require a revised performance assessment with
4 a more sophisticated model before waste acceptance took
5 place. In addition to that we also require an annual
6 performance assessment update, you know, to account for
7 any changes over time in waste received, additional
8 site-specific information, or any other changes;
9 regulatory, you know, environmental, those times of
10 things that could affect waste receipt.
11 CHAIRMAN RYAN: So in short, you're trying
12 to keep your performance assessment updated to all things
13 it can impact?
14 MR. BROUSSARD: That's correct.
15 CHAIRMAN RYAN: Okay.
16 MR. BROUSSARD: We determined to use the
17 50,000, or decided to use 50,000 years as a compliance
18 period. And since that time we worked with the licensee
19 to have them develop a more, I guess, robust
20 sophisticated model to look at some of the more
21 long-lived radionuclides such as depleted uranium and
22 we're currently in the process of that right now.
23 And as far as the intruder performance
24 objective, the 500-millirem, from our perspective I
25 think the State of Texas is okay with it. I mean

1 historically all analyses have used the 500-millirem.
2 You know, because it's in guidance, you still have to
3 demonstrate meeting the performance objective. So the
4 500-millirem to me is acceptable, whether it's in rule
5 or whether it's in guidance.
6 CHAIRMAN RYAN: Okay.
7 MR. BROUSSARD: One of the other things
8 that we've done, which is somewhat consistent with what's
9 being proposed in the revisions, is developed waste
10 acceptance criteria. I believe a lot of the sites do
11 this. Some are more extensive than others. But we
12 looked at what all the other -- the sited states have done
13 as far as waste acceptance. We used some of the
14 information that was gathered from the performance
15 assessment and also some of the existing guidance like
16 the BTPM concentration averaging to develop the waste
17 acceptance criteria that we've actually put in the
18 license.
19 One of the comments that we had also as far
20 as waste acceptance goes is that in some regards it seems
21 that what the NRC is moving towards is allowing for waste
22 acceptance to be based solely on performance assessment,
23 which I'm not sure that that's really a good idea. I do
24 believe that it could be very helpful, but I do think that
25 for the purposes of maintaining doses that the waste

1 classification table should be retained. There should
2 be some option, and I believe there is, to look at one
3 or the other. Unfortunately we did not have a chance to
4 review the supporting technical guidance for the
5 proposed revisions. The document was voluminous. We
6 didn't have enough time to do it. So I believe some of
7 the comments and some of these issues may be addressed
8 in that document.
9 MEMBER ARMIJO: You meant --
10 MR. BROUSSARD: One thing I'm going to talk
11 about is compatibility. And we really had no comment.
12 The State of Texas had no comments on proposed
13 compatibility issues. I think one of the areas that
14 would be a concern to some stakeholders would be the
15 changes to 61.13 that would go from a health and safety
16 category to category C. You know, for the most part I
17 believe what -- even if the proposed regulations had been
18 promulgated 10 years ago, the State of Texas would still
19 be compatible, because the time of compliance that we
20 used was 50,000 years and the 61.13 proposed requirements
21 are for 10,000 years. So either way it would have been
22 okay from our perspective. So that's really the reason
23 that we didn't have any comments regarding
24 compatibility.
25 And that's really about all I have. I'll

1 answer any questions, if you have any.

2 CHAIRMAN RYAN: Okay. Any questions for

3 Brad?

4 MEMBER ARMIJO: I've got a couple of

5 questions.

6 MEMBER BLEY: Okay. Sam, you need to use

7 the microphone here or there.

8 MEMBER ARMIJO: Okay.

9 MEMBER BLEY: These are the only ones that

10 pick you up.

11 MEMBER ARMIJO: Okay.

12 MR. BROUSSARD: I'm sorry, like all the

13 Committee members, we're having a -- I don't know if we're

14 all having this problem, but I can barely hear you.

15 CHAIRMAN RYAN: We'll raise our voices.

16 Thank you. We were just told --

17 MEMBER BLEY: Project toward that

18 microphone.

19 MEMBER ARMIJO: I'll try and speak as loud

20 as I can because the microphone's quite a way from me.

21 MR. BROUSSARD: Okay.

22 MEMBER ARMIJO: The State of Texas uses a

23 compliance period of 50,000 years, is that correct?

24 MR. BROUSSARD: Yes.

25 MEMBER ARMIJO: Now, you know, we've talked

1 about the uncertainties in that kind of a long-term
2 analysis to justify such a compliance period. Have you
3 ever been challenged either in court in members of the
4 public or other organizations about the technical
5 adequacy of an analysis that says you are assuring health
6 and safety out to 50,000 years?
7 MR. BROUSSARD: Actually we haven't. And
8 I believe the reason is because we don't have -- the
9 compliance period is not anything that's specifically
10 stated in our rules. Our rule requirement is a minimum
11 of 1,000 years or when the peak dose occurs. So we
12 started to see doses -- and that could have been
13 considered peak doses around 10,000 years, but as we went
14 out further we were starting to see other things
15 happening like the previous example I gave, like from
16 erosion and some in-growth starting to take place.
17 Now that being said, the applicant during
18 their initial analysis went out to 100,000 years. And
19 so they felt that that captured all of the peak doses from
20 everything except the long-lived, specifically depleted
21 uranium in which they -- they had initially asked for I
22 think about 10,000 cubic meters in the initial
23 application. But because the models that we were using
24 weren't as sophisticated as they needed to be, we put a
25 prohibition in the license for the short term until the

1 applicant or licensee could develop a more sophisticated
2 model to account for some of, you know, the things that
3 happen over the longer tie frames.
4 MEMBER ARMIJO: Okay. I just want to make
5 sure I've got it clear. Your rule requires, the
6 regulation in the State of Texas is 1,000 years for
7 compliance, is that correct? But you require licensees
8 or applicant for analyze for 50,000 years or perhaps even
9 longer as part of your licensing process?
10 MR. BROUSSARD: That's correct.
11 MEMBER ARMIJO: Okay.
12 MR. BROUSSARD: The regulatory
13 requirements are a minimum of 1,000 years or to the time
14 when peak dose occurs.
15 MEMBER ARMIJO: Yes, and that's the second
16 question I had is since we know peak doses can be
17 extremely long, you capped that time somehow?
18 MR. BROUSSARD: Right, we capped it based
19 on the simple model we were using and the proposed
20 inventory in the license application excluding depleted
21 uranium.
22 MEMBER ARMIJO: Okay. I think I
23 understand that. Thank you.
24 MR. BROUSSARD: Okay. Any other
25 questions?

1 CHAIRMAN RYAN: Any other questions for
2 Brad?
3 (No audible response.)
4 CHAIRMAN RYAN: Brad, thank you very much.
5 We appreciate your time.
6 MEMBER ARMIJO: I'm sorry, Mike, I had just
7 one more just to make sure I had my notes right.
8 CHAIRMAN RYAN: Okay.
9 MEMBER ARMIJO: You seem to be requesting
10 that the rules should retain the waste classification as
11 well to permit, you know, use of waste acceptance
12 criteria. Is there anything in the rule that suggests
13 that that would not happen?
14 MR. BROUSSARD: Well, you know, in my
15 reading of it some of the language, it seemed to indicate
16 that a site-specific analysis could determine waste
17 acceptance. And I think that because there's so much
18 uncertainty associated with, you know, these types of
19 modeling exercises that there needs to be something, you
20 know, either between the licensee or applicant and
21 regulator where, you know, everyone's in agreement, or
22 strong agreement that, you know, okay, hey, this is
23 something that's defendable. It's great. You know, we
24 all agree and we can move forward with it. But as some
25 of you are aware, that's not always the case. And that's

1 okay. It's going to happen. But, you know, for some of
2 the other radionuclides beside -- you know, instead of
3 depleted uranium I think the waste classification tables
4 are very important.
5 MEMBER ARMIJO: Okay. Thank you.
6 CHAIRMAN RYAN: All set? Next on the
7 agenda we have Earl Fordham from DEH in Washington State.
8 Earl, you with us?
9 MR. FORDHAM: Yes, I am. How are you all
10 doing back there?
11 CHAIRMAN RYAN: We're doing fine, and
12 yourself?
13 MR. FORDHAM: Not too bad. We got our
14 first initial snowfall here today.
15 CHAIRMAN RYAN: Well, hopefully we will
16 not.
17 (Laughter.)
18 CHAIRMAN RYAN: All right. The floor is
19 yours, Earl. Thanks for joining us. We appreciate your
20 time.
21 MR. FORDHAM: Good morning, all. Again,
22 my name is Earl Fordham and I want to thank the Committee
23 for inviting me to address you today.
24 I have a lot of firsthand experience at the
25 Washington facility and I think I actually met your chair

1 there, Dr. Ryan, back when I was a resident inspector and
2 making some trips out to South Carolina. I was the
3 resident at the Washington facility for 12 years and
4 supervised the Waste Management Group for the last 6 or
5 7 years. So during that time in the last 20 years
6 Washington as an existing facility when Part 61 came out,
7 so we were grandfathered in, but one of our goals has been
8 is to become fully compliant and to no longer need that
9 grandfather clause that was in there before. And we have
10 completed an Environmental Impact Statement back about
11 almost 10 years ago and had opportunities to update it.
12 Washington's facility is closer to the
13 phase of life of that Susan mentioned for South Carolina,
14 and that's not necessarily because of the land use or,
15 you know, volume available for us, as we've only used
16 approximately I'd say half the facility acreage. The
17 issue for us is the Northwest Compact basically used its
18 exclusive right to restrict access to itself and the
19 Rocky Mountain Compact back in 1992. As a result we are
20 now only getting, you know, a mere pittance of what we
21 got back in the '80s and '90s. Our volume is down around
22 20,000 cubic feet a year, whereas before back in the '80s
23 it was over a million.
24 I take it somebody's there to turn slides.
25 CHAIRMAN RYAN: Yes, we're on the aerial

1 view of the site.

2 MR. FORDHAM: Ah, thank you. Thank you.
3 That's perfect. What I want to do is, you know, bring
4 to your attention there is you are looking north and the
5 buildings in the upper right are part of the Department
6 of Energy's Hanford facility. So you can see we are in
7 very close proximity to acreage controlled by the
8 Department of Energy. In fact, the site is on a 100-year
9 lease from the AEC, now the Department of Energy and is
10 subleased by our Department of Ecology to the site
11 operator, U.S. Ecology. There are burial grounds that
12 the Department of Energy uses all around us. Perhaps one
13 of the bigger ones is the Environmental Restoration
14 Disposal Facility, also known as ERDF, off to the left
15 originally on the acreage that was leased to the State
16 of Washington and then returned back to the Department
17 of Energy in the mid-'90s for their use in constructing
18 ERDF. Again, please note that proximity of those
19 Department of Energy buildings.

20 And if you'd go ahead and move the slide.
21 I'm trying to take this presentation along the lines of
22 the way it was asked for questions to be answered in the
23 *Federal Register* notice on Part 61. So we'll talk a
24 little bit about the two-tier approach, you know,
25 compliance and a performance period appropriate. The

1 State of Washington agrees with that. Primarily back in
2 the late '90s when we were getting our draft
3 Environmental Impact Statement together we were talking
4 to the NRC folks in the Low-Level Waste Program nearly
5 every week. And so we had kind of come up with an idea
6 of what were we use for evaluation purposes and then go
7 beyond that to find peak dose.
8 I think you've heard a lot about modeling
9 already. I won't spend a lot of time expressing our
10 concern over the uncertainties. We are a little
11 concerned perhaps to get beyond 10,000 years because we
12 have a hard time going beyond 10,000 years our self. We
13 would treat 10,000 years as a maximum and kind of wonder
14 why not just use up to 1,000 years?
15 CHAIRMAN RYAN: Okay.
16 MR. FORDHAM: Move onto the fourth slide.
17 Should there be a dose limit other than the quarter of
18 a million sievert, 25 millirems? No. Twenty-five has
19 worked really well. I'm not sure if they were hinting
20 about this going down to what EPA at one time talked
21 about, 15 millirem. That's always an issue out here at
22 Hanford because they try to clean Hanford up to 15
23 millirem and we are 100 acres of different light. Using
24 25 millirem per year is out standard. And a lot of our
25 doses, and perhaps I have not heard it in other

1 discussions, our linked to some of the modeling
2 assumptions that you use.
3 And in our particular case, being a desert
4 environment only getting between six-and-a-half and
5 seven inches of rain a year on average, you know, our
6 infiltration and our primary driver and the Kd's that are
7 used in the modeling become very critical.
8 CHAIRMAN RYAN: Earl, could you refresh my
9 memory and tell me what the net efflux is of evaporation
10 versus infiltration at the State of Washington site?
11 MR. FORDHAM: With or without a cover?
12 Without a cover of any type we lose probably five inches
13 of it at a max through the waste strata, and it's 300 feet
14 to groundwater. With a cover or a proposed cover our
15 Phase 1 is basically a -- I call it a raincoat. It's
16 going to be dirt, HDPE 60 to 80 mL and then dirt on top
17 of it to protect the HDPE from UV.
18 CHAIRMAN RYAN: So we're going from a
19 smaller fraction of your annual rainfall down to your new
20 cap, essentially no infiltration?
21 MR. FORDHAM: Correct. The Phase 2 when
22 we get it fully designed and we'll hopefully -- no, this
23 one's conceptual -- will be an ET cover.
24 CHAIRMAN RYAN: Yes.
25 MR. FORDHAM: So we'll have a silt-loam

1 percentage in the top meter. We are using as kind of a
2 model the -- back in the '90s, I believe it was Battelle
3 was contracted to install a cover over the B pond out
4 here, 14 layers, very expensive beyond what we could hope
5 to do here or Department of Energy can do on their waste
6 site. But we are basically using the top meter of that
7 B pond cover, which is a silt-loam and vegetated having
8 a small percentage of pea gravel mixed in for erosion
9 control.
10 CHAIRMAN RYAN: Thank you.
11 MR. FORDHAM: Continue on to the next
12 slide.
13 MEMBER ARMIJO: I have a quick question for
14 your slide 4.
15 MR. FORDHAM: Okay. Back to slide 4.
16 MEMBER ARMIJO: Yes, I'm not familiar with
17 the Kd's. What are Kd'ses?
18 MR. FORDHAM: It's basically how fast the
19 radioisotopes will move through the vadose zone. The
20 closer to zero, the faster they move. Water is zero in
21 essence. So if you get a Kd value, you can model it
22 conservatively and then in reality Mother Nature is going
23 to have a different Kd. So your model may not
24 necessarily be validated by reality. But you try to be
25 conservative. And then you go back to your modeling and

1 adjust Kd's or you establish mobile fractions for your
2 isotopes depending on what further sampling and analysis
3 bring.
4 MEMBER ARMIJO: Okay.
5 MR. FORDHAM: The Hanford Facility has had
6 the opportunity to have several rounds of analysis.
7 Being an existing facility plant now, RCRA came into
8 being, we had accepted mixed waste, what is now mixed
9 waste, wasn't mixed waste back in '85, and thus our
10 Department of Ecology is very interested in looking at
11 the facility from a chemical point of view also. You
12 know, we have issues with a few chemicals here.
13 MEMBER ARMIJO: Okay. I understand the
14 concept. I don't know the units or whether it's a
15 dimensionless parameter or it's feet per year or inches
16 per century or what it --
17 MR. FORDHAM: I believe it's like
18 milligrams per liter.
19 MEMBER ARMIJO: Milligrams per liter?
20 MR. FORDHAM: But I could be mistaken
21 there. I'd have to get back to you exactly.
22 MEMBER ARMIJO: Yes. Okay. My
23 colleagues can educate me later. I just wanted to know
24 what that was.
25 MR. FORDHAM: Okay. Onto the next one. I

1 talked a little bit about the 10,000 years, and I'm pretty
2 sure you've heard the other previous speakers that 10,000
3 years -- we definitely don't want to see it any further
4 out. We kind of wonder if it shouldn't be even shorter.
5 MEMBER ARMIJO: Well, I've got to ask this
6 question again, because the way I interpret a compliance
7 period is that a licensee must prove to the regulator that
8 their site meets the regulation for the period of 10,000
9 years and they do it by analyses, and those analyses are
10 subject to review and approval and challenge.
11 Personally I believe that there is no analysis for 10,000
12 years that would survive a rigorous technical challenge,
13 but that's me.
14 MR. FORDHAM: I'm on the same boat as you
15 are.
16 MEMBER ARMIJO: Okay. Well, then why is it
17 okay? You know, why does the State of Washington say,
18 well, I guess it's okay for analysis? But there's an
19 analysis period. You can do anything you want. It's
20 just paper. If you make a mistake, you just erase it and
21 redo the calculation. But if you have to comply
22 physically by the design or the maintenance of the
23 low-level waste facility, that's a different story. So
24 I'm just confused of the interpretation of compliance
25 period. Is it really hard compliance or is it 1,000

1 years real physical compliance and 10,000 years of just
2 a calculation? Can you try and help me out here?
3 MR. FORDHAM: It's rather difficult with
4 the uncertainties involved, especially with
5 infiltration rates and what the actual mobile fractions
6 for various isotopes are and, you know, the soil
7 permeability, the Kd's involved. In the discussions
8 that we had with the NRC back in the late '90s when we
9 were wrestling with this question we asked why is 1,000
10 years good enough for uranium metals, but we need to go
11 out beyond? I'm sure you're aware that some of the
12 initial discussions with Part 61 were influenced by the
13 high-level waste --
14 MEMBER ARMIJO: Yes.
15 MR. FORDHAM: -- group at the NRC. And
16 they were looking at 20,000 years. And we went like, no,
17 in our initial set of comments were is that our error bars
18 get really bad just in that last 10,000 years. So I think
19 there was some compromise looked at. Ten thousand years
20 does have a degree of uncertainty. Twenty thousand
21 years has a, you know, much greater degree in our
22 calculations. A thousand years, you know, as I told our
23 Commissioner, I basically said for Washington it's a
24 maximum 10,000 years, and we would prefer 1,000.
25 MEMBER ARMIJO: Okay.

1 MEMBER RAY: Let me add. Sometimes I've
2 seen here in this discussion the 1,000 quantitative, in
3 quotes. I think that was on one of the slides earlier.
4 And the 10,000 qualitative. Now, in your question, Sam,
5 I thought it sounded like you were assuming they were both
6 quantitative. I don't know the difference between
7 quantitative and qualitative, but --
8 MEMBER ARMIJO: I think they're both
9 semi-quantitative because they're calculations, right?
10 And but the credibility of the calculation is only
11 defensible up to a reasonable time, maybe up to --
12 MEMBER RAY: Well, yes, but I mean at least
13 there's an effort to distinguish between the two in the
14 way that I've said in some of the presentations.
15 CHAIRMAN RYAN: I think Harold's onto
16 something that's absolutely useful. If you can identify
17 things that you really want to be quantitative versus
18 qualitative, you've really added some value to the
19 discussion because, you know, you can't calculate things
20 with certainty to 10 or 20,000 years. You can probably
21 reach with something shorter, on the order of 1,000
22 years, in terms of a future event or process in the
23 natural environment. So I mean that's a point I think
24 we need to all think about.
25 MEMBER RAY: And I think some of us are

1 concerned about challenges in a legalistic sense. And
2 it does make a difference if you're challenging, whether
3 you're challenging a qualitative assessment or a
4 quantitative calculation.
5 MEMBER ARMIJO: Exactly.
6 CHAIRMAN RYAN: And that's why I think when
7 the tools are defined as, you know, what kind of
8 calculation you're going to make and what a performance
9 period ought to be for this, that or the other thing, you
10 need to be pretty precise, and I'm not sure we've been
11 as precise as we might could be to get at the question
12 you're raising, Harold. So that's a good point. Thank
13 you.
14 Earl?
15 MR. FORDHAM: Continuing on, a little bit
16 more on the compliance period of 10,000 years. Going
17 back to that picture of the facility from the
18 introduction --
19 CHAIRMAN RYAN: Yes.
20 MR. FORDHAM: -- and how at a close
21 proximity to our facility the Department of Energy
22 disposal sites are, there are several Hanford disposal
23 facilities nearby. Some of them have been used for
24 years. ERDFs are to the west. It's been operational
25 since '96. There's another constructed ready to go for

1 the waste treatment plan about a mile or so from me, or
2 these. The idea is we ran our analysis very
3 conservatively trying to accomplish political needs that
4 we have in this area, but at the same time realizing that
5 the Department of Energy is going to use the land at the
6 disposal site as part of an industrial complex. And they
7 use an industrial scenario for theirs, which would make
8 the doses even lower than what we had predicted.
9 And the NRC held a kind of a meeting I want
10 to say two or three years ago now where the Department
11 of Energy representative talked about the WIPP Facility
12 and then the -- you know, I can't remember what they call
13 the Nevada Test Site now, but, yes, they talked about the
14 land being withdrawn and thus the probably of intrusion
15 was no longer equal to one. It's something in that
16 regard may be appropriate for the Hanford sites, too,
17 because I can't envision the Department of Energy
18 releasing its disposal areas back to public domain for
19 thousands of years.
20 Moving onto --
21 MEMBER ARMIJO: Earl, I just want to
22 comment on that. The built-in assumption in that
23 argument is that the Department of Energy will be around
24 to control the property thousands of years in the future.
25 And that's just -- history has shown us that that's highly

1 unlikely that any current organization will still be in
2 place that far into the future, which makes this whole
3 issue of regulating for periods thousands and thousands
4 of years into the future -- well, my opinion, almost
5 silly, you know?
6 MR. FORDHAM: I run into, talk to
7 stakeholders here in Washington. You know, we operate
8 on the assumption of institutional controls that are
9 going to last 100 years. And here out at Hanford the
10 assumption is more like 30 to 50.
11 MEMBER ARMIJO: Yes. Well, a colleague of
12 mine has just pointed out that one church has been
13 existing for 2,000 years as an organization, but I
14 challenge anybody to show me a government that's existed
15 for that length of time.
16 So, you know, I think our assumption is that
17 there is a big difference between government control.
18 And private sector control is really just an assumption
19 when you're talking periods that far into the future. So
20 if we're going to regulate for one type of organization
21 or be more restrictive because they're so-called private
22 sector and less restrictive because the government will
23 exist forever, I just don't think that makes -- I find
24 that hard to defend, but I'll leave it at that.
25 MR. FORDHAM: I'll go ahead and move on

1 to --

2 MEMBER ARMIJO: Please do, Earl.

3 MR. FORDHAM: -- a question and the answer.
4 Dose limit associated with a performance period
5 analysis. So what should the dose limit be? I think
6 we've kind of talked about this already, you know,
7 qualitative versus quantitative. In the performance
8 period we don't believe that there should be a limit.
9 State of Washington when it did its analysis for CIS did
10 go out to peak dose and a little bit beyond. Our modeling
11 went out 100,000 years and our error bars are huge. So
12 to try to put a limit on it and it just doesn't make a
13 lot of sense for us.

14 CHAIRMAN RYAN: Earl, did you wrestle with
15 the question of how do you know it's the peak when you
16 picked one?

17 MR. FORDHAM: Oh, yes. Oh, yes. And I'm
18 not sure if my colleague -- you know, I think, Mike, you
19 might know him, Drew Thatcher, if you actually had Monte
20 Carlo loaded or not. But he did 500 realizations of the
21 model. And that's how we came up with the numbers. So
22 it wasn't just a single run and come up with a number or
23 a year. It was a lot of effort to try to vary what we
24 could as far as establishing a band for parameters and
25 --

1 CHAIRMAN RYAN: Can you assign some
2 distributions of that selection --
3 MR. FORDHAM: Yes.
4 CHAIRMAN RYAN: -- you know, calculation
5 all that usual way? Okay. Thanks. That's helpful.
6 MR. FORDHAM: So next, slide 7. Should
7 there be a dose limit associated with the inadvertent
8 intruder analysis? If so, what should it be? We do
9 support the 500 millirem for the uncertain intruder. We
10 are well below it. But again, that was, you know, a
11 healthy discussion between our staff and the NRC back in
12 the late '90s as 500 millirem was guidance at the time
13 and we were quizzing them on were they looking at
14 something different. They said, no, we weren't, so we
15 went with 500. Obviously with the inadvertent intruder
16 versus an on-site resident, it's two different scenarios
17 as far as how long it lasts. So we believe 500 is
18 appropriate.
19 And then kind of the all the others issues
20 slide, slide No. 8. Cost-benefit analysis is the really
21 interesting new topic. Definitely plays into the
22 assumption about, you know, future generations and their
23 values. Land use. Remember that picture that I showed
24 you at the beginning. Year 2063 my 100 acres will be shut
25 down, covered and all above-ground facilities will be

1 demolished and the land will revert back to daily
2 operating report or its successor.
3 I envision it turning back over to the same
4 group that looks at the uranium mills, the legacy
5 management group for monitoring well into the future.
6 How far that future is, I think we can acknowledge that's
7 up for discussion.
8 Moving on, we agree with the NRC on using
9 the most up-to-date ICRP recommendations for the states
10 being allowed to develop their own waste acceptance
11 criteria. It is kind of interesting. Department of
12 Energy has done a performance assessment on its ERDF
13 facility. What I would have to bury in a package as Class
14 B cesium they can, you know, bury in their cells just a
15 couple of miles to the west of me un-packaged,
16 un-stabilized. That's the benefit right there of a
17 site-specific performance assessment.
18 Finally, I'd like to chat just a little bit
19 on compatibility. Generally I agree with Rusty. There
20 are areas where they need to be compatibility A and B.
21 Everything else the states always want flexibility. We
22 didn't comment on that when we delivered our comments to
23 the NRC back last spring and so we are always striving
24 for flexibility but understand the need for someone
25 that's at 25 millirems to 500 millirems.

1 And the final picture was taken last year.
2 You can see at the bottom of the picture the effects of
3 the fire of 2006 at Hanford there where the sagebrush is
4 missing. It is restoring and it's a great tool on saying
5 how fast the site will be reclaimed by Mother Nature. Do
6 I believe it's going to look like the center picture
7 forever? No, I don't, because Hanford does heal and
8 sagebrush does return.
9 CHAIRMAN RYAN: Any other questions for
10 Earl?
11 MEMBER ARMIJO: Yes, just on your slide 8
12 you used the words "tread carefully." Could you expand
13 on that?
14 (Laughter.)
15 MR. FORDHAM: The idea here is that you're
16 making assumptions about the values of future
17 inhabitants. We have values today. Are they going to
18 be the same values? For instance, here at Hanford the
19 Columbia River is a primary value of the stakeholders.
20 They don't want to see their use of it, whether it be for
21 a water source or recreation jeopardized in any way,
22 shape or form. A hundred years ago what did people think
23 about the Columbia River? You talk to the Native
24 Americans and it was sacred to them back then. But I have
25 a belief that you could probably make an assumption that

1 100 years from now the river will be, you know, a critical
2 component for this area, but other parts of our
3 environment out here may not be. So we try to put values
4 on future generations, we get into a quagmire. You know,
5 are they our values, personal values or are they truly
6 the collective community values?
7 MEMBER ARMIJO: Okay. Thank you.
8 CHAIRMAN RYAN: Any other questions from
9 members?
10 (No audible response.)
11 CHAIRMAN RYAN: Okay. With that, we
12 appreciate everybody's presentations in this session.
13 it's been very helpful and informative.
14 MEMBER POWERS: They have been outstanding
15 presentations.
16 CHAIRMAN RYAN: Yes, every one. They've
17 been all very informative and to the point, which we
18 appreciate.
19 MEMBER POWERS: Very, very focused and --
20 CHAIRMAN RYAN: Thank you, Dr. Powers.
21 With that, we are scheduled for a 15-minute
22 break, which we'll maybe kind of cut it a minute or two
23 short. Come back a couple minutes after 12:00 if we can,
24 we'd appreciate that.
25 MEMBER BLEY: Eleven.

1 CHAIRMAN RYAN: I'm sorry, 11:00.

2 (Laughter.)

3 CHAIRMAN RYAN: So, let's get our schedule

4 back a little bit. So thanks. We'll reconvene at let's

5 say five after 11:00.

6 (Whereupon, at 10:48 a.m. off the record

7 until 11:06 a.m.)

8 CHAIRMAN RYAN: All righty. We have two

9 more speakers before our lunch break, and first up is

10 Scott Kirk from Waste Control Specialists.

11 Scott, welcome and thanks for being with us

12 today.

13 MR. KIRK: Thank you very much. And, yes,

14 I am Scott Kirk and I work for Waste Control Specialists.

15 I'm a health physicist. I'm vice-president of licensing

16 and corporate compliance and I'm also the site's

17 corporate radiation safety officer. I'm here today to

18 share, you know, some of the perspectives that WCS has,

19 you know, acquired over licensing a new facility.

20 You know, a lot has happened over the last

21 40 years, a lot of advancements in waste management

22 practices, but there's really been only one facility

23 license which is operating. The Ward Valley Facility

24 was licensed, but it's not operating. But in 2009 WCS

25 did acquire a low-level waste license. We're

1 authorizing to dispose of Class A, B and C waste. This
2 is first the facility, you know, like I said, that's
3 operated since 1980. We're authorized to dispose of
4 waste within the Texas Compact, but also outside of it.
5 But we have two facilities. We also have a federal waste
6 disposal facility that was envisioned by the state
7 legislature as well.
8 With that said, we're allowed to import
9 waste from non-regional generators, which I think has
10 really benefitted the nation since the closure of the
11 Barnwell Facility to non-regional disposal facilities.
12 You know, the Texas legislature is, you know, as well
13 behind the facility. You know, they've authorized the
14 importation of up to 275,000 curies per year of waste
15 materials.
16 The facility is located in West Texas.
17 It's a very arid remote portion of the United States. It
18 borders Lea County, New Mexico. We're located probably
19 about 70 miles east of the Wood Facility, but the facility
20 is also located within the Permian Basin. And that's
21 very important to also recognize that the primary
22 industry out there is oil and gas. They're very familiar
23 with risk. They're very familiar with geology,
24 drilling, those sorts of things because oil and gas is
25 the bloodline to that area of the country.

1 MEMBER ARMIJO: Just a quick question.

2 MR. KIRK: Yes.

3 MEMBER ARMIJO: When did the facility

4 actually receive its license and start operating?

5 MR. KIRK: 2009 is when we received our

6 license. We had a variety of pre-construction license

7 requirements like we had to do some additional

8 characterization and other sorts of things. And I think

9 we took our first waste in 2011 for the compact facility.

10 And for the federal facility we opened it up and took the

11 first waste in June of last year, or this year.

12 This sort of gives you an aerial view of the

13 facility. The LSA pad, you know, we stored some of the

14 Department of Energy's Fernald Silos 11(d)(2) byproduct

15 materials at the LSA pad. We also constructed a

16 byproduct facility, which is for 11(d)(2) materials.

17 There's a lot of radium in that waste materials, which

18 is now disposed of in Andrews County. We also have a RCRA

19 Subtitle C landfill that's permitted. We have

20 facilities which are admin buildings, but we also have

21 a treatment storage and disposal facility as well where

22 we can treat waste.

23 In the center you'll see the federal

24 facility. It's much larger. You see the one area that

25 has been developed. You know, we can expand that further

1 to the west, which is on the left-hand side of the screen.
2 The smaller facility, which is the compact facility, the
3 Texas Compact facility, it's also dead center, which
4 you'll see, but it's a much smaller facility. That's
5 Phase 1 that we have undergone, you know, that's already
6 operational, but we've already submitted a major
7 amendment request to expand it towards the east. So
8 there are abilities to expand the capacity of it.
9 You also see what we call -- there's
10 evaporation and sedimentation ponds that we do collect
11 leachate. We treat it. We pump it into the
12 sedimentation and evaporation ponds.
13 MEMBER ARMIJO: Where is that on the
14 picture?
15 MR. KIRK: The evaporation ponds? There's
16 two of them, one for the federal facility and one for the
17 compact facility.
18 MEMBER ARMIJO: Okay.
19 MR. KIRK: And it's really designed as a
20 zero discharge facility. And what you'll see is -- and
21 this is really a vision of the Texas legislature. They
22 were willing to sign up allowing a private entity to
23 license a new facility and also to have one that would
24 service the Department of Energy. But they had certain
25 visions that they wanted to have in place. And it far

1 surpasses, you know, past disposal practices and
2 disposal concepts. One thing that they wanted to ensure
3 was is that the federal facility and the compact facility
4 were separate. But they did not want to have commingling
5 of radionuclides between the two facilities, so they're
6 physically separate. They have a fence between the two.
7 They have separate, you know, entrance and egress
8 pathways. So that's what you also see and that's why
9 they are separated.
10 MEMBER ARMIJO: Okay. I'm going to ask a
11 bunch of questions --
12 MR. KIRK: Oh, please do.
13 MEMBER ARMIJO: -- that are just for
14 familiarize with this. The federal facility, this is
15 all private land or is it federal facility on government
16 land?
17 MR. KIRK: It's private land, but that's a
18 very good point, and I'll get to that later in the
19 presentation.
20 MEMBER ARMIJO: Okay.
21 MR. KIRK: But I'll answer your question.
22 The legislature required us to have a memorandum of
23 agreement with the Federal Government and that agreement
24 stipulates that at the end of plant life that the Federal
25 Government will own all the buildings, all the land into

1 perpetuity. In essence it's institutional controls
2 into perpetuity --
3 MEMBER ARMIJO: That's correct. Yes.
4 MR. KIRK: -- so it was federal land. And
5 that's that memorandum of agreement that has been signed
6 between the Department of Energy and Texas.
7 MEMBER ARMIJO: Okay.
8 MR. KIRK: Now the Texas facility also has
9 stipulations. They own the facility today. I mean we
10 own the facility. We license it. But part of that
11 licensing process was that we had to transfer title of
12 that facility prior to start-up. So when we receive
13 waste -- we have two resident inspectors. They evaluate
14 the manifest. They sign the documents. Once they sign
15 it, they own that waste before it gets placed into the
16 hole.
17 MEMBER ARMIJO: Okay. And the last
18 question is what is the LSA pad?
19 MR. KIRK: That stands for low-specific
20 activity. It's just a name that it's been called. It's
21 a storage pad, but we do work up at that LSA pad. And
22 what I mean, when we do work there, we have a irradiated
23 hardware transfer system. Only it might be 300,000
24 pounds. The transfer belt is about 10 inches thick.
25 But in the older disposal facilities they use like a slit

1 trench design to off-load irradiated hardware. The
2 design of our facility doesn't allow that. All of our
3 waste has to be placed in what's called modular concrete
4 canisters. So we have to do vertical lifts. So we had
5 to come with a state-of-the art transfer system so that
6 we could off-load sources that are, you know, very highly
7 radioactive. The sources -- the design bases were to
8 off-load a source of 30,000 R per hour on contact. And
9 we've done about 18 of those.
10 MEMBER ARMIJO: So is the LSA pad just an
11 interim location where you do some packaging and
12 preparation for disposal?
13 MR. KIRK: We do preparations. We
14 off-load the containers there. We also have used that
15 as a storage pad for ion exchange resins and other things
16 like that prior to the time that we opened our facility.
17 But primarily we don't do storage there. We do some
18 de-watering of resins there. It's really just a
19 isolated facility that's remote, but we use it for those
20 type of activities.
21 MEMBER ARMIJO: Okay. Thanks, Scott.
22 MR. KIRK: You're welcome.
23 MEMBER ARMIJO: That helps.
24 MR. KIRK: You know, as I'd mentioned, to
25 answer a question, the Texas legislature, you know,

1 required transfer of the land to the State of Texas, but
2 prior to waste receipt. We were authorized under or
3 license to receive up to 2.3 million cubic feet of waste
4 materials and 3.89 million curies, but for the curies
5 were allowed to decay correct at. You know, we provide
6 to the Texas Compact Commission really about on a monthly
7 basis. We have license requirements that we provide
8 updated inventories where it's decay-corrected, where we
9 demonstrate compliance, but also for the capacity. And
10 the important part here is is that the compact facility
11 serves Texas and Vermont as the compact and the Texas
12 legislature and the Texas Compact Commission wanted to
13 ensure that the Texas Compact is also protected as far
14 as available capacity for volume and for number of
15 curies.
16 And as I mentioned, Texas takes title to the
17 waste prior to waste receipt, but a really important part
18 of this is, too, there are fees collected for waste that's
19 imported into the State of Texas. You know, Texas agreed
20 that they would help serve in a lot of the nation's waste
21 disposal needs since Barnwell closed, but a percentage
22 of those fees go to Andrews County where they build
23 recreational facilities and other things like that that
24 services the local constituency. But a large portion of
25 that also goes to the Texas coffers as well, the state

1 treasury.

2 MEMBER SKILLMAN: Who are the contributors

3 to your waste streams? Where is the waste really coming

4 from?

5 MR. KIRK: It's coming from the majority of

6 nuclear power plants across the country. We've received

7 some silt sources. We've received medical waste like

8 -- and also American Airlines. They send us a lot of

9 tritium exit signs. I think they had like, I don't know,

10 20,000 curies of tritium in these exit signs. But we

11 take, you know, research waste as well, though some

12 facilities have not been able to take like pathological

13 waste, like animal carcasses. But we don't have that

14 prohibition, so we also support the research community

15 and the University of Texas and other universities.

16 MEMBER SKILLMAN: Okay. Thank you.

17 MR. KIRK: For the federal waste disposal

18 facility, you know, what Texas was grappling with really

19 was the failure of licensing the facility at Sierra

20 Blanca, which was down by El Paso. And what they said

21 is that a private entity -- and they passed a law -- a

22 private entity could submit a license amendment request

23 to support the Texas Compact, but they recognized that

24 there wasn't large volumes of Class B and C waste. And

25 to ensure that facility would be economically viable,

1 they also agreed that they would allow another facility
2 to be built that would service the Department of Energy.
3 So that framework was established. It was a law passed
4 in about 2003.
5 Now as I had mentioned before, there was a
6 requirement by the legislature that a memorandum of
7 understanding had to be in place before we received waste
8 at the federal facility. And that agreement was with the
9 State of Texas and the Department of Energy, and that has
10 been signed and is in place. And such, the Department
11 of Energy has agreed to assume ownership of the federal
12 waste disposal facility into perpetuity upon closure.
13 For the federal waste facility it's much larger. We're
14 authorized to dispose of up to 26 million cubic feet or
15 5.6 million curies. And again we decay correct the
16 source terms. WCS' perspective with regard
17 to Part 61. You heard a little bit from Brad Broussard,
18 so some of my information will be repetitive from what
19 he has, but I think it really puts a lot of light on the
20 licensing of the new disposal facility.
21 You know, from the outset, you know, we have
22 supported a 10,000-year period of compliance. And what
23 we believe is and what we've learned by licensing our
24 facility it really allows a true evaluation of the
25 long-term environmental performance of a waste disposal

1 facility. What it really allows you to do is to, you
2 know, evaluate or test the engineered barriers that you
3 build. It allows you to evaluate the significant
4 exposure pathways and it also allows you to or indicates
5 if you need additional characterization. Especially like
6 for updates to a performance assessment, it really allows
7 us to do that so that -- you know, on a 1,000-year time
8 period you wouldn't be able to test these kind of
9 features.
10 We think that our site is, you know, very
11 well suited, you know, for unique waste streams such as
12 depleted uranium. And by the sheer fact that we've
13 licensed our facility for -- it has a period of compliance
14 of 1,000 years or peak dose, whichever is longer. You
15 know, we think that the fact that we've licensed one,
16 that's not an insurmountable task, especially if it's for
17 a well-sited facility. And I'll get into that more.
18 And what I'm getting at is if you have a very robust
19 facility and the water table is far removed from the site,
20 it's arid, it's remote, you don't have lots of rainfall,
21 we do not find that to be overly problematic to
22 demonstrate compliance with a standard, you know, that's
23 more restrictive than what the NRC, you know, may or may
24 not be proposing.
25 MEMBER RAY: Well, what do you assume; just

1 to take rainfall as an example, the rainfall will be in
2 10,000 years?
3 MR. KIRK: Well, you know, we also looked
4 at climate changes. You know, the site itself really is
5 not subject to erosion. We have what's called a
6 gradation. The Mescalero Sands to the west will grade
7 over the site. We've looked at, you know, very
8 sophisticated computer modeling of the site. What we
9 had assumed for the future climate change, we don't have
10 like glaciation in West Texas, but what we did is we
11 assumed that we would have much wetter conditions. You
12 know, we doubled the rainfall up to 30 inches. It's
13 usually about 16 inches, but we doubled that for prolong
14 periods of time.
15 And really what we found out from our site
16 is is that when you saturate the soils with large volumes
17 of water, what happens is it pushes those radionuclides
18 down, you know, further towards the water table. But,
19 you know, our water table is about 600 feet below grade.
20 The soils are very impermeable. And on natural
21 conditions, that's really more bounding. The natural
22 tendency of those radionuclides would be to diffuse
23 upwards. But when we looked at, you know, wetter
24 climates, what that showed is is that that's not the
25 bounding scenario. And if we would not have really

1 looked at, you know, peaks longer than 1,000 years, we
2 never would have had that realization.
3 MEMBER RAY: So you did make a conservative
4 -- or I assume you'd consider it conservative assumption
5 about future changes on climate, as you called it?
6 MR. KIRK: Yes, unrelated to manmade
7 activities. We just assumed based on the last Ice Age
8 that, you know, it was wetter conditions in West Texas.
9 And so, you know, the original study we had used was from
10 Wichita, Kansas. You know, we questioned whether that
11 was really applicable, but that was the study that was
12 most germane to the topic. And so, you know, we used
13 those rainfalls and also looked for, you know, historical
14 records. We thought a doubling of the rainfall would be
15 appropriate.
16 MEMBER ARMIJO: But that's pretty
17 arbitrary. It could have been if someone said, hey, I
18 think it should have been 10 times just to be sure. Ten
19 thousand years is a long time.
20 MR. KIRK: But it would be --
21 MEMBER ARMIJO: How would --
22 MR. KIRK: Okay. I'm sorry.
23 MEMBER ARMIJO: How would you respond to
24 that? You say, hey, look, we've gone back in historical
25 records, geology or something, that says this has been

1 arid for 100,000 years and it's likely to be arid for
2 another 10,000? You know, how do you do this? It sounds
3 to me like it's very qualitative.
4 MR. KIRK: It is qualitative and you have
5 to use reasonableness, you know, and there's a reasonable
6 assurance provision in the Texas statute and in the
7 regulations. But the point I was trying to make is the
8 more rainfall that you have, it really causes you to have
9 lesser doses. I mean the bounding case is that you have
10 zero rainfall. And what happens then is that the
11 radionuclides over time migrate to the surface where you
12 could have crops and those sorts of things that would
13 update those radionuclides and could be consumed in
14 foodstuff.
15 MEMBER ARMIJO: Okay. But you know that
16 from time zero then that the bounding case is zero
17 rainfall?
18 MR. KIRK: We know that. Exactly. But my
19 point here though is is that if you don't look at a time
20 period past 1,000 years, like 10,000 years, you'll never
21 come to that realization. Now I think that's a very
22 fundamental understanding that one needs to know when
23 you're licensing a facility. You need to know how it's
24 going to behave and perform.
25 MEMBER ARMIJO: Yes, I understand that.

1 MEMBER RAY: "Know" is maybe not the right
2 word you want to use, but estimate or --
3 MR. KIRK: Oh, it's an estimate. Oh, no,
4 absolutely it's an estimate.
5 You know, and as we said before and as Brad
6 Broussard at TCEQ had mentioned, that period of
7 compliance is 1,000 years or peak dose, whichever is
8 longer. In our initial license applications we did look
9 at time periods over 50,000 years. But we have submitted
10 a major amendment request. We've altered those. And
11 I'll get into that as well.
12 We believe that the NRC's rulemaking should
13 be forward thinking and we think it should really reflect
14 some of the waste management advancements that have been
15 made over the past several decades that's exemplified by
16 the successful licensing of the WCS facilities.
17 For intruder protection, you know, I think
18 the key here is is that -- at least at our facility, is
19 the barriers that you need. Our facility; and I'll show
20 you in a second, is highly engineered. You know, we do
21 have multiple intrusion barriers, but we believe that
22 it's a longstanding fundamental design requirement and
23 a performance objective that's in Texas regulations.
24 And we think that that needs to stay, but we also, you
25 know, recognize that you need to have reasonable and

1 likely intruder scenarios.

2 For example, depleted uranium; and I'll get

3 to this later, you know, we assumed that intruder would

4 be there for our major amendment, which is about 400,000

5 cubic meters of depleted uranium. We assumed that a

6 resident would be there a million years from now. You

7 know, you could come with estimates of those sorts of

8 things. Obviously they're not precise estimates, but

9 what it really tells you is, you know, the site really

10 suitable? Does it degrade? Is it stable over time

11 periods?

12 For the intruder scenario that we really

13 used for someone, you know, drilling was for oil, but we

14 assumed that time period was going to be about 500 or 600

15 years into the future, because we assume at some point

16 in time that oil is going to be depleted in the United

17 States. Now and how long would that be? Would it be 500

18 years? Six hundred years? A thousand years into the

19 future?

20 Now we modeled that scenario and, you know,

21 I think that we drew up for the compact facility -- we

22 stack our MCCs high, about four. And for the federal

23 facilities we stack them high, about six. Each of these

24 MCCs; and you'll see pictures of them, they're about 10

25 feet high. You know, we assume that a driller would

1 drill into it, bring the materials to the surface and we
2 still pass the 500 millirem intruder pathway at about 500
3 or 600 years. And we assume that was bounding because
4 that includes the fission products and activation
5 products, the more shorter-lived radionuclides. But
6 for depleted uranium large periods of time, no, I think
7 you need to apply reasonableness to intruders.
8 MEMBER ARMIJO: And that reasonableness
9 standard is in the State of Texas regulations?
10 MR. KIRK: Yes, the dose standard -- what
11 it's called out for -- and when the rule was passed, or
12 when the legislation was passed in 2003, TCEQ then
13 embarked on a rulemaking effort. And what they did is
14 they -- you know, they establish regulations for the
15 1,000-year time period and peak dose, whichever is
16 longer. And in response to comments there's a lot of
17 good information in that. And what they said is they
18 didn't anticipate someone would model out into infinity.
19 The standard really applies to the reasonably maximumly
20 exposed individual.
21 CHAIRMAN RYAN: Scott, have you ever looked
22 at or had any experience with chemical waste disposal
23 which is for all practical purposes infinitely live? I
24 mean I struggle with the fact that we have RCRA
25 requirements that have fairly shortened the horizon, for

1 years, things like that, we see.

2 MR. KIRK: But those heavy metals will be

3 there for a long time.

4 CHAIRMAN RYAN: Forever.

5 MR. KIRK: Yes, that's a fact. I think

6 it's well understood, but that's the construct of the

7 regulatory environment in which we live. The EPA

8 regulates the hazardous portion of these sorts of things

9 whereas, you know --

10 CHAIRMAN RYAN: That's not my question. I

11 mean my question is we've got two kind of modes of

12 operation: One is where essentially infinitely-lived

13 material -- there's some consideration given to that.

14 The other is a class of other infinitely long-lived

15 hazardous materials where we don't consider. How do we

16 get around that? I mean how do we get a coherent system

17 someday?

18 MEMBER ARMIJO: It isn't.

19 MR. KIRK: Well, you know, a lot of people

20 propose having a generic risk-based system where you look

21 at risk of hazardous materials and you juxtapose that,

22 similar to how we handle radioactive materials. And I

23 know NCRP has come out with reports like that as to how

24 we move forward. But you know, it's a good question, but

25 I don't have an answer for you.

1 CHAIRMAN RYAN: Well, I mean we're talking
2 about it and it sort of struck me we keep talking about
3 basically something that's going to be here for the life
4 of the planet.
5 MR. KIRK: Absolutely.
6 CHAIRMAN RYAN: And, you know, half-life
7 doesn't mean much when you're in that time frame.
8 MR. KIRK: No, I agree with you completely.
9 CHAIRMAN RYAN: Thanks.
10 MR. KIRK: You know, we think that
11 10,000-year period of compliance, it provides regulatory
12 and public confidence in the long-term performance of the
13 site.
14 MEMBER ARMIJO: You know, I guess where I
15 really struggle -- and these presentations have helped
16 a great deal. To me compliance is a tough standard. You
17 comply. And what you talked about, when you talk 10,000
18 years, you're talking really an analysis, qualitative,
19 semi-quantitative analysis. But then when you actually
20 want to comply in a physical way, you talk in terms of
21 1,000 years. And the term "compliance" is used in both
22 cases. And that's confusing to me, that you can analyze
23 until you're blue in the face, but it doesn't matter as
24 long as you aren't obligated by law to demonstrate that
25 you meet the standard in a hard sense.

1 And so do you think of the 10,000 years
2 period of compliance as an analysis, an evaluation, but
3 not a requirement?
4 MR. KIRK: It was a requirement. It was a
5 quantitative requirement.
6 MEMBER ARMIJO: A quantitative requirement
7 to do the analysis, but is it a quantitative requirement
8 that you have to prove that you protect the public for
9 10,000 years into the future?
10 MR. KIRK: We do. We did have to.
11 MEMBER RAY: Can I ask it a different way,
12 Sam?
13 Do you have to meet a threshold of let's call
14 it probability that no one would be exposed to greater
15 than the standard of compliance, that the probability of
16 that happening is less than 10 to the minus 6th or
17 whatever you --
18 MR. KIRK: No. This issue goes back into
19 reasonableness.
20 MEMBER RAY: No, wait.
21 MR. KIRK: I'm sorry.
22 MEMBER RAY: What was your answer?
23 MR. KIRK: It's reasonable. I mean --
24 MEMBER RAY: No, your answer was no, I
25 think, wasn't it? You don't have to show that it's less

1 than 10 to the minus 6th?

2 MR. KIRK: No, we don't use probability

3 estimates.

4 MEMBER RAY: Okay.

5 MR. KIRK: It's part of the regulation.

6 MEMBER RAY: That's the difference that

7 we're talking about.

8 MR. KIRK: Yes.

9 MEMBER RAY: In some things we have to do

10 that. Okay? The probability of something bad

11 happening is less than 10 to the minus 6th, or 10 to the

12 minus 5th, or whatever. That's not the methodology

13 you're using here?

14 MR. KIRK: No, nobody for low-level waste

15 disposal uses --

16 MEMBER RAY: I understand, but I'm just

17 trying to make that distinction so that we don't apply

18 the same protocol to this in our thinking that we do in

19 other things that come before us here.

20 MR. KIRK: I would completely agree with

21 you. I don't know how you put probability estimates on

22 things in such large time frames.

23 MEMBER RAY: Well, that's what we're trying

24 to figure out.

25 MR. KIRK: I don't think it's possible to

1 do that.

2 CHAIRMAN RYAN: Well, because it begs the

3 question then, Scott, what use is a deterministic

4 analysis for the same time period? You're picking one

5 number and that's it.

6 MR. KIRK: Yes, I think what you do is you

7 define your assumptions to the parameters in which you're

8 calculations are defined. You defend those. You do

9 your calculations. When your calculations -- they come

10 up with a point estimate. Sometimes they're

11 probabilistically driven. I mean we did -- and our dose

12 assessments are probabilistic analysis. You come up

13 with a numerical value and you compare it to a dose

14 standard.

15 CHAIRMAN RYAN: Well, but you're still kind

16 of in the place where, you know, your beta calculation,

17 you've made some variations of that calculation. But,

18 you know, I always kind of wondered about, well, am I

19 SCUBA diving in oatmeal and I don't know which way the

20 bubbles are going or have I hit the target in the center?

21 I don't know which field I'm. How do I know that I'm

22 representing reality with some degree of certainty?

23 MR. KIRK: Well, I think you struggle with

24 that. You do. And so and I mean I understand your

25 point. A thousand years is shorter than a ten thousand

1 year period, or for peak dose, which is, you know, way
2 into the future.
3 CHAIRMAN RYAN: Yes.
4 MR. KIRK: So how do you make sense of that?
5 And I think the thought is, and at least the way I look
6 at it is, the numerical number that you're coming up with
7 that demonstrates compliance with that dose standard is
8 one issue. But the other issue about site suitably, like
9 stability and those sorts of things is another issue.
10 And Texas grappled with that as well and their logic and
11 their rationale for coming forward to the point that they
12 did is well documented.
13 CHAIRMAN RYAN: We've had some good
14 discussions with the state representatives today about
15 their strategies and, you know, background thinking on
16 how they approach that. So that's helpful that we know
17 that.
18 MR. KIRK: You know, our concept was you
19 shouldn't regulate for peak dose because that's
20 potentially into infinity. The point should be 10,000
21 years, which was consistent with NRC guidance at the
22 time. And their response was, no, we can look at periods
23 much greater than that. And the key part is to look at
24 site suitability, was the response in response to
25 comments to rulemaking.

1 MEMBER BLEY: You know, we've heard this
2 from a number of folks today. Those calculations can be
3 helpful if they point out some holes in the system that
4 you weren't aware of, but the way the thing is written,
5 it sounds as if we're trying to prove that it will be
6 maintained properly for that period of time, which is
7 nonsense.
8 MEMBER POWERS: It strains credulity.
9 MEMBER BLEY: It does more than strain it.
10 (Laughter.)
11 MEMBER BLEY: Well, like I said, there's a
12 problem in the way this stuff is written for me. Now,
13 you know, doing that analysis I can see benefit as long
14 as you don't pretend that all these systems that you
15 assume will be there, socioeconomic and governmental
16 systems. As long as you aren't relying on that for such
17 long periods of time.
18 CHAIRMAN RYAN: Dennis, I think that's a
19 key point that ought to be made in our letter. You know,
20 there's a difference between gaining insights into
21 something and saying the numerical value is 1.6328.
22 MEMBER BLEY: Exactly. Yes.
23 CHAIRMAN RYAN: You know, so I think we need
24 --
25 MEMBER ARMIJO: Qualitative compliance is

1 the standard as opposed to quantitative compliance. And
2 I understand it. I understand that, hey, these guys
3 aren't trying to prove to -- to meet a standard, a
4 numerical standard, you know, whether it's peak clad
5 temperature of things that we worry about. It's a
6 qualitative assessment.
7 MEMBER BLEY: And you're making
8 assumptions that some of the institutions will be there,
9 but that's an assumption that --
10 MEMBER ARMIJO: Sure. And people can
11 argue until -- but the real effective control in, at least
12 in Texas is a reasonableness standard that will accept
13 qualitative arguments for these long periods of time.
14 And even then it only has to be for 1,000 years. It
15 doesn't have to be for 10,000, if that's correct.
16 MR. KIRK: Well, the reasonableness
17 argument went beyond 1,000 years during our licensing
18 process.
19 MEMBER ARMIJO: Okay.
20 CHAIRMAN RYAN: I'm going to suggest we
21 move on because we've got one more speaker.
22 MEMBER STETKAR: Well, I have a question
23 actually. Since you've done the 10,000-year analysis,
24 right, for your facility have you made any changes in the
25 way that you designed your facility or requirements for

1 package of waste as a result of looking at 10,000 years
2 versus 1,000 years, for example?
3 MR. KIRK: Well, I could tell you that it
4 required us especially for some of the mobile long-lived
5 radionuclides like technetium-99. You know, one of the
6 things in our major license amendment that we have
7 submitted and what we are defending is, you know, being
8 able for tech-99 to take -- you know, to be able to take
9 much larger inventories of it.
10 MEMBER STETKAR: Yes.
11 MR. KIRK: And one of the things that we
12 came to understand pretty quickly is that the volume of
13 concrete in our facility is instrumental in impeding the
14 mobility of technetium-99. Because what happens is that
15 concrete will degrade over time. There's a buffering
16 effect. The pH will rise. And as a result, you know,
17 we adjusted our Kd's for tech-99. So we showed, you
18 know, based on that construction feature that, you know,
19 the math of the tech-99 will be sort of held up in that
20 matrix, you know, well over a 100,000-year time period.
21 So, you know, we already had the requirement
22 to have all the concrete, but it --
23 MEMBER STETKAR: Yes, that's --
24 MR. KIRK: -- required us to go back and
25 re-look at things.

1 MEMBER ARMIJO: But did the analysis help
2 you discover another advantage of what you'd already
3 decided to do?
4 MEMBER STETKAR: Yes, what I was asking was
5 --
6 MEMBER ARMIJO: Yes.
7 MEMBER STETKAR: I mean that's confirming
8 that the design you already had can satisfy the
9 requirement. I was asking whether the comparison of
10 1,000 versus 10,000 versus -- pick any other number,
11 actually gave you some insights such that you said, oh,
12 gee, we should actually put some more concrete in.
13 MR. KIRK: No, we didn't do that. No.
14 MEMBER STETKAR: Okay. Thanks.
15 MR. KIRK: We did not.
16 MEMBER STETKAR: That's what I was looking
17 for. Thanks.
18 CHAIRMAN RYAN: Okay. Scott, we're
19 getting a little bit tight on time, so if you could
20 -- we're asking a lot of questions, so it's not your
21 fault, but I want to make sure we don't shortchange Dan.
22 We'll go a little bit over 12:00.
23 MR. KIRK: Okay. I'll can do the best I
24 can.
25 CHAIRMAN RYAN: I'm speaking to my

1 colleagues through you, I think.

2 (Laughter.)

3 MR. KIRK: You know, we think our success

4 though is really rooted with the tremendous support that

5 we've gotten from the state and our region and our local

6 communities. They've been very supportive of the WCS

7 facility. And without them we would not have a licensed

8 facility today.

9 Our local community, you know, they agreed

10 from the outset that they would host the disposal

11 facility, but only if it was backed by good science

12 technology as well as being regulated with proper

13 regulatory oversight.

14 You know, Texas' vision of a modern

15 low-level waste disposal facility. You know, one of the

16 key things that they recognized was is that the -- they

17 thought more stringent requirements may be needed. And

18 one of the key parts of that is, you know, they adopted

19 this sort of philosophy about isolated assurance,

20 monitor retrievable storage and the overall design

21 concepts of our facility, but they mandated that we us

22 modular concrete canisters which have reinforced

23 concrete in them. All of the waste has to be placed in

24 those for the compact facility. They're stacked four

25 high. At the federal facility they're stacked six high.

1 Again, we're located in a very arid remote
2 part of Western Texas where the average rainfall is less
3 than about 16 inches and it's far removed from any water
4 table. The water table, which is non-potable, that
5 resides underneath the site is about 600 feet below
6 grade.
7 As we mentioned before, the standard of
8 1,000-year or peak dose, that's really a quantitative
9 standard that we were held to. And as I have said before
10 that, you know, we had proposed a 10,000-year period of
11 compliance as being, you know, the maximum bound, but you
12 know, Texas wanted us to look at the more mobile
13 radionuclides, and so that's why they imposed, you know,
14 a peak dose standard. But they also said that it
15 demonstrates a relationship between site suitability to
16 the performance objectives specified in the rule itself.
17 This is really just an overview of the
18 design itself. The first layer that you is really an
19 evaporation of cover itself. We have multiple intruder
20 barriers which are large concrete and boulders. The
21 reason that you see this portion, the arched portion of
22 that performance cover is what happens is, or what it's
23 designed for is when rainfall does come, if it
24 infiltrates to the site, it won't intrude into the waste
25 itself. And again those are multiple layers. The liner

1 system at the bottom is about seven feet thick of
2 reinforced concrete, sand, rebar. And again, we pump
3 any leachate that we have off to evaporation ponds.
4 The hydraulic conductivity of the clays
5 themselves, it's about 600 feet thick. Now, those are
6 more impermeable than concrete themselves. The
7 hydraulic conductivity is 1 times 10 to the minus 9
8 centimeters per second. Again, they're about 600 feet
9 thick of these red bad clays. The facilities are
10 designed precisely at the ridge of where the Dockum
11 Formation is, which is where these red bed clays are.
12 We do have a sandstone lens about 125 feet
13 below grade. We've age dated that water. It age dated
14 about 16,000 years. The reason we age dated it was to
15 show the stability of the site and the fact that that
16 water doesn't move. We took over about 600 borings in
17 order to best characterize the site.
18 This is a picture of the compact facility.
19 We think this is a new industry standard. As you can see
20 the hole itself, the disposal facility -- when it's all
21 said and done it's going to be 100 feet from ground
22 surface down to the bottom of the disposal facility. So
23 again, it's very deep. The cover system varies anywhere
24 from 25 to 40 feet. And again, you can see concrete all
25 around it. You know, there's concrete up the sides of

1 the wall of the disposal facility. Again, the liner is
2 seven feet thick and each of these concrete containers
3 when they're full they'll weigh about 90,000 pounds. We
4 place like ion exchanges resins in them. We grout them
5 in place.
6 CHAIRMAN RYAN: Just to calibrate my eye,
7 how many cubic feet of waste will that disposal unit hold?
8 MR. KIRK: The unit? The disposal unit?
9 CHAIRMAN RYAN: That I'm looking at, yes.
10 This one hole.
11 MR. KIRK: To that hole? That's Phase 1.
12 I could come back and give you some specifications on
13 that.
14 CHAIRMAN RYAN: Okay. That would be
15 great.
16 MR. KIRK: This is a picture, an aerial view
17 of the federal waste disposal facility. You can see it's
18 much larger. And again, for the federal waste disposal
19 facility we can stack, you know, MCC six high.
20 The older facilities. You know, the Clive
21 Facility is a great facility for Class A waste, but they
22 use impoundments. But it's nowhere near the type of
23 features that we have. And again, it's our legislature
24 that helped mandate some of these requirements. And for
25 the Barnwell Facility, just in oversight -- you know, and

1 I just have to commend the Barnwell Facility. It's
2 really helped, you know, support the generators across
3 the country for many, many years, but the design of it
4 is not anywhere near the WCS facility because our
5 facility is modern and it's forward thinking.
6 We have updated our performance assessment.
7 You know, we submitted a major amendment request where
8 we can take up to 400,000 cubic meters of depleted
9 uranium. We submitted that in August of 2013. You
10 know, as I had mentioned before, the maximum doses to an
11 intruder is really limited to the reasonably maximum
12 exposed individual. It was also well below the
13 regulatory limits.
14 You know, when we were looking at peaks, we
15 spoke to our regulators as to what they wanted us to see.
16 In the original application it was 50,000 years. To take
17 waste up to the Class C limit, you know, we looked a peaks
18 from 100,000 years up to 1 million years time period.
19 And what it really show you -- I would agree it tells you
20 nothing about the precision of the dose estimate, but it
21 should tell you that you should have confidence in the
22 performance of your site.
23 CHAIRMAN RYAN: I got to tell you I struggle
24 with a million years, because that's probably a range of
25 probability where the U.S. could get whacked up pretty

1 good by a meteor strike. I mean I just don't have any
2 confidence whatsoever that --
3 MR. KIRK: We didn't look at meteor
4 strikes.
5 (Laughter.)
6 MR. KIRK: We do not look at meteor strikes
7 or the probability.
8 CHAIRMAN RYAN: Listen, a million years for
9 anything in a model of surface behavior is silly. I mean
10 how can you say there's any certainty in what you end up
11 with as the answer?
12 MR. KIRK: Well, you know, people look at
13 the geological record. You know, they look at that and
14 they make judgments on faults and those sorts of things
15 for much longer periods than a million years.
16 CHAIRMAN RYAN: I'm not asking what people
17 do. I'm asking how you did it. With what certainty are
18 you making estimates over that time period?
19 MEMBER ARMIJO: Well, the impression I get
20 is you can do these calculations and there's really no
21 standard against what somebody can judge whether you're
22 right or wrong. There's a lot of opinion, there's a lot
23 of assumptions and you do your best and you're in an
24 environment where the legislature says, okay, you've
25 satisfied us. And but as far as really believing it, you

1 know, as long as you don't have to comply in a hard sense
2 to meet a -- then I think I understand what you're doing.
3 MR. KIRK: Well, you know, the effort that
4 we had in front of us, we had a regulation which is 1,000
5 years or peak dose. We used the best tools that are
6 available today to estimate, you know, environmental
7 performance of the site. The model showed that the
8 site's going to perform for, you know, well past 10,000
9 years.
10 CHAIRMAN RYAN: I'm not arguing with your
11 modeling. Not at all. I mean I understand how you did
12 it, what you did, what you calculated, but when you get
13 into time periods of say 500 or 1,000 or 10,000 kinds of
14 numbers and get to a million years, then lots of features,
15 events and processes that weren't in play in your
16 performance assessment come into play.
17 MR. KIRK: I agree with you.
18 CHAIRMAN RYAN: Yes, okay. All right.
19 That's fine. I understand.
20 MR. KIRK: You know, as I mentioned before,
21 we did look at climate change where we doubled the annual
22 rainfall.
23 CHAIRMAN RYAN: Scott, I'm going to have to
24 ask you to wrap up because we do have another -- you know,
25 Dan yet to speak and we're running short on time.

1 MR. SHRUM: With your permission should
2 Mike Benjamin and I switch, because he said he's is
3 shorter.
4 CHAIRMAN RYAN: No, it's not a matter
5 of --
6 MR. SHRUM: Okay.
7 CHAIRMAN RYAN: -- time. It's a matter of,
8 you know, getting --
9 MR. SHRUM: Understood. Okay.
10 CHAIRMAN RYAN: We'll be a little late
11 going to lunch, but that's okay.
12 MR. KIRK: So you want to hear the
13 conclusions?
14 CHAIRMAN RYAN: Sure.
15 MEMBER ARMIJO: Yes, just keep going.
16 MR. KIRK: Much has changed in the manner
17 in which radioactive waste materials are being managed
18 since Part 61 was promulgated over 40 years ago.
19 Our site is the only site that's been
20 licensed since the Low-Level Waste Policy Act was enacted
21 in 1980.
22 We believe that safety has assumed a
23 leadership role in helping site a new facility and
24 developing a 21st Century state-of-the-art disposal
25 facility.

1 The NRC's guidance developed with the
2 support of Agreement States hosting a disposal facility
3 have recognized the need for a period of compliance of
4 10,000 years.
5 A 1,000-year period of compliance is not
6 sufficient to evaluate the long-term environmental
7 performance of a disposal facility, especially for
8 long-lived radionuclides.
9 Building community support is essential to
10 the development of new sites.
11 Communities willing to host a license
12 facility should expect a modern state-of-the-art
13 facility built on the best science and technologies that
14 are available that are really depended upon to protest
15 public health long into future.
16 The length of time for a period of
17 compliance is more of a policy issue than a technical
18 decision.
19 Demonstrated compliance for a well-sited
20 and designed facility for 10,000 years is not
21 unsurmountable as evidenced by the successful licensing
22 of the WCS facility. Thank you very much.
23 CHAIRMAN RYAN: Scott, thanks very much for
24 your presentation.
25 Any questions or comments for Scott?

1 MEMBER ARMIJO: One quick question. Now,
2 first of all, thank you for a very good presentation and
3 obviously a very modern facility. There's no question
4 about that. But the question I have is this facility was
5 designed and licensed to the current regulations of Part
6 61 and those additional requirements from the State of
7 Texas. So if that's the case, and you believe this would
8 comply with a new Part 61, then does Part 61 do anything
9 for you, the proposed regulations? Does it help you?
10 Does it bother you?
11 MR. KIRK: Yes, and that's a very good
12 question. I think the part that helps is it's
13 recognized, at least in my opinion, that you need to
14 demonstrate whatever waste streams that you put into that
15 disposal facility are safe. But the classification
16 tables, you know, licensees can use those or they can do
17 a site-specific analysis. So for depleted uranium I
18 think that really helps us because we demonstrated the
19 safety case. If later if the NRC came back and said, hey,
20 DU is not Class A waste, it's Class B or C, we'd be able
21 to take it. But if they say that it's greater than Class
22 C waste, we'd -- I think it demonstrates that for a modern
23 disposal facility it's very helpful in that regard,
24 especially when it comes to depleted uranium.
25 MEMBER ARMIJO: Okay. Thanks, Scott.

1 Appreciate that.

2 MR. KIRK: Thanks very much for your time.

3 CHAIRMAN RYAN: Scott, appreciate it.

4 Thank you for being here.

5 MR. KIRK: Thank you.

6 MR. WIDMAYER: Can you do it, or you want

7 me to do it?

8 MR. SHRUM: I don't know. It's pretty

9 high-tech here.

10 MR. WIDMAYER: Oh, come on.

11 (Laughter.)

12 MR. WIDMAYER: See Shrum?

13 MR. SHRUM: Got it.

14 MEMBER STETKAR: Welcome to our world.

15 MR. SHRUM: Here we go. Hey, that wasn't

16 bad, was it?

17 CHAIRMAN RYAN: Perfect. Very good.

18 Thank you very much for being with us. Dan Shrum from

19 EnergySolutions.

20 MR. SHRUM: Very much appreciate the

21 opportunity. I do have a disclaimer that when Part 61

22 was first being contemplated, these changes, I had a full

23 head of hair and --

24 (Laughter.)

25 MR. SHRUM: -- I can only imagine what I'm

1 going to look like when it's done.

2 MEMBER POWERS: Just remember there are

3 only a few perfect heads in this world. The rest of them

4 are covered with hair.

5 (Laughter.)

6 MEMBER BROWN: Wise words.

7 MR. SHRUM: I've got some slides in here for

8 some context. You know, the NRC is proposing these new

9 regulations for waste streams that are significantly

10 different than what was considered when Part 61 was

11 originally developed. Originally the rule was going to

12 require new and revised site-specific technical

13 analysis. The rule was going to say exposure limits for

14 intruders, a developed criteria for the acceptability of

15 low-level radioactive waste. And the rule also

16 identified that Part 20 would also have to be amended.

17 Then in January 2012 the Commission

18 redirected staff and asked them to evaluate to following;

19 and that is, would you consider accepting and adopting

20 new ICRP standards? Would you consider or possibly look

21 at a two-tiered approach for the period of compliance or

22 -- and the compliance period? Would you consider a WAC?

23 And what kind of compatibility? What when these rules

24 are sent out -- what are the states going to have do? So

25 those things were asked by the Commission in January of

1 2012.

2 So the fundamental requirement of the rules
3 is to require performance assessment. There are four
4 commercial disposal facilities in the United States, and
5 all four have done technical analysis to -- and they are
6 different. And that's one of the things that ought to
7 be considered or ought to be looked at is do they need
8 to be the same? I don't have the answer to that. But
9 they're all different. I know that our facility
10 has a different exposure requirement. Ours is a little
11 more stringent than the other facilities. Is that
12 right? Is that wrong? You know, that's what we're here
13 to talk about. All four of them have WACs also. All of
14 the facilities have waste acceptance criteria.

15 On the two-tiered approach, the word
16 "reasonably." Now I've been taught to be very careful
17 when I write things like "significant" and "reasonably,"
18 and that's been a point of discussion. And I'm going to
19 not shy away from it. We're going to discuss that word
20 once again.

21 To me reasonably foreseeable does not mean
22 you can run the model. The model is simple. It runs
23 simple. You know, we've got people that have helped us
24 develop these models.

25 Okay. I'm sorry, John, the model is not

1 simple. It's very complex.

2 (Laughter.)

3 MR. SHRUM: But adding time to it is pretty

4 simple, isn't it?

5 But there's more to the model than just

6 plugging in the numbers. All the facilities are aware

7 that there has to be more than just increasing the time

8 frames. You have to look at durability of cover

9 components. You have to look at the durability of waste

10 forms. You have to look at the HIC durability. That's

11 what a lot of the waste gets disposed of. How about the

12 drainage systems that are either manmade constructed?

13 How long do those last? You know, will those continue

14 to flow over time? Concrete, rebar and those types of

15 things, those are other durability issues that have to

16 be looked at.

17 So, you know, I'm a geologist in training.

18 I like to look at longer time frames. But typically we

19 have not been doing that. We try to look at things about

20 300 years out. Steel, concrete, things like that. So

21 how do we extend those time frames out to 10,000 and make

22 it meaningful? That's the concern.

23 So to me reasonably foreseeable is closer to 1,000 years.

24 And the reason for that is it captures most of the

25 low-level waste that's being disposed of in the United

1 States.

2 Now 1,000 years doesn't capture depleted

3 uranium, but neither does 10,000 or 20,000. Depleted

4 uranium doesn't really start going until the time period

5 after that. Ten thousand years, you know, threw this in

6 there. It's also what was mostly contemplated for

7 high-level waste. Now 1,000 years is consistent with

8 other regulated low-level facilities such as what the

9 Department of Energy has. Now again, we haven't looked

10 at components out for 1,000 years, but we can kind of

11 extrapolate out a little easier from 300 to 1,000 as

12 opposed to 300 to 10,000.

13 Yes, sir?

14 MEMBER POWERS: That's what bothers me a

15 little bit. Your first line, you had me in your hand when

16 you said you'd like to think of 300 and then you went to

17 1,000. I mean 300 seems plausible for things.

18 MR. SHRUM: And why did I say 1,000?

19 MEMBER POWERS: Yes, then you went wimp on

20 me.

21 (Laughter.)

22 MR. SHRUM: One, two, three, four, five,

23 six. The sixth bullet. You're absolutely right. A

24 thousand is tough. When you start looking at components

25 of a system, of an engineered system, 1,000 is tough.

1 MEMBER POWERS: We were having troubles
2 getting from 60 to 80 on components.
3 MEMBER ARMIJO: Well, you know, I got to
4 step in at least from a metallurgist's standpoint. You
5 know, if you go down to the museums here in Washington,
6 you go and see the ancient Chinese bronzes, 2,000, 3,000
7 years old, cast bronzes in beautiful condition, buried
8 in the ground for thousands of years. There was a
9 finding in Scotland several years back of buried iron
10 spikes that the Romans buried.
11 MR. SHRUM: Yes.
12 MEMBER ARMIJO: Buried for almost 1,500,
13 1,800 years in pretty nasty soggy Scottish soil without
14 any engineered barriers. When they were discovered and
15 found, they were still -- yes, they had rust on them, but
16 they hadn't dissolved away. They still were sharp,
17 pointed and functional. So, you know, metals -- you
18 know, I don't know concrete. Concrete could be a tougher
19 problem. So things don't degrade. You have that much.
20 So 1,000 is not an extraordinary challenge, I don't
21 think, but it will be costly to prove it with experiments.
22 But I think --
23 (Laughter.)
24 MEMBER POWERS: I want to do those
25 experiments.

1 MEMBER ARMIJO: No, they've already been
2 done.
3 (Laughter.)
4 MEMBER ARMIJO: Archeology will tell you
5 it's there hopefully, you know?
6 MEMBER POWERS: Sam, for every case that
7 you find a nail that lasted 1,000 years, I can find cases
8 of nails that didn't last 5.
9 MEMBER ARMIJO: Well, you've had
10 different --
11 (Laughter.)
12 MEMBER ARMIJO: I'm just saying that there
13 are lots and lots of archaeological findings to
14 demonstrate materials last quite a long time.
15 CHAIRMAN RYAN: If you take a look at it
16 from the other side of the coin and say what radionuclides
17 are left at time A, B, C and D down the timeline, you'll
18 find very quickly that your down to a very small number
19 of radioactive materials with long half-lives and very
20 low inventories in an inventory that's a big inventory.
21 Chlorine-36 and a little bit of this and a little bit of
22 that and, you know, that's it.
23 MEMBER POWERS: I mean that seems to me
24 that's really where you get to is what will I have left
25 that I have to worry about?

1 CHAIRMAN RYAN: And I think at some point
2 when you look at failure barriers or containers or
3 whatever it might be, you've got to also kind of line up
4 with what fraction of the radioactive material inventory
5 is still around. Two-thirds of the inventory is
6 cobalt-60.
7 (Laughter.)
8 CHAIRMAN RYAN: You know, and 300 years,
9 cesium and strontium. I mean not -- you know, 30-year.
10 Three hundred years that's gone, and lots of other stuff
11 is gone with it. So I struggle with the fact that we talk
12 about paying 20,000 years, like other DU what's going to
13 be left? Not much.
14 MEMBER BLEY: Well, I think, you know, I
15 mean his third bullet is kind of where we started on this
16 at our first meeting some long, long time ago.
17 CHAIRMAN RYAN: Yes.
18 MEMBER BLEY: You know, except for DU
19 you're probably all right at much less than that.
20 CHAIRMAN RYAN: Right.
21 MEMBER BLEY: And going to 10 or 20 doesn't
22 get you any closer to the --
23 (Laughter.)
24 MEMBER POWERS: Not much.
25 MEMBER ARMIJO: But, you know, I think

1 Dana's point is that, you know, if you were talking about
2 300 years, 500 years, you address the problem of
3 low-level waste, but you don't address DU.
4 MR. SHRUM: That was my point.
5 MEMBER ARMIJO: Yes.
6 MEMBER POWERS: And you never address DU.
7 MEMBER ARMIJO: And you never will.
8 MR. SHRUM: You never will address DU.
9 MEMBER ARMIJO: And so --
10 MR. SHRUM: I agree with that.
11 MEMBER ARMIJO: Okay.
12 MR. SHRUM: Okay. Thank you. Okay. So
13 1,000, this gets to your point. It's still a long time.
14 (Laughter.)
15 MR. SHRUM: I am well aware of that. But
16 you get closer to trying to manage the uncertainty of
17 1,000 better than you can with other time frames. I
18 believe it does give confidence to other stakeholders.
19 Other stakeholders may believe that we have to model with
20 certainty out to 2 million years or don't take it. We
21 need to change and work on changing that expectation and
22 through education through that. And it's also a number
23 that won't cause unintended consequences for some of the
24 existing facilities.
25 So performance period. So the first one

1 was reasonably foreseeable compliance period. The
2 second tier is performance period. And that's used to
3 capture longer-lived isotopes. And I believe, it's my
4 opinion that they need to be looking more to catastrophic
5 effect, not 25 millirem, not even 500 millirem to the
6 inadvertent intruder which is being proposed, but into
7 the 1 to 10 rem range. And the reason for that is it's
8 speculative anyway. People live -- I mean we're allowed
9 to give our employee five rem a year. That's allowed.
10 And, you know, that's a known thing that we can do. And
11 so as we project these things into the future, increasing
12 the threshold might be a reasonable way to handle that.
13 We also believe that as you get into the
14 performance period you start to focus more on the site
15 location as opposed to engineering features. Now the
16 facility that I represent, the Clive Facility, we're all
17 natural materials. We take no credit for any engineered
18 features other than, you know, how long will rock last,
19 and rock is -- rock's been around for quite awhile.
20 So anyway, and then you start to capture
21 what happens with DU, and I'm not saying specifically you
22 capture, but you start to understand some of the dynamics
23 of what will happen with depleted uranium.
24 MEMBER ARMIJO: Well, just on that point,
25 I raised this question before, and wouldn't this whole

1 regulatory process be much cleaner if DU was just
2 regulated separately? Take it out of the low-level
3 waste thing and have a separate regulation that addresses
4 DU and its disposal and not bury it -- and not confuse
5 the -- or add burden to what I consider really low-level
6 waste. It just seems to me that when you stick DU into
7 this regulation, large quantities, it becomes a driver
8 of the regulation, and it shouldn't.
9 MR. SHRUM: I believe that it has conflated
10 two very different things that we've had to deal with,
11 normal low-level waste and the potential of the facility
12 for depleted uranium. However, I do believe that
13 properly worded we can capture both. And I'm going to
14 get some slides later why I think that's important to keep
15 it as one just because of I'm more of a pragmatist on that
16 type of thing. It will be tough to --
17 MEMBER ARMIJO: Okay.
18 MR. SHRUM: Okay.
19 CHAIRMAN RYAN: And you mean keeping it as
20 one in the same regulation and keeping one use the same
21 facility?
22 MR. SHRUM: Yes, one regulation, potential
23 of using one facility. Or not just one facility. I
24 don't mean our facility.
25 CHAIRMAN RYAN: Collocated?

1 MR. SHRUM: It could be collocated, that's
2 right.
3 MEMBER ARMIJO: But distinct requirements.
4 You can't have the same requirements for something that
5 has a 30-year half-life and then the same --
6 MR. SHRUM: I don't disagree with that.
7 Yes, something has to change when you start to evaluate
8 the --
9 MEMBER ARMIJO: There has to be a boundary
10 between so that the requirements don't drift over and
11 you're applying DU thinking to short half-life.
12 MR. SHRUM: That I agree with, yes.
13 It's also been proposed -- you know, the
14 Clive Facility did not evaluate an inadvertent intruder
15 for some specific reasons that I'll get into. Right now
16 it's being proposed that it would be a 500 millirem per
17 year standard. The NRC has also discussed in their
18 recent -- in the July 2013 proposed rule to change the
19 definition of the inadvertent intruder to limit
20 scenarios to reasonably foreseeable activities.
21 Now this is what we are experiencing and I'm
22 going to give you an example of what we are experiencing
23 with what's happening.
24 So we believe we're on the bleeding edge of
25 what's going on with Part 61. The State of Utah has

1 adopted some rules and we're trying to implement those
2 rules and our regulators are trying to implement those
3 rules. And as they implement those rules without clear
4 guidance we are having some unforeseen situations
5 happen. And that's what's happened here.
6 The Clive Facility. This isn't a commercial for
7 the Clive Facility. This is to tell you what we
8 experienced. So it's inhospitable to human health.
9 You cannot live out there. It's very salty. It's
10 doesn't support life in this area. Our regulators
11 concluded that it's unrealistic to assume residential or
12 agricultural intruders. The NRC in their order for the
13 LES said significant intruder exposures at a site like
14 Envirocare; that's the old name, are unrealistic. It
15 could be licensed under Part 61 regardless of the time
16 frame. Okay. This was back in 2006. I'm not going to
17 read all that one, but it says it's a good site.
18 Okay. So as Rusty mentioned earlier, we're
19 doing other licensing things and the state has tried to
20 look at inadvertent and intruder analyses at our
21 facility. And that's gone from in 2006 from what could
22 happen to now we've got a resident that lives, farms and
23 mines at the facility, pumps the water; the water's twice
24 as salty as the ocean, treats the water for consumption
25 and irrigation. They can grow crops at our facility and

1 there's a potential to receive dose from the filter cake.
2 The only reason I'm bringing these up is if
3 we're going to have to look at these time frames, we need
4 a better understanding from the NRC of what is an
5 inadvertent intruder. Is it anybody? Are we going to
6 play the what-if game? Because the what-if game take a
7 long time. You know, so these are some of the things that
8 we were dealing with.
9 So one of the things that they stated was
10 lack of historical habitation doesn't preclude future
11 residence patterns. So they're trying to implement what
12 they believe is going to be coming down the pipeline.
13 I didn't realize that there's a potential
14 to grow algae for food source in high-saline waters, and
15 we're being asked to evaluate that.
16 So when I was a kid, I thought we were all
17 going to be flying around in cars. And we're not yet.
18 I understand that we have to look out into the future.
19 That's the purpose of performance assessments, but we
20 need to be careful on how we do that and we need to be
21 able to be reasonable in doing so.
22 WAC. I think the WAC is a good idea. It's
23 consistent with what DOE does. It's also --
24 MEMBER ARMIJO: Dan, I'm sorry to --
25 MR. SHRUM: Oh, I'm sorry.

1 MEMBER ARMIJO: -- interrupt you. Getting
2 back to the current issues related to the inadvertent
3 intruder, is this strictly somebody saying, okay, given
4 all these what-ifs, run your model and you'll get some
5 answers, but you don't have to do anything about it?
6 MR. SHRUM: Oh, no, we have to do things
7 about it.
8 MEMBER ARMIJO: What would you have to do?
9 MR. SHRUM: I don't know.
10 MEMBER ARMIJO: That's the problem then.
11 If it was just running your model for all of these
12 what-ifs, you know, people play around with that until
13 they're broke or satisfied, but as long as you don't have
14 to physically do anything other than run the model --
15 MR. SHRUM: Now, I have been informed that
16 performance assessments are a good tool to help with your
17 decision process.
18 MEMBER ARMIJO: This isn't.
19 MR. SHRUM: We have been in a deterministic
20 -- the way we have done our models in the past. And so
21 actually the performance assessment is the answer and
22 we're working with the new models that have been done and
23 saying that it helps inform the decision. But to date
24 it's been that the decision -- and John's nodding his head
25 -- John Tauxe with Neptune -- that's the world right now.

1 It is the decision. Okay? Any other questions?

2 MEMBER ARMIJO: So it's becoming the basis

3 for decision as opposed to just information?

4 MR. SHRUM: Correct. I know that might be

5 a little too bold, but that's the reality.

6 MEMBER ARMIJO: Oh, that's what we have to

7 be careful about, that if that's not the intent of the

8 regulations, we shouldn't make sure that it's worded so

9 it doesn't become the basis.

10 MR. SHRUM: We're very supportive of this

11 WAC idea, because all of the facilities currently have

12 waste acceptance criteria. It's used throughout DOE.

13 I believe that a properly written WAC criteria would end

14 the need for further rulemaking because you could have

15 the table or you could use through analysis waste

16 acceptance criteria and you could inform the decision

17 either way. And we believe that that's important for

18 moving on and we believe it's important to move on.

19 For example, we had a moratorium placed in

20 the State of Utah in the disposal of the depleted uranium

21 in June of 2010. We submitted our performance

22 assessment on June 1st of 2011. The state has begun

23 their performance -- the review of our PA. But this has

24 been one of the policy issues that has come up. And I

25 want to be very clear on this. I don't disagree with what

1 the state is saying, but further Part 61 rulemaking is
2 a significant policy issue to be resolved. And they will
3 wait until this is done. And I don't know that I blame
4 them for that, but it's a real challenge for us. You
5 know, they will wait. They don't know what will happen.
6 And what will happen -- and will depleted uranium be
7 reclassified or something like that? So that's a
8 concern.
9 And so when you ask me about two rules and
10 things like that, it needs to come to a conclusion.
11 MEMBER ARMIJO: So there's a lot of
12 regulatory uncertainty right now and the state has chosen
13 let's put everything on hold until we're --
14 MR. SHRUM: Well, we're doing it right now,
15 and that's good. And we're supportive of that, but we
16 won't probably won't receive a decision until Part 61 is
17 completed.
18 CHAIRMAN RYAN: You mean, just to be clear,
19 until the Part 61 update that's currently in process, or
20 soon to be in process here?
21 MR. SHRUM: And there's discussion that it
22 will be opened back up again. That's discussed very, you
23 know, candidly with NRC.
24 CHAIRMAN RYAN: Okay.
25 MR. SHRUM: And we may open it back up

1 again. And that's tough. That's tough to be a
2 regulated entity when -- you know, it's not that we want
3 absolute certainty, but if it's being openly discussed
4 that Part 61 may be opened up again, that's a concern for
5 us. It's a concern for other stakeholders also.
6 Compatibility. A lot of these are just my
7 opinion. If this was so important, I thought the
8 compatibility categories would be quite high. Right now
9 there's a lot of overlapping. It's not clear to me
10 exactly where the compatibility is going to come down.
11 I think further discussion on that. I don't know that
12 we have to have absolute consistent standards through all
13 the states, but many of the issues of, you know, requiring
14 a performance assessment and probably dose standards, as
15 well as what the inadvertent intruder scenarios are going
16 to look like would be important to have that consistent.
17 But there will be some -- states absolutely have the right
18 to either require some things or suggest some things and
19 move into that direction. Okay?
20 That's all I have. Thank you very much for
21 your time. And any other questions?
22 (No audible response.)
23 MR. SHRUM: Always good to go right before
24 lunch.
25 (Laughter.)

1 CHAIRMAN RYAN: Any questions from
2 members?
3 (No audible response.)
4 CHAIRMAN RYAN: Any other comments or
5 questions for anybody in the room, speakers past or --
6 (No audible response.)
7 CHAIRMAN RYAN: Hearing none, Mr.
8 Chairman, we'll convene until -- how about we make it
9 1:10?
10 MEMBER ARMIJO: 1:10. Okay. We'll have a
11 full hour?
12 CHAIRMAN RYAN: Yes.
13 MEMBER ARMIJO: Okay. Thank you, sir.
14 CHAIRMAN RYAN: Thank you. We'll convene
15 until 1:10.
16 (Whereupon, the hearing was recessed at
17 12:11 p.m. to reconvene at 1:10 p.m. this same day.)
18 CHAIRMAN RYAN: And I appreciate everybody
19 coming back after lunch. The next speaker is Mike
20 Benjamin who will talk about the disposal facility in
21 Barnwell, South Carolina, operated by EnergySolutions.
22 Mike, welcome and thanks for being with us.
23 MR. BENJAMIN: Thank you, Mike, and thanks
24 to the ACRS for allowing me to spend a few minutes talking
25 about Barnwell. My name is Mike Benjamin. I'm the

1 general manager for the disposal operations for the
2 EnergySolutions Barnwell Disposal Facility.
3 Contrary to some belief, Barnwell is not
4 closed. Barnwell, we work every day, year around, and
5 we are providing a very necessary service to the Atlanta
6 Compact states providing them a low-level radioactive
7 waste disposal service.
8 We've been in business since 1971. As
9 Susan Jenkins' slides showed we've used about 86 percent
10 of the land surface as completed and have enhanced caps.
11 Enhanced caps are a multilayer, low permeability soil,
12 bentonite mat, a high density polyethylene umbrella on
13 top of that with a sand layer, top soil and vegetation.
14 I think there was a question about the
15 efforts taken for the long-term care. Taking care of
16 that vegetative cover ensuring that tall trees or
17 long-rooted species do not have a chance to grow means
18 that -- our cutting season, or our growing season in South
19 Carolina runs from May to October so it's almost a
20 constant grass-cutting challenge. And then adding 200
21 wells for sampling analysis and reporting keeps a number
22 of folks fairly busy.
23 As the host for the Atlantic Compact or the
24 disposal site for the Atlantic Compact, we expect to be
25 in business until about 2038, allowing us to continue

1 receiving about 7,000 to 11,000 cubic feet of waste per
2 year, and allowing near the end of that time frame some
3 additional disposal space for decommissioned reactor
4 facilities.
5 CHAIRMAN RYAN: What kind of components
6 would go into the space for decommissioning reactors?
7 MR. BENJAMIN: It's hard to say. The
8 dynamics of the low-level waste industry, I think, have
9 changed a little bit with Clive and Barnwell being
10 restricted to the three states, so probably the
11 irradiated components.
12 CHAIRMAN RYAN: But nothing fuel bearing or
13 anything like that.
14 MR. BENJAMIN: No fuel bearing. We've
15 never received any fuel bearing materials. Everything
16 is strictly low-level radioactive waste.
17 CHAIRMAN RYAN: Thank you.
18 MR. BENJAMIN: We agree with the
19 conclusions and the recommendations that the ACRS
20 provided to the NRC chair dated July 22nd in their memo
21 revisions to the low-level radioactive waste disposal
22 requirements, 10 CFR Part 61.
23 The Barnwell Disposal Facility has disposed
24 of low-level radioactive waste for longer than 40 years
25 in compliance with all the regulations at any given time.

1 The radiological performance of the BDF is addressed by
2 the acceptance of waste according to our waste acceptance
3 criteria, regulations, direct measurements and model.
4 As an operating facility, we believe the
5 additional imposed requirements are a risk because we
6 would have to demonstrate compliance for an operating
7 facility for 10,000 years as well as protection of
8 inadvertent intruder for that period.
9 We do not believe there is justification for
10 the selection of this time period. We believe
11 forecasting human activities and natural processes over
12 10,000 years has not progressed to be a reliable science.
13 (Crosstalk)
14 MR. BENJAMIN: As nice as I can be.
15 MEMBER POWERS: A little bit understated
16 there.
17 MR. BENJAMIN: The proposal to change the
18 regulations to also be applicable to previously disposed
19 waste will cause unnecessary burden to the BDF.
20 I think Susan Jenkins talked about our
21 extended care fund. Today our extended care fund
22 consists of about $144 million where we are withdrawing
23 about $2.2 million per year for what is considered
24 institutional activities.
25 And those are those activities that manage

1 and maintain and monitor the closed portion of the site,
2 and the proposed changes will not affect the performance
3 of the facility for waste that's already disposed of.
4 CHAIRMAN RYAN: Just to clarify a point
5 here. Also receiving institutional control money with
6 currently received waste, correct?
7 MR. BENJAMIN: Yes.
8 CHAIRMAN RYAN: Yes, so what's the net --
9 and I understand. What's the net to the bottom line?
10 Are you still gaining in funds or are you spending more
11 money than what you're adding?
12 MR. BENJAMIN: Still gaining in funds.
13 CHAIRMAN RYAN: Oh, so the fund is still
14 growing in spite of the fact you're using some of that
15 revenue for ongoing.
16 MR. BENJAMIN: Right.
17 CHAIRMAN RYAN: Okay, thanks.
18 MEMBER SKILLMAN: Mike, let me ask this.
19 I'd asked Susan about the activities to maintain the
20 facility and she mentioned inspections, looking for
21 burrowing, looking for intrusion, kind of walking the
22 fence line.
23 You just communicated that the growing
24 season as it is in South Carolina, you've got quite a few
25 people tied up cutting grass and keeping the fauna and

1 flora from going through the HDPE. I think that's what
2 you were meaning when you said that.
3 MR. BENJAMIN: Yes.
4 MEMBER SKILLMAN: Please tell us what that
5 support will look like after 2038.
6 MR. BENJAMIN: As far as manpower-wise or
7 --
8 MEMBER SKILLMAN: Yes. Is there going to
9 be an army of grass cutters and security with arms and
10 patrolling the perimeter? What's it going to look like
11 after 2038 as we consider control period?
12 MR. BENJAMIN: I think my opinion will be,
13 is what I will express. At that time the site would be
14 under full control of the South Carolina Department of
15 Health and Environmental Control. We would have
16 terminated our license.
17 If they chose to retain the company
18 EnergySolutions at that time to do those managing and
19 monitoring efforts, two or three people to maintain and
20 manage the physical portion of the facility -- cutting
21 grass, maintaining the equipment, walking the site on a
22 regular basis looking for signs of disturbance or
23 subsidence. Another small handful of environmental
24 samplers, analysts and recordkeeping processes.
25 So right now we're spending about $2.2

1 million a year on that. Things come up. We've had two
2 cap repairs over the last couple of years. They were
3 small, so the cost to repair was minimal. We have
4 brought in subcontractors to help support that but you've
5 still got to have local people or people on the payroll
6 to support the subcontractors.
7 MEMBER SKILLMAN: So you would see that
8 continuing after 2038 whether EnergySolutions is doing
9 it or the state is doing it?
10 MR. BENJAMIN: Yes. I believe it would
11 continue at least for a five-year period, and then could
12 be reduced for the next 100-year period, post closure
13 period.
14 MEMBER ARMIJO: Now the state has control
15 of those funds.
16 MR. BENJAMIN: Yes.
17 MEMBER ARMIJO: So they could either keep
18 you folks running --
19 MR. BENJAMIN: Yes.
20 MEMBER SKILLMAN: -- post closure or get
21 someone else. And it would really be their decision on
22 whether something needed to be done, let's say another
23 repair or something like that or would their contractor
24 --
25 MR. BENJAMIN: Well, the process right now

1 is we, or the department recognize the need for an effort.
2 We gather the facts and make a proposal to South Carolina
3 Department of Health and Environmental Control.
4 If they approve or agree, we send a
5 communication to South Carolina, the Budget and Control.
6 We have a Budget and Control Board that oversees
7 disbursement of funds. We would make a request to that
8 Budget and Control Board to spend those monies contingent
9 upon approval from the Department of Health and
10 Environmental Control.
11 MEMBER SKILLMAN: Okay. Thank you.
12 MR. BENJAMIN: You're welcome.
13 CHAIRMAN RYAN: With that any other
14 questions for Mike?
15 MEMBER ARMIJO: Mike, before you go, let's
16 assume that the regulations, proposed regulations are
17 implemented as written. Have you estimated what the
18 cost burden would be to do the various analyses that would
19 be required?
20 MR. BENJAMIN: No, we have not. And I
21 think a modeling run is probably a million dollars.
22 MEMBER ARMIJO: Everything costs a
23 million.
24 MR. BENJAMIN: Remediation. You know, if
25 there was remediation required it would be very, very

1 difficult to quantify that without some type of target
2 to look for.
3 MEMBER ARMIJO: Okay. But it wouldn't be
4 a small amount of money even if you didn't have to
5 remediate.
6 MR. BENJAMIN: Yes.
7 MEMBER ARMIJO: So you would just run some
8 models, and are there specific models that are approved
9 for use in this kind of work or is it just --
10 MR. BENJAMIN: I'm not a modeler so it would
11 be hard to answer that.
12 MEMBER ARMIJO: Okay. I'll ask someone
13 else. Thank you.
14 MEMBER RAY: It's somewhat on the same
15 point, but I'm just struggling with the last paragraph
16 in your letter here. "The proposal that changes
17 regulations to also be applicable to previously disposed
18 waste will cause unnecessary burden on the BDF." I think
19 I understand that, sort of what you were just talking
20 about.
21 The second sentence though is the one I
22 don't understand. "The proposed changes will not affect
23 the performance of the BDF for waste already disposed."
24 What's the basis -- first of all, tell me if I understand
25 that to mean there's an unnecessary burden but it

1 wouldn't be excessive to the point of affecting
2 performance.
3 MR. BENJAMIN: For previously disposed
4 waste it's at where it's going to be. In my opinion it
5 would be very non-ALARA to try to exhume that waste,
6 repackage and rebury it.
7 MEMBER RAY: Sure.
8 MR. BENJAMIN: So given all those factors,
9 previously disposed waste, it is what it is.
10 MEMBER RAY: Well, I know. But what do you
11 mean by will not affect the performance?
12 MR. BENJAMIN: What's going to perform, and
13 the site's going to perform in that general area of the
14 site as it will with a 10,000-year PA, or without a
15 10,000-year PA.
16 MEMBER RAY: Okay. I'm trying to just
17 compare the unnecessary burden to the will not affect the
18 performance. Those two things don't seem --
19 CHAIRMAN RYAN: There may be a point I can
20 make that will help.
21 MEMBER RAY: Go ahead.
22 CHAIRMAN RYAN: I think, Mike, the point is
23 what would affect buried waste? Well, infiltration from
24 the top, of water, is the principle issue in my book
25 because the water's got to rise up into the waste.

1 MR. BENJAMIN: I think in the long term it's
2 more erosion of the top.
3 CHAIRMAN RYAN: Well, whatever happens to
4 the top to improve water getting down into the waste
5 though is a negative. So all the capping is designed to
6 preventing that so maintaining the cap is really kind of
7 the key thing to keep that from being a risk. Water coming
8 up from below is very unlikely because the water table
9 would take tremendous amounts of water to raise that
10 aquifer up any appreciable amount from its, you know,
11 current very small oscillations.
12 MR. BENJAMIN: And I think our idea is that
13 if we ran a 10,000-year PA and we were over 25 millirem
14 per year at some point, we can't wait for 5,000 years to
15 do a remediation. We would have to develop and implement
16 activity or action now, or at that time of finding we
17 would exceed a target which what we feel would be an
18 unnecessary burden.
19 MEMBER RAY: Right. Again I'm still just
20 struggling with the last sentence, what it means.
21 "Proposed changes will not affect the performance of the
22 BDF."
23 MEMBER BROWN: Well, they seem
24 inconsistent. Is that --
25 MR. WIDMAYER: Well, I understand it to say

1 that he thinks that South Carolina DHEC is not going to
2 make them do anything. So the waste that's there is
3 going to perform the way it's going to perform. So even
4 if they spend a million dollars doing modeling, South
5 Carolina DHEC's not going to --
6 MEMBER RAY: We've spent too much time on
7 this. I should just give up. But the first sentence
8 seems to say you should not make these changes because
9 of the unnecessary burden. The second sentence says,
10 but it won't make any difference.
11 MEMBER BROWN: And what we often do is to
12 take this comment and say if they do the analyses and the
13 analyses also but nobody makes them do anything with it,
14 then it changes nothing. But if somebody made them --
15 (Crosstalk)
16 MR. WIDMAYER: The regulation will make
17 them do the analyses or else they have to close.
18 MEMBER ARMIJO: Right. But also if the
19 analysis shows that there is no need for changing
20 anything, you'll have just have proved that you spent a
21 lot of money where no safety benefit. If the analysis
22 shows that your caps are going to be eroding badly in
23 5,000 or 10,000 years, then you would have to spend money
24 to re-cap assuming that the state made you do that.
25 The question is will these calculations

1 yield a safety benefit for this particular site, and I'm
2 getting the impression you're saying it's just a waste
3 of money. That's my impression.
4 (Crosstalk)
5 MEMBER RAY: I can read lots of things into
6 it, but I'm just trying to understand what was intended
7 by the second sentence.
8 MEMBER ARMIJO: Well, you can try one more
9 time, Mike, because we all three have different --
10 MR. BENJAMIN: We're talking specifically
11 about previously disposed waste. So we've already
12 placed the waste in the ground and it's met all of our
13 regulatory requirements.
14 MEMBER BLEY: When you placed it.
15 MR. BENJAMIN: When we placed it. So
16 making a new rule today that affects previously disposed
17 waste, we feel, places unnecessary burden on the disposal
18 operator.
19 MEMBER RAY: I understand that.
20 MR. BENJAMIN: That rulemaking doesn't
21 change the overall performance of the disposal
22 methodology. But for those wastes that are already in
23 the ground it's there. The engineering barriers are
24 there, the natural barriers are there, and they're not
25 going to change over time.

1 MEMBER RAY: Okay.

2 MEMBER STETKAR: But if the analysis said
3 you ought to exhume that and put in better barriers or
4 just move it out that would affect you.

5 MR. BENJAMIN: Sure. That would greatly
6 affect.

7 MEMBER STETKAR: You bet.

8 MEMBER ARMIJO: And it would affect your
9 performance --

10 (Crosstalk)

11 MEMBER ARMIJO: It would have an effect if
12 it led to physical changes in what you do.

13 MR. BENJAMIN: Yes, maybe we overlooked
14 that kind of an extreme activity.

15 CHAIRMAN RYAN: One thing that comes to my
16 mind is from my own history, is that I think it's very
17 important to understand what's around at that period of
18 time. The radionuclides that would be around at that
19 kind of 300-year period would be nickel-62, uranium-238,
20 which is there forever, carbon 14, I-129 and tech-99.
21 That's it. That's all that's left.

22 MEMBER POWERS: There's a certain amount of
23 235.

24 CHAIRMAN RYAN: 235, 238, yes. I'd say
25 that's uranium.

1 MEMBER BLEY: And the implication of that
2 is it's very unlikely that a future analysis would show
3 that you needed to do anything.
4 CHAIRMAN RYAN: Bingo. Thank you.
5 MEMBER ARMIJO: So even if your caps were
6 eroding and all that?
7 CHAIRMAN RYAN: Well, 1.1 million curies of
8 cobalt-60 will receive and irradiate hardware. The
9 five-year half-life, that's long since out the window.
10 (Crosstalk)
11 CHAIRMAN RYAN: The only radionuclides
12 that are out there are the ones that remain. There's
13 one, two, three, four and five.
14 MEMBER POWERS: And those radionuclides
15 remain because they decay every alternate leap year.
16 CHAIRMAN RYAN: Yes, or somewhere around
17 that roughly. So I think it's very important to keep in
18 perspective that as time marches on the problem gets
19 smaller and smaller.
20 MEMBER POWERS: I think that's a very, very
21 important perspective that it is, there's a tendency to
22 say 1,000 is good then 10,000 must be better. But you
23 have to understand it's the product of time and what
24 you're specific dose rate is. And in fact that number
25 is falling off at fairly dramatic --

1 CHAIRMAN RYAN: 9.76 curies of I-129
2 distributed in how many acres, Mike?
3 MR. BENJAMIN: 235.
4 CHAIRMAN RYAN: 235 acres doesn't
5 necessarily give me a huge amount of trouble.
6 MEMBER ARMIJO: But you already knew that.
7 (Crosstalk)
8 MEMBER POWERS: Iodine-129 anywhere for
9 any purpose doesn't give me a lot of trouble.
10 MEMBER ARMIJO: Okay, so we've proved that
11 we know all of these things already. It's probably in
12 your existing performance model, and repeating that
13 model if required by Part 61 rulemaking would cost money
14 and unlikely to require physical changes, so why are we
15 doing it? I guess that's your point.
16 CHAIRMAN RYAN: No, I think what Mike's
17 saying is he doesn't see any value in going in and
18 disturbing all of that. Did I catch you right?
19 MR. BENJAMIN: Right.
20 MEMBER POWERS: Well, I mean the fact is
21 that exhuming waste and doing something else with it
22 actually incurs hazard.
23 CHAIRMAN RYAN: Yes, an operational hazard
24 and all that --
25 MEMBER POWERS: If you're precluding

1 speculated hazard by imposing demonstrable hazard
2 doesn't seem like a good tradeoff to me.
3 MEMBER RAY: Yes, but what you're referring
4 to is, okay, the legacy stuff that's certainly true about
5 and therefore almost grandfathers it in whatever
6 circumstance it's in. I'm not sure that it speaks to any
7 other aspect of the proposed changes here.
8 MEMBER POWERS: But wasn't trying to
9 either.
10 MEMBER ARMIJO: We're just talking about
11 already disposed stuff.
12 CHAIRMAN RYAN: Okay, any other questions
13 for Mike?
14 MEMBER BLEY: Yes. Just as a devil's
15 advocate from what the staff presented us at various
16 times in the past, the impression I got from the last
17 subcommittee meeting when they presented what the
18 analysis requirements were was that if you could do a
19 simplified performance analysis along the lines we were
20 just talking and show that given what's left it really
21 doesn't matter, that that would be sufficient and you
22 wouldn't have to do that very elaborate analysis. Now
23 I don't know if that's true or not, but that was what the
24 claim was.
25 CHAIRMAN RYAN: Well, I think that gets

1 back to the kind of operational profile that a site has
2 at any given time where they're brand new and receiving
3 lots of waste --
4 MEMBER BLEY: But I was talking about this
5 case we were just talking to.
6 CHAIRMAN RYAN: Okay.
7 MR. BENJAMIN: And, you know, who makes the
8 decision that the model inputs, especially the societal
9 and natural processes, are correct or agreeable,
10 acceptable?
11 MEMBER POWERS: Well, I think that's where
12 you get the real problem, because I guarantee you that
13 whatever assumption you made there's somebody that
14 thinks that's the worst assumption that ever crossed
15 human mind and that some alternate assumption is
16 demonstrably better.
17 And so without agreements on not only what
18 the assumptions are but what constitutes an acceptable
19 analysis these things are, I mean they just escalate.
20 MR. BENJAMIN: And those assumptions are
21 very site-specific.
22 CHAIRMAN RYAN: Yes, and I think the fact
23 that, you know, there's site-specific assumptions,
24 there's a history of modeling and monitoring that goes
25 back decades at all these sites, and then there's, okay,

1 what do we do with this mass of information in terms of
2 looking forward?
3 Well, are we looking forward with a big,
4 robust input of new waste, are we looking forward with
5 a very modest amount of new waste that's very well
6 characterized or are there new and unique things? So it
7 really has to be a story that goes from start to finish
8 for the whole system of this site before it can really
9 make, well, the path going forward should go down this
10 road.
11 So I appreciate Dennis' question, but
12 that's kind of, it's got to be almost case specific to
13 whatever, you know, scenario you're outlining for that
14 site to move forward.
15 MEMBER BLEY: That's true.
16 MR. BENJAMIN: Thank you all.
17 CHAIRMAN RYAN: Thanks, Mike.
18 (Off the record comments)
19 CHAIRMAN RYAN: Next up on our agenda is
20 Lisa Edwards from EPRI. Lisa, welcome, and thank you for
21 being with us today.
22 MS. EDWARDS: All right. Thank you very
23 much for the invitation and I appreciate the opportunity
24 to talk to you about this topic in particular. I'm going
25 to talk about the time of compliance. So Slide 2.

1 (Off the record comments)

2 MS. EDWARDS: All right, so my name is Lisa
3 Edwards. I'm the senior program manager at EPRI. My
4 programs include the chemistry program, low-level waste
5 radiation management, ground water protection in
6 decommissioning areas. Before I came to EPRI I worked
7 for about 20 years in nuclear power plants and that kind
8 of forms my background for this presentation.

9 So before I start, I just want to give you
10 a high-level view of EPRI. We are a nonprofit research
11 organization, but our mission is to conduct research and
12 demonstrations on key issues that face the electric
13 sector on behalf of our members.

14 You can't hear me?

15 (Off the record comments)

16 MS. EDWARDS: Can you hear me now? Okay.
17 So EPRI is the Electric Power Research Institute. We're
18 a nonprofit organization and we conduct research,
19 development and demonstrations on key issues that face
20 the electric sector. We do that on behalf of our members
21 which is generally electric producers, but also on behalf
22 of the public and we consider the public sector and
23 society our ultimate stakeholder. And I point
24 this out just because I noticed on the agenda that we're
25 listed as industry, and although we do get funding from

1 the industry we are not part of industry. They fund our
2 research but they don't dictate the results or how we
3 report it or, you know, anything --
4 CHAIRMAN RYAN: For our purposes you're
5 part of industry.
6 (Laughter)
7 MS. EDWARDS: Okay, so at EPRI in the
8 low-level waste area we have three focus areas. The
9 first is waste minimization which is basically don't
10 generate the waste. So in this area we conduct research
11 and give the plants tools to minimize waste.
12 In the '90s that was seen in Class A volume
13 reduction, more recently in the Class B and C volume
14 reduction effort. So it's been ongoing. The second
15 prong is safe storage.
16 So that's really focusing on plants that
17 have orphaned waste streams, have lost access to disposal
18 as many of the plants did when environmental closed to
19 out of compact waste, and just to make sure that the
20 plants have the research and the design information they
21 need to build and operate storage facilities in an
22 event-free manner.
23 And then finally, disposal flexibility.
24 So disposal flexibility is about developing the
25 technical basis to help risk inform the regulatory

1 process when revisions to regulatory guidance and rules
2 are going on.
3 So before we get into the details, I kind
4 of just wanted to do just a high level look at some of
5 the discussion topics that I think relate to what I'm
6 going to talk about today. They're a little bit varied,
7 but I think you have to consider all of them together in
8 order to get a complete picture.
9 So the first is related to the near surface
10 disposal versus geologic disposal and the reasonably
11 foreseeable future. I think the thing to keep in mind
12 is that any manmade engineered barriers that are
13 implemented as part of 61 disposal facility will never
14 reasonably afford the longevity provided by a geological
15 disposal site nor do they need to because the decay of
16 low-level of rad waste hazard doesn't warrant it.
17 The shallow land disposal facilities are
18 constructed using materials like concrete and clay and
19 manmade membranes. All things that are going to be
20 expected to erode far more quickly than any geological
21 formation. So the reasonably foreseeable future in
22 terms of shallow land disposal is different than what it
23 is for geological land disposal.
24 In terms of calculations for compliance
25 with a limit that they should have reasonable accuracy

1 in the results, I think to do otherwise, to simply, I
2 think, as someone else pointed out is we can run the miles
3 and produce a number, but the number may have such high
4 levels of uncertainty but it's still a number we can put
5 a value, I think that that maybe could even be considered
6 misinformation. Because when you put a number in print,
7 particularly when you put it in print as a way of
8 satisfying your regulatory requirement, public
9 consumption of that is that that is real number.
10 And generally, our interaction with the
11 public has shown me that the understanding of levels of
12 uncertainty are confidence levels and a number is not
13 generally well accepted. If it's there in writing then
14 that's a real number and it should be able to withstand
15 challenges. And yet we know from a science basis that
16 numbers with high levels of uncertainty are going to have
17 a very difficult time withstanding challenges.
18 MEMBER STETKAR: Lisa, have you tried in
19 your interactions with the public explaining and
20 quantifying and showing the public those uncertainties?
21 MS. EDWARDS: No.
22 MEMBER STETKAR: Okay, thank you. Well,
23 it's been my experience that members of the public do
24 understand uncertainties when you present them, get
25 uncertainties. They may disagree with your

1 characterization but they understand uncertainty.

2 MS. EDWARDS: Okay.

3 MEMBER RAY: And so your point is simply in

4 disagreement with those who have said earlier that the

5 insights that they get are worth the potential

6 misunderstanding because they have looked beyond 1,000

7 years and have felt that they benefited from doing so.

8 But you would think that's not a good idea.

9 MS. EDWARDS: Well, I think that my point

10 is on whether you assess it as a qualitative number or

11 quantitative number.

12 MEMBER RAY: We made that distinction. If

13 we said it was qualitative then what would your answer

14 be?

15 MS. EDWARDS: I'd be more comfortable with

16 that. If it was qualitative and you had the ability to

17 express uncertainty with it and effectively communicate

18 that, that seems more reasonable to me. However, if you

19 say it's quantitative and I give you a limit of 500

20 millirem or 25 millirem or 50 millirem and I say I've done

21 a calculation and I can prove to you that I will be less

22 than 25 millirem a million years from now or 10,000 years

23 from now or, you know, 5,000 years from now, I think that

24 is a different story.

25 MEMBER RAY: Well, then it depends then on

1 how -- excuse me, Dana. It depends on how it's
2 characterized whether or not it's objectionable. Go
3 ahead.
4 MEMBER POWERS: Well, I don't want to --
5 MEMBER RAY: No, I'm done.
6 MEMBER POWERS: When you say the public has
7 troubles with this uncertainty, I don't disagree with you
8 by the way. In contrast to John, I find even trained
9 engineers don't really understand uncertainty
10 especially if they're on the ACRS.
11 (Crosstalk)
12 MEMBER STETKAR: Fortunately I've never
13 been trained so --
14 MEMBER POWERS: You're not even
15 housebroken sometimes.
16 (Off the record comments)
17 MEMBER POWERS: Is the difficulty the
18 public have with the uncertainties is that they ask you,
19 I mean they can't go out a million years and say, see,
20 you were wrong, it came in too high. They physically
21 can't do that.
22 So is the challenge they say, ask you, well,
23 did you consider X? And you did not because it has a
24 probability of some vanishing small, and they say, okay,
25 your number is wrong. And true enough, it is, but by such

1 a minuscule amount that you think you're still
2 comfortable with it. Is that where they have
3 challenges?
4 MS. EDWARDS: I guess the scenario I kind
5 of had in mind when we were preparing these slides is that
6 when you run a calculation like this there's going to be
7 a number of places where you have to make a decision
8 point. That the assumption that you're going to include
9 in your modeling could be somewhere between this number
10 or this number, or that the human activity is going to
11 follow this path or this path.
12 MEMBER POWERS: I see what you're saying.
13 Yes. Yes.
14 MS. EDWARDS: So when you do a calculation
15 like that if at every point, every decision point you go
16 way to the very most conservative, the one that can't be
17 challenged by anyone, you're going to end up with a very
18 good, very big number that cannot easily be challenged
19 in a public forum but will have no meaning.
20 So if the same people decide to take a middle
21 of the road number or make their assumptions balance,
22 kind of not one extreme or the other, in a public forum
23 with a potential audience that believes you are
24 intentionally trying to mislead them, they can say well,
25 you use this number here, but isn't it true that maybe

1 the real number is something out here? And then you look
2 like you're misleading or, you know, stacking the deck.
3 MEMBER POWERS: But you also get into traps
4 of where you're trying to honestly get a balanced view,
5 so you make one kind of assumption here and you make the
6 opposite kind of assumption over here to kind of get a
7 balance, then they say, well, you're inconsistent. I
8 know whereof you speak.
9 MS. EDWARDS: There is a need for DU
10 disposal and I think that's a problem faced in our society
11 where obviously we generate DU and we need to be
12 responsible about how we handle it. But DU is a unique
13 hazard separate and different than the vast majority of
14 the low-level rad waste that's disposed of.
15 And it appears that trying to address the
16 unique characteristics of DU is leading to a
17 one-size-fits-all approach at least in terms of
18 quantitative time of compliance for Part 61 disposal
19 site. It isn't actually, or may not be warranted for
20 low-level rad waste absent DU.
21 And finally, I guess if you think about what
22 is at risk from the actual low-level rad waste stream
23 itself, which we know far more about now than we did when
24 Part 61 was actually developed, we can assess what those
25 risks are. And that is part of what I'll do in the

1 upcoming slides is take a look at some analysis of the
2 behavior of the actual hazards over time.
3 So when preparing for this discussion
4 specifically related to the time of compliance for
5 low-level rad waste -- I'm going to the chart so which
6 is the stuff that EPRI maybe some excels at in a few
7 slides.
8 But really, in reality, the first thing we
9 did is say who else has considered this question? And
10 we looked at both within the United States and outside
11 the United States and two from outside the United States
12 are the ICRP and the IAEA. I'm not going to read these
13 quotes to you, I think everybody can kind of do that on
14 your own.
15 But in summary there's two concepts that
16 emerge. And the first is that uncertainties increase
17 perhaps even unacceptably as one moves further into the
18 future. And the second is that there's a recognition
19 that the duration for meaningful accuracy in dose
20 calculations increases with the robustness of the
21 disposal methodology.
22 So your ability to predict the behavior of
23 the disposal site, the more highly engineered it is and
24 the more robust the site is, that can increase your
25 confidence in the accuracy of the numbers that you might

1 produce further out than if you had, say, just kick and
2 roll and, you know, throw a little dirt over the top,
3 because you've got a better engineering that you can
4 predict over time. Maybe not in geological time, but in
5 hundreds of years' time.
6 So inside the United States, NAPA prepared
7 an analysis. Dennis, a question?
8 MEMBER BLEY: No, no.
9 MS. EDWARDS: NAPA prepared an analysis for
10 the DOE on this same subject and concluded that the near
11 future was two to four generations and that distant
12 future was 500 to 1,000 years.
13 This same report acknowledged four related
14 principles. Two that are designed to protect future
15 generations and two that recognize that there will be an
16 awareness and a responsibility of hazards that is passed
17 along to future generations and that that awareness can
18 be protected.
19 Another concept that's recognized in this
20 report was one where near-term hazards have a priority
21 over long-term hazards that are less certain. And I
22 think that's a pretty comparable metaphor for the
23 difference between the low-level rad waste minus DU and
24 the characteristics of DU itself.
25 I will acknowledge up front that EPRI

1 understands that the staff, the NRC staff, considered
2 this same report and analysis of this question, but I
3 think that they reached different conclusions from their
4 analysis of the report than the summary that I just
5 provided.
6 Another source that we came across in our
7 kind of hunting through how other people answered this
8 question is from CEQ, the Council on Environmental
9 Quality. This approach is used for oil and gas
10 activities on federal lands and is used by the EPA, and
11 there's a whole list of them here. USDI, Bureau of Land
12 Management, National Park Service, Forest Service, Fish
13 and Wildlife Service, et cetera. It's all about oil and
14 gas activities. And basically, the center line here --
15 (Off the record comments)
16 MS. EDWARDS: So basically there's a
17 cumulative effect and a significance threshold here, so
18 you define some level that's acceptable from a risk
19 standpoint and then you analyze the risk over time and
20 find where the peak is, basically. This proximate cause
21 test is what it's called, tends to eliminate scenarios
22 that are remote, speculative or outside of the realm of
23 reasonable probability.
24 In this chart from the CEQ, the significance
25 threshold is some form of safe limit in what would be

1 equated to an acceptable intruder dose at probably 100
2 years in our scenario. So the point here is not to use
3 the time frame that's actually up on the screen. It was
4 just to look to see how another agency addressed this same
5 kind of question of how far out do we look.
6 CHAIRMAN RYAN: I guess the practical
7 reality is that it will be halfway through its
8 institutional control period required by regulation and
9 law at the end of your craft.
10 MS. EDWARDS: Say that again.
11 CHAIRMAN RYAN: Any, say, license number 61
12 will only be halfway through its required institutional
13 control period at 50 years.
14 MS. EDWARDS: So the years here, this is
15 just a graph that is showing it in how they use it with
16 oil and gas.
17 CHAIRMAN RYAN: Oh, so that doesn't have
18 anything to do with low-level waste. My mistake.
19 MS. EDWARDS: But the approach, the concept
20 is what we're trying to reference here not the specific
21 application of it. We haven't tried to take this and
22 specifically apply it to low-level rad waste, but it
23 could be. But here is an organization that tried to
24 tackle this same problem and the approach that they used
25 to do it.

1 So if you look at the last bullet, you know,
2 some level of acceptable risk is where that significance
3 threshold is, and if you liken this peak to a point where
4 postulated low-level rad waste intruder dose is known to
5 be the highest that would probably be at about 100 years,
6 because in effect the low-level rad waste significance
7 threshold -- sorry, then diminishing the hazard from
8 cesium-137.
9 So what's trying to be pointed out in that
10 last bullet without me trying to read pieces and parts
11 at a single time is your cesium-137 and nickel-63 are
12 probably going to be highest in terms of your dose at that
13 100 or so year mark, not at the 10,000-year mark.
14 MEMBER POWERS: This kind of an approach
15 allows you to take into account your inventory effects.
16 And I would not be surprised if in fact it did peak out
17 at about 50 years, just because you'd be starting to
18 deplete heavily anything that has, you know, ten or
19 15-year half-lives.
20 CHAIRMAN RYAN: Yes, a lot of stuff would
21 begin, but the cesium and the strontium should be there
22 too.
23 (Crosstalk)
24 MS. EDWARDS: I have some graphs to that
25 effect.

1 MEMBER POWERS: But recognize that yes,
2 it's half as much as it started after 30 years --
3 CHAIRMAN RYAN: Sure, yes.
4 MEMBER POWERS: -- and by the time you hit
5 100 years you're now down to what, 127. And this allows
6 you to take that into account.
7 CHAIRMAN RYAN: You bet.
8 MEMBER POWERS: And then you'll get this
9 interesting phenomena where the inventory kind of
10 flattens out but your time keeps going on, so you're going
11 to get an interesting plot. It's going to be almost, the
12 risk is going to fall like it's stung, but the integrative
13 cumulative list is going to be flat as a pancake.
14 MS. EDWARDS: I agree. So kind of the
15 first step was how did other people answer this question?
16 And just in summary, the ICRP said several hundred years
17 with any level of certainty. The IAEA says several
18 hundred years, but that could go up to a few thousand
19 years if you had a robust enough facility.
20 NAPA was 500 to 1,000 years, and that was
21 what they called the distant future not the near future.
22 RCRA site says, I think Dr. Ryan mentioned earlier is 30
23 years. CEQ, which was the site we were just talking
24 about, usually comes out at the 35 to 55-plus years.
25 It's only when you get to the geological disposal and

1 high-level waste that you see anybody who's remotely
2 trying to approach the kinds of time frames that are being
3 discussed for the regulation. So what we
4 said is in our analysis we found the discussion from the
5 IAEA, the ICRP and NAPA to be the most compelling. And
6 given that even from an ICRP to the IAEA and NAPA you still
7 range from several hundred to maybe a couple thousand
8 years, we decided to look at the actual behavior of the
9 hazard over time to see if conclusions could be drawn
10 about the life of the hazard that would be pertinent to
11 the discussion to see where in that time frame a good
12 place would be to fall.
13 So you've got to stay with me on this slide.
14 There's a lot of information here. There's actually
15 going to be three slides, and we worked on these slides
16 specifically designing them to portray one view of the
17 current risk of low-level as it relates to dose with
18 decay.
19 All of these graphs are based on the actual
20 low-level rad waste radionuclide mix published by EPRI
21 in 2007 taken from four years of utility waste data and
22 not the disposal cell mix that was used to develop Part
23 61.
24 This is important because there's far more
25 certainty about the composition of the radionuclide mix

1 today from what we've actually disposed of than what we
2 knew when Part 61 was being developed. And we don't
3 expect that mix to change dramatically or significantly
4 because fuel fission yields and materials of
5 constructions don't and haven't changed significantly.
6 Before I get into this first chart, I'll
7 note that we only use the utility waste on this chart
8 because that's where we have the level of detail and it
9 is only used --
10 CHAIRMAN RYAN: A quick question, if I may.
11 Sorry to interrupt, Lisa, but I'm intrigued by your
12 materials statement. Is there anything in new reactors
13 or new construction of reactors that has different
14 materials, different alloys that would introduce a
15 different radionuclide? Has anybody taken that step to
16 look forward to those materials?
17 MS. EDWARDS: We haven't actually done that
18 analysis, but if you want kind of a gut level reaction,
19 most of the material changes are focused on reduced
20 corrosion rates. Most of the activity that we find in
21 our waste is a result of cleaning up the corrosion that
22 is taking place.
23 So kind of my gut-level reaction would be
24 the less corrosion you have, the more corrosion resistant
25 materials you have, probably your inventory will go down.

1 (Crosstalk)

2 MS. EDWARDS: And how it will affect the

3 specific radioisotopic mix, there might be a --

4 (Crosstalk)

5 MS. EDWARDS: -- but I don't think it's

6 going to be --

7 CHAIRMAN RYAN: Okay, I was just curious.

8 MS. EDWARDS: But I haven't done the

9 numbers.

10 CHAIRMAN RYAN: Okay. No, that's fair

11 enough.

12 MEMBER POWERS: How would that be? If I go

13 to more corrosion resistant materials that nearly always

14 means I'm putting more nickel into the system.

15 MS. EDWARDS: I can't hear you.

16 MEMBER POWERS: Nearly all my metals that

17 are more corrosion resistant are richer in nickel.

18 MS. EDWARDS: You know, there's some truth

19 in that because we see steam generator replacements

20 followed by a nickel-63 spike.

21 MEMBER POWERS: It's hard to get more

22 nickel than Inconel.

23 (Crosstalk)

24 MEMBER POWERS: Yes, but it's more

25 widespread use, it's not more concentration. And so

1 it's just not obvious to me that -- but what is absolutely
2 true is that modern plants, we've gotten the cobalt out
3 of them.
4 MS. EDWARDS: Yes.
5 MEMBER POWERS: Okay, that's true, but it's
6 not obvious to me that the corrosion resistance is
7 leading us to less easily activated materials.
8 MS. EDWARDS: So I'm going to go back to
9 where I should have stopped in the first place. I
10 haven't run those numbers.
11 MEMBER ARMIJO: You're the chemistry
12 person also at EPRI, right? Water chemistry. And
13 people have been deliberately adding, let's say, noble
14 metals and zinc to a control dose and to reduce stress
15 corrosion cracking potential in the core internals. Are
16 those, produce high activity waste streams or in filters
17 or --
18 MS. EDWARDS: That's not just an easy
19 question to answer because there's not a single answer
20 that's going to fit all behaviors that we see in a plant.
21 So --
22 MEMBER ARMIJO: I'm just guessing it would
23 be a small amount but, you know, I --
24 MS. EDWARDS: We don't see a significant
25 impact to the low-level rad waste streams after zinc

1 injection.

2 MEMBER ARMIJO: Okay.

3 MS. EDWARDS: You won't see a big change in

4 the classification of the waste or anything like that.

5 Okay, so I'm going to go back to this chart.

6 Okay, here is the chart, what it's made of. We used the

7 EPRI database which was four years of shipping records

8 from commercial nuclear power plants and we developed an

9 isotopic mix from that.

10 We took all of the Class A, B, and C waste

11 from utility only, not non-utility. From utility only,

12 what's been generated up to the current point out 48 years

13 through decommissioning. So very large inventory.

14 (Off the record comments)

15 MS. EDWARDS: So we took that Class A, B,

16 and C -- go ahead, Billy.

17 MR. COX: Okay, what you're looking at here

18 is, this is the four years of rad waste data from

19 utilities, all Classes A, B, and C minus activated metal.

20 And what we did was we made the assumption that the

21 classification limits in the existing Part 61 represent

22 an acceptable level of risk when they set the unity.

23 So what we did here was we took all the waste

24 and its volume, so we determined its concentrations and

25 we divided it by the Class A limit in the existing Part

61, then we normalized them to 100 percent. So what you're actually looking at here is decay of risk as it's related to the existing Part 61 concentration limits which represents some risk. And what you can see is that at 100 years which would be institutional controls would stop, the risk is 22 percent of what it was when it was first disposed of. And at 500 years the radiological risk is 2.6 percent.

So there's a factor of 10 drop just between 100 years and 500 years. And beyond that it really doesn't change a lot. Pretty much the only thing that's left is carbon-14.

The tech-99 isn't charting here only because it's primarily reported on manifests as a detection limit value and we know it's not present at the concentrations that have been reported on manifests. But what we're really trying to show here is what the decayed risk is.

MS. EDWARDS: So we have our total activity that's A, B, and C combined together. We divided by the volume of the waste, and we come up with a concentration and we divided that by the Class A concentration limit. And that is a way of equating the inventory to a risk.

We tried to be conservative which is why we put A, B, and C together so we had all of the activity,

1 and we used just the Class A concentration limit and
2 applied it to that summation of total activity.
3 And we say that at year one all that is 100
4 percent of whatever that risk is. And if you accept that
5 Part 61 Class A concentration limits represents some
6 acceptable risk or some level of risk, that's 100 percent
7 on year one. And then we just simply decay that through
8 time and you can see at the 100-year mark we're actually
9 22 percent of what it would have been at year one.
10 And Billy's point, which I think he made
11 very well, is that by the time you get to 300 years and
12 500 years you're at a small fraction of where you started.
13 You can do this same thing with activity, but I think what
14 made this especially interesting is using the Class A
15 concentration limits to provide kind of an anchor or a
16 viewpoint of how that activity relates to some perceived
17 or measured risk.
18 And I'm going to go to the next slide if
19 there's not more questions either from what Billy said
20 or what I said.
21 MEMBER POWERS: I guess what you're saying
22 is that you started off and you said, gee, this is totally
23 acceptable now, and so if nothing happens to this
24 repository your risk goes down because of decay.
25 MS. EDWARDS: Yes.

1 MEMBER POWERS: And that's comforting but
2 not really illuminating. I'm worried about if something
3 happens to your repository because you're assuming that
4 that repository is as it was because you didn't allow it
5 to change over this period of time.
6 MS. EDWARDS: In my mind, that's where the
7 Class A concentration limits come in. If I only showed
8 you the chart and showed you the decay over time simply
9 on radioactive decay, there's no kind of taking that back
10 to a risk.
11 The presumption in this particular graph is
12 that the Class A concentration limits were analyzed as
13 Part 61 and derived based upon the fact that those
14 concentration limits represented some acceptable level
15 of risk.
16 CHAIRMAN RYAN: Lisa, I'm thinking about
17 the fact that the 61 analysis really is kind of aimed at
18 the material in a reactor and then something happens to
19 the material in the reactor and it gets out or doesn't
20 get out.
21 But 61 is based on two things. One is an
22 intruder analysis which means that human being comes in
23 contact externally or internally with the radionuclide.
24 I'm a little nervous that some of those radionuclides
25 that are on the list that we all work with in that area

1 are much more important either as an internal exposure
2 hazard or an external exposure hazard.
3 So the scenario of exposure here is probably
4 a little different. I'm trying to figure out how I
5 translate this into something for, say, an environmental
6 case of the long-term performance of the disposal site.
7 So it's a very interesting analysis, but it will be
8 helpful to try and put what's the scenario of exposure
9 here that gets somebody exposed from this system versus
10 kind of it's a site and you walk on it or dig in it or,
11 you know, go hunting for gold doubloons in it which is
12 an intruder scenario and all that stuff.
13 So can you help me with that a little bit
14 or --
15 MS. EDWARDS: There is no modeling done --
16 CHAIRMAN RYAN: On that, okay.
17 MS. EDWARDS: -- with this graph. This is
18 strictly a look at the activity, how it changes over time
19 relative to the risk that was assigned to that activity
20 based upon the Class A concentration limits from the Part
21 61 tables.
22 CHAIRMAN RYAN: So that's apples and
23 oranges. I mean I don't know how you can assign a risk
24 in the 61 analysis scenario and then look at strictly a
25 risk from the standpoint of, you know, what you're

1 presenting in the graph. I'm struggling with it.

2 MEMBER ARMIJO: I see this chart as saying

3 these things are safe the day we disposed of them. I mean

4 it's 100 percent of the risk is taken into account, and

5 as long as my disposal site does not degrade this is what

6 your risk will be as a function of time. And within the

7 period of performance you're actually managing that.

8 You're inspecting and repairing and whatever.

9 After that you have to prove to yourself

10 that the facility will not degrade to change the risk

11 model. So those are much easier time frames to analyze

12 what's going to happen to the materials, to the caps, to

13 the -- so to me it argues. It says hey, 500 years would

14 probably be plenty.

15 CHAIRMAN RYAN: I really like the way that

16 you've presented it. But when I look at it I think about,

17 well, let's take the top 20 radionuclides by inventory

18 and say, okay, here's where we are times zero, and then

19 decay them down radiologically in that soil, and then

20 independent of those decay curves let's make up three or

21 four or five or how ever many scenarios you want that

22 expose people under various conditions to this set at

23 this point in time. And then you get some relative idea

24 over time what that profile of radionuclide risk might

25 be. Does that make sense?

1 MS. EDWARDS: I hear what you're saying and
2 it does make sense, but then I wouldn't divide by the
3 Class A concentration limits.
4 CHAIRMAN RYAN: Forget the Class A
5 concentrations. I'm holding that kind of separate for
6 the moment. This is just the look at what's happening
7 and I'm sure this is reactor-informed, you know, in terms
8 of the numbers and the radionuclides you've chosen, which
9 is great.
10 But just do that independent and then
11 interpret it separately as a separate matter might really
12 help clarify it a little bit. Just a thought.
13 MS. EDWARDS: I don't have that data, and
14 Billy's yelling at me quietly from the back of the room
15 again --
16 CHAIRMAN RYAN: That's all right.
17 MS. EDWARDS: -- to tell me that we do have
18 that data. I don't have that data up here with me.
19 CHAIRMAN RYAN: That's fine. That's fine.
20 I'm not saying we need an answer today. I'm just
21 thinking out loud with it. That might be a way to, you
22 know, further inform the kind of analysis you're
23 presenting.
24 MS. EDWARDS: I don't want to beat a dead
25 horse here because I agree with what you're saying and

1 I'm actually kind of now interested in going back to that
2 number. The reason we picked this chart is short of
3 doing a site-specific performance assessment, which I
4 don't have the data to perform on the individual sites,
5 and short of a graph that I'm going to show you two graphs
6 from now that looks at a generic site, I wanted a way to
7 conservatively take the inventory that exists today as
8 we know it in the isotopic mix and add in A, B, and C
9 together over many years and still relate it somehow to
10 risk. Put all of that waste into kind of a single package
11 that's related to risk without performing those
12 calculations.
13 The best methodology we could come up is say
14 the Class A concentration limits weren't pulled out of
15 the air. They were derived saying if we keep our waste
16 at this concentration or less in a disposal environment,
17 whatever may happen to that disposal environment that
18 concentration represents a hazard that's acceptable.
19 Otherwise the concentration limits would have been
20 lowered or raised if there was more wiggle room, I guess.
21 CHAIRMAN RYAN: It might be helpful to go
22 back to the 61 technical basis documents and make sure
23 that you're using it in a way that comports with the way
24 it was developed. You know, I guess I can't say I
25 completely agree with the analogy that --

1 MEMBER POWERS: The division is suspect but
2 the chart is good, because it just communicates the same
3 thing you're saying except they don't have technetium-99
4 on it for reasons they didn't explain. And nor do they
5 have the depleted uranium on because they've got a good
6 sense.
7 MS. EDWARDS: Oh, and I should have said
8 that up front is that part of this analysis is to look
9 at what does the hazard look like without DU, and is there
10 an obvious time of compliance for the waste without the
11 DU being incorporated into the waste.
12 CHAIRMAN RYAN: That's a terrific goal.
13 That's an excellent goal to, you know, begin to put this
14 in kind of a perspective.
15 MEMBER POWERS: Yes, I mean gives it to you
16 without looking at dose effectiveness kinds of numbers,
17 which is fine. What's intriguing about it is that from
18 a risk analyst's point of view you have to come up with
19 risk enhancements in the period between the 1,000 and
20 10,000 that have to exceed something on the order of the
21 factor of 50 to compensate for the decay, and that's hard
22 to do that because it has to be a factor of 50 over what
23 you've got during this 100 to 1,000-year period and I
24 don't see easy routes to that.
25 MEMBER SKILLMAN: Lisa, let me ask you this

1 question please. You said this is four years of shipping
2 records. How thorough are those records?
3 MS. EDWARDS: I believe what we did is go
4 to some of the people who do the electronic preparation
5 of shipping records and then we went to the utilities and
6 requested them to send us their shipping records for a
7 four-year period. And out of the 104 or so utilities I
8 think we've got all the shipping records from 67 of them.
9 Is that about right?
10 MR. COX: Sixty five.
11 MS. EDWARDS: Sixty five.
12 MR. COX: Ten thousand records and we
13 vetted them all and we came up with 8,500 of them that
14 were shipped. The ones that weren't indicated as
15 shipped in the rad mean database we didn't use. Just the
16 ones that were shipped. So 8,500 records over four
17 years.
18 MEMBER SKILLMAN: So 60-some sites or
19 60-some plants?
20 MR. COX: No 65 units.
21 CHAIRMAN RYAN: What's a unit?
22 (Crosstalk)
23 CHAIRMAN RYAN: Just want to make sure.
24 MS. EDWARDS: So out of the 100 and some
25 that could have sent us the records, at the time there

1 was 104 plants, we got 60-some that responded with their
2 database.
3 MEMBER SKILLMAN: And did you adjust these
4 upward for the difference between the 65 and the 104?
5 MS. EDWARDS: Okay, so the isotopic
6 distribution we assumed was representative regardless of
7 the number of plants.
8 MEMBER SKILLMAN: I understand, okay. Now
9 I do. Thank you.
10 MEMBER POWERS: What's surprising is how
11 low the cobalt-60 is that might not be the case if you
12 were looking at decommissioning shipment.
13 MS. EDWARDS: I think that the thing to take
14 away from this, each one of these graphs we can go into
15 a great deal of detail. And actually at the back of this
16 package there's a series of slides that give you
17 assumptions and that the processes that were used to
18 develop these graphs individually.
19 The point being that I take away from this
20 is that at 300 years you're pretty much on your TRU and
21 carbon-14 line where your total is starting to be almost
22 entirely composed of that. By 500 years your total is
23 just barely above the carbon-14 line, meaning that all
24 these other nuclides have decayed away and this is where
25 your hazard is centered.

1 And whether you look at the hazard, if you
2 assume all barriers have broken down and no longer exist,
3 you assume they're all gone by 1,000 years, you're not
4 going to get a dramatically different effect further out.
5 That a 1,000 year look may be from this viewpoint
6 adequate.
7 (Crosstalk)
8 MEMBER RAY: Point then that drives the
9 concern beyond 1,000 years?
10 MS. EDWARDS: I didn't, that's not my
11 viewpoint so I can't say --
12 MEMBER RAY: Understand, but you're not
13 aware of what, you don't know what it is?
14 MS. EDWARDS: Well, I think part of it is
15 the DU.
16 MEMBER RAY: Okay, anything else that comes
17 to mind?
18 MS. EDWARDS: No, I don't want to, I guess,
19 speculate.
20 CHAIRMAN RYAN: Chlorine-36 and some of
21 these other --
22 (Crosstalk)
23 CHAIRMAN RYAN: I'm just thinking out loud
24 and just thinking --
25 MEMBER SKILLMAN: I think what's going on

1 here is the shipping records do not represent plants that
2 have clad failure. And as long as you don't have clad
3 failure, I think that's the fingerprints. And if you
4 have clad failure you have a whole different set of
5 isotopes, and as long as the clad's intact you really come
6 down to the carbon-14.
7 MS. EDWARDS: Well, I think it's a mixture.
8 I mean almost every plant has had at least some pen leaks.
9 (Crosstalk)
10 MEMBER ARMIJO: Clinton has never had a
11 fuel leak but for -- there's tramp uranium in the crud
12 and all that sort of stuff, but that's not included --
13 MEMBER SKILLMAN: If you've had clad
14 failure you've got some other longer life isotopes that
15 are going to show but they're not predominant and they're
16 not great numbers.
17 MS. EDWARDS: Just to be clear, we did not
18 segregate records out based upon whether a plant had
19 experienced any fuel leaks or not, and simply put the
20 request for the information out to the industry and we
21 took all of the information that was released to us. And
22 having worked at some of those plants I know that they
23 had fuel leaks at the time, and that is included in the
24 data along with the plants that had fuel without any
25 leaks.

1 MEMBER STETKAR: And Lisa, you said this is
2 just a four-year snapshot.
3 MS. EDWARDS: For the isotopic mix.
4 MEMBER STETKAR: For the isotopic mix.
5 MS. EDWARDS: That is correct.
6 CHAIRMAN RYAN: Just looking ahead here a
7 little bit, we're scheduled for a break relatively soon
8 at 3:15, and I want to make sure we leave Roger enough
9 time. Roger, how are you doing on your time?
10 MR. SEITZ: We've got about 20 slides.
11 CHAIRMAN RYAN: Okay.
12 MS. EDWARDS: Okay, risk versus decay.
13 That last graph didn't look at irradiated metal, so it
14 did not include activated metal so we wanted to take a
15 look at activated metal. And this graph simply does a
16 comparison between a Class C source, this is what's
17 approved for a Class C source, in red, 130 curies. And
18 we set that equal to that's 100 percent.
19 Dose rate at three centimeters is 100
20 percent, and we show how that models and decays over time
21 from a dose rate. In this case it's an intruder
22 scenario. It's about a carry away piecemeal type of
23 thing. And we compared that to the model dose from a
24 piece of stainless steel. I think it's 0.01 inches and
25 a Class C filter from a PWR and a Class C filter from a

1 BWR.

2 But we didn't use just the filter and the

3 actual activity that was typical. We took an average of

4 the Class C filters and then we went to ten times that.

5 So we said, if this is the actual activity, we're going

6 to scale that activity up so it's ten times the Class C

7 limit. Because the BTP allows for the ten times --

8 CHAIRMAN RYAN: What's carry away setup?

9 What's the -- I take it and put it in my pocket and leave?

10 MS. EDWARDS: Put it on your mantelpiece.

11 MALE PARTICIPANT: What's the mantelpiece

12 one?

13 CHAIRMAN RYAN: Okay, if you had it in your

14 pocket awhile the mantel part won't matter.

15 MS. EDWARDS: That could be true. So this

16 is the Class C source. We also put in a couple of

17 reference points here to show the Class A source and the

18 Class B source, both at 100 years and 300 years. And

19 basically we've just decayed these over time and showed

20 how their dose rate at the three centimeter, how it

21 compared to the Class C. And you can see by the time you

22 get out to 500 years they're below that.

23 And in fact at the 100 and 300 years they're within

24 a factor of 10 of actually the Class A and B source limits.

25 And this is just an impact of a mix of radionuclides

1 instead of having a single monoisotopic source. Next
2 slide.
3 This was done for both a wet site and dry
4 site. So basically we took all the waste, utility and
5 non-utility, and we put all of it into a single disposal
6 site instead of dividing it between sites. And then we
7 said, what are the dose rates if we model the site
8 according to the descriptions that are in the NUREG, if
9 we model the site what kind of dose performance do we get
10 out of it?
11 So there's four different cases here in
12 blue. You will see that it still meets the 500 millirem
13 criteria even at year 100 very close to the site closure,
14 but that base case assumes no cap and just two meters of
15 cover.
16 So there's no waste form kind of
17 enhancements or capping over the disposal site. The red
18 line you put a barrier in place. That's the trench cap
19 to keep water from infiltrating and then we ran RESRAD
20 and did the dose projections out again. And again you
21 can see by the time you get, no matter which scenario you
22 use, by the time you get to 500, 600 years kind of all
23 in the same place.
24 Green looks at waste form, and purple which
25 is the best case looks at both the combination of waste

1 form using those concrete overpacks, high integrity
2 containers, et cetera, that limits the mobility of the
3 radionuclides for a certain period of time where it can
4 decay combined with the cap.
5 And in all cases you meet the millirem
6 requirement. This is on a wet waste site. We did the
7 same thing on a dry site, on a western, arid site, and
8 the graph's a lot less interesting because it's all way
9 down in the dirt.
10 MEMBER ARMIJO: Lisa, could you explain the
11 red curve? I don't understand why it peaks, goes down
12 and then peaks. Is that --
13 MALE PARTICIPANT: The barrier fails.
14 MEMBER ARMIJO: The barrier fails at 200
15 years more or less, is that --
16 MS. EDWARDS: And then you get your
17 infiltration.
18 MEMBER ARMIJO: Is that just an arbitrary
19 assumption or is that a --
20 MS. EDWARDS: I'd have to dig back in the
21 report, but I think that actually came from assumption.
22 I'd have to dig back in the report.
23 CHAIRMAN RYAN: I'm going to guess that up
24 to about 200 years you're assuming some corrosion failure
25 of containers, stainless steel and other, you know,

1 robust matters. That's where we get out to the 300 to
2 500 period and then, you know, kind of migrate --
3 (Crosstalk)
4 CHAIRMAN RYAN: And so I'm guessing that
5 there's a change in container robustness from --
6 MEMBER ARMIJO: It's basically degradation
7 of barriers that caught at that point that's peaked out.
8 MS. EDWARDS: In the red case we're not
9 looking at any waste forms. We're not looking at the
10 containers or, the red case is simply looking at the, the
11 difference between the red case and the blue case is the
12 introduction of the cap.
13 CHAIRMAN RYAN: Yes.
14 MS. EDWARDS: The green case has both the
15 cap and the waste form, so the concrete containers are
16 high integrity containers.
17 CHAIRMAN RYAN: Got you.
18 MEMBER ARMIJO: So the green case you could
19 lose the cap entirely and you'd still, the concrete boxes
20 they put things in --
21 MS. EDWARDS: Overpacks in the high
22 integrity container. Okay, so those were the three
23 charts. I'm going to just quickly go back to the concept
24 that there are uncertainties in performance assessments.
25 And there are a number of people who have

1 considered this topic and under IAEA might point out in
2 particular that if you misuse these results from overly
3 conservative representations of the disposal system can
4 lead to poor decision making that's based on results that
5 bear little resemblance to the actual performance of the
6 facility.
7 So I just go back to that. Those are not
8 my words. Those are words from the IAEA, another agency
9 that has looked at this type of thing. I think it's
10 important, because once 10,000 years is introduced as the
11 time of compliance it's very difficult for someone later
12 to say I need to pull that back to a more reasonable time
13 frame.
14 So once you ring that bell that's kind of
15 where the mark is then in the sand and it would be very
16 difficult to pull it back. And I think it's a new
17 precedence that moves a perception that low-level rad
18 waste represents the same kind of risk that high-level
19 waste does and that you're moving it into a geological
20 time frame.
21 CHAIRMAN RYAN: Well, that's something
22 that the waste part of this industry has struggled with,
23 low-level waste and high-level waste, as far as trying
24 to get into the let's make a bunch of conservative
25 assumptions or assumptions we think are conservative

1 and, you know, run with that. And we don't disconfirm
2 it very well.
3 Well, we know the intruder at 100 years plus
4 zero is going to dig into the waste and conduct his entire
5 life right there in the Class C disposal cell.
6 MS. EDWARDS: At the worst possible spot.
7 CHAIRMAN RYAN: Yes.
8 MS. EDWARDS: At the very first opportunity
9 --
10 (Crosstalk)
11 CHAIRMAN RYAN: I guess it would be
12 interesting to hear your comment on do you think this
13 should be risk informed in the way that probabilistic
14 risk assessments are done for other issues that have
15 complex problems like this or not?
16 I'm not looking for an answer this second,
17 but I'm thinking that if it was something that got a
18 little bit leaning toward don't make a bunch of very
19 conservative assumptions that compound on each other so
20 you don't even know what reality is, but to do some kind
21 of systematic risk insights analysis so you could come
22 up with something that was a little bit more
23 representative of the realities, many of them which are
24 in a PRA -- dare I say it -- to think it through.
25 MS. EDWARDS: I think there's a place for

1 probabilistic risk assessment and the management of
2 disposal of radioactive waste. I think there is another
3 place where you can take a deterministic view but inform
4 it with reasonable rather than overly conservative
5 assumptions and maybe get to a framework that's usable
6 and easily usable. I'd have to look at the details of
7 both to really understand where I fall on which one I
8 think is better.
9 CHAIRMAN RYAN: I hear you. You know,
10 one's easy to explain but may not be as accurate
11 representing reality. One's tougher to explain but it
12 might give you the options to really understand the
13 system behavior. So the devil you know and the devil you
14 don't want to know.
15 MS. EDWARDS: Exactly.
16 CHAIRMAN RYAN: So I'm kind of waiting for
17 Mr. Stetkar to say something but he's not going to.
18 MEMBER ARMIJO: Well, your chart argues for
19 a different criteria for time of compliance or even
20 assessment for low-level waste that it's not DU, you
21 know, to separate the two things, and you'd have a totally
22 different issue on the table.
23 MS. EDWARDS: That's on the third bullet on
24 this slide. So the unique hazard from land disposal of
25 DU should not dictate a generic time of compliance for

1 low-level rad waste sites that don't accept DU.

2 I think the behavior and the

3 characteristics of this hazard are so different and

4 atypical of the rest of the low-level waste that the

5 one-size-fits-all approach is going to drive us to an

6 assessment that communicate to the public that

7 communicates a hazard that's not actually there.

8 MEMBER ARMIJO: I think that's a very

9 important point. I talk to different groups of people,

10 and it's incredible when instead of giving them assurance

11 that they're being protected by when we say, oh, we're

12 designing this for 1,000 years or 10,000 years, instead

13 of saying, gee, that's great, they conclude that if it's

14 that dangerous that you have to worry about it for 10,000

15 years, what in the world is happening today? And so it

16 backfires.

17 As engineers we see conservatism in one way

18 but the general public sees our conservatism as treating

19 something that's incredibly dangerous, and that's

20 misinformation. It creates anxiety and it's not true.

21 MS. EDWARDS: I couldn't agree with you

22 more.

23 MEMBER ARMIJO: I think this is a very

24 valuable piece of work. Have you published this in a

25 report?

1 MS. EDWARDS: Many reports. And I think
2 there is a slide --
3 MEMBER ARMIJO: Okay.
4 MS. EDWARDS: -- in the back of the slides.
5 This is not a last slide, but in the backup slide there
6 is a list of references.
7 CHAIRMAN RYAN: That would be great. I
8 think it adds to it. Well, it strikes me that one thing
9 that's come out of this discussion is something like, you
10 know, maybe we ought to think about that we treat DU as
11 a special case since it's hazardous chemical not
12 radiological, and deal with it in some other way than
13 trying to squeeze it into radiological.
14 MEMBER RAY: Well, it changes the picture
15 dramatically when you include --
16 CHAIRMAN RYAN: That's what I'm saying,
17 Hal. I mean we've been kind of chasing it --
18 MEMBER ARMIJO: We're distorting the
19 picture.
20 CHAIRMAN RYAN: Maybe this is something
21 that we ought to think about. I just throw that out to
22 think about --
23 MEMBER RAY: No, I've been thinking about
24 it. I don't know that it distorts the picture, Sam, if
25 you allow the things to be combined.

1 CHAIRMAN RYAN: That could be co-located
2 but the basis of regulating it might not be the same.
3 MS. EDWARDS: Well, you know, my
4 perspective, and I might have a few of the facts, they
5 get a little blurry over time. But I thought we were
6 going to do a comprehensive review of Part 61 and we were
7 going to do kind of a broad look at it.
8 But the DU thing came up and there was a
9 limited rulemaking that was supposed to be designed
10 specifically to look at DU. I think somewhere along the
11 line the staff got the direction to combine the concept
12 of blended and unique waste streams in with DU and the
13 whole picture got bigger faster.
14 MEMBER POWERS: And this is surprise to you
15 how? Okay.
16 MS. EDWARDS: That's it.
17 CHAIRMAN RYAN: Yes, that's great. Thanks
18 very much.
19 (Off the record comments)
20 CHAIRMAN RYAN: Thanks for having this up,
21 Roger, and we appreciate your patience.
22 MR. SEITZ: I think Christine should be on
23 the phone.
24 CHAIRMAN RYAN: Okay.
25 MS. GELLES: I am. Can you hear me okay?

1 CHAIRMAN RYAN: We can hear you just fine,
2 Christine.
3 MS. GELLES: Are we ready to begin?
4 CHAIRMAN RYAN: Yes, please. I'm sorry.
5 Yes, we're ready to go. Thank you.
6 MS. GELLES: Okay, so I first want to begin
7 by thanking you for allowing us to return and providing
8 the committee with some additional information about
9 DOE's proposal plans and our analysis.
10 This time we're going to specifically focus
11 on depleted uranium which has received so much attention
12 here, I think, in your dialogue even today. I'm very
13 sorry that I can't be there in person and I want to thank
14 you for accommodating me while I'm on travel.
15 Roger Sietz, who you met several weeks ago,
16 is going to share this presentation with me, and I also
17 want to mention that we have several technical experts
18 from the Portsmouth-Paducah Project who can answer any
19 detailed technical questions you might have on our
20 conversion technology or again, really detailed
21 questions on our waste form.
22 And that's Jack Zimmerman, our federal
23 project director, and I believe he has several others
24 also on the line, Keith Sparks and Jeff Mowbray among
25 them.

1 CHAIRMAN RYAN: Thank you for the staff who
2 is participating and we're waiting for Christine to call
3 on her as needed, all right?
4 MS. GELLES: Thank you.
5 CHAIRMAN RYAN: All right.
6 MS. GELLES: Okay, so Roger if you could
7 pass through right to our discussion topics. In talking
8 to Derek, we tried to construct a deck of slides that
9 provides enough background on our history of managing our
10 depleted uranium hexafluoride inventory and how we came
11 to the decision on waste form selection.
12 And it's a somewhat detailed history so
13 we're not going into it in great detail, but we wanted
14 to summarize it. So if the members are interested in
15 looking at some of our new documents about the context
16 which do that.
17 And then we'll close with Roger reviewing
18 some of the, more details of our defense-in-depth
19 disposal systems as applicable to our analyses related
20 to depleted uranium. Slide 3. The next
21 three slides are really good pictures. We'll go through
22 them very quickly. Slide 3 is a composite showing both
23 one of our cylinder yards where our several decades of
24 cylinder generation is stored. There's a close-up of
25 some of the refurbished cylinders where we painted them

1 to deal with some deterioration that's occurred over
2 time.
3 CHAIRMAN RYAN: Are these full or empty
4 cylinders?
5 MR. WIDMAYER: Full. Can you hear,
6 Christine? Mike asked if they're full or empty
7 cylinders.
8 MS. GELLES: These are full cylinders.
9 CHAIRMAN RYAN: Full of UF6?
10 MS. GELLES: Yes, sir.
11 MR. SPARKS: There are some partials in
12 there, Christine.
13 MS. GELLES: Thank you.
14 CHAIRMAN RYAN: Due to the number on the
15 screen I didn't see it. That might be eventually what
16 I think.
17 MALE PARTICIPANT: Well, it goes on to the
18 horizon.
19 (Crosstalk)
20 MS. GELLES: We've got two of those. And
21 I should mention that although there are the three
22 gaseous diffusion sites, the entire inventory of
23 cylinders from Oak Ridge were relocated to the Portsmouth
24 facility. Is that correct, guys?
25 MR. SPARKS: Yes.

1 CHAIRMAN RYAN: Okay, thank you.

2 MS. GELLES: You can see the relative size
3 of these cylinders with one of our workers standing next
4 to it. This is a picture of how we move the cylinders
5 around. And Slide 5 is another picture, alternative
6 mechanism for moving the cylinders. And you can see
7 again some similar workers standing next to the cylinders
8 that have been in storage for some time.

9 You can see we stack them two-high, so
10 although that yard looks long it's actually, you know,
11 the inventory's twice because it's stacked two deep.

12 CHAIRMAN RYAN: Dana has a question on it.
13 Dana?

14 MEMBER POWERS: No, I was just going to
15 point out the hazard to the public from those yards lies
16 in the HF and not anything to do with the uranium. The
17 opportunity presented to those of a terrorist bent is the
18 HF.

19 MR. SPARKS: On the phone we couldn't hear
20 that question, if you could repeat it.

21 CHAIRMAN RYAN: It was a comment. And that
22 Dr. Powers made the comment that most of the hazard from
23 the public standpoint is the HF rather than anything
24 else.

25 MR. SPARKS: Yes, that would be correct.

1 MS. GELLES: And we'll talk to that because
2 that was also a consideration in the selection of the
3 waste form.
4 Okay, if you could go to Slide 6, and please,
5 because it is a little bit hard to pick up every speaker
6 around the table, if I'm not hearing you when you have
7 questions just forcefully interrupt me, all right?
8 CHAIRMAN RYAN: Okay, thank you for that
9 Christine. If I've got a question on this I might just
10 jump in and help facilitate a little bit. So thank you
11 for that.
12 MS. GELLES: I appreciate that Mike.
13 CHAIRMAN RYAN: Yes.
14 MS. GELLES: Okay, so on Slide 6 this is a
15 busy slide. I apologize for so many words but we'll
16 spend a few moments on it. So we think inventory of our
17 DUF6 is a legacy of our enrichment activities. Not just
18 the Department of Energy but also the United States
19 Enrichment Corporation, or USEC after the privatization.
20 And we did look exhaustively at options for
21 how to manage this inventory, and there have been several
22 really significant analyses that have helped formulate
23 the framework of our, the patchwork of our decision
24 making for moving forward.
25 Most significant, I guess, is the

1 foundational documents, would be the 1999 Programmatic
2 Environmental Impact Statement on Alternative
3 Strategies, and the document number's there, it's
4 available electronically if folks want to read it. I'm
5 going to just summarize it here a bit.
6 The alternatives we evaluated were no
7 action, long-term storage as DUF6 but in a, with perhaps
8 making new storage yards, maybe enhanced storage
9 capabilities. Long-term storage as an oxide, reused as
10 a uranium oxide, reused as a uranium metal and disposal
11 as a uranium oxide.
12 And in '99 we published our Record Of
13 Decision, and that Record Of Decision indicated that we
14 wanted to quickly, expeditiously with conversion of the
15 entire inventory to an oxide or a depleted uranium metal
16 or a combination of both.
17 But I want to note that our original
18 preferred alternative was disposal as an oxide,
19 conversion for disposal as an oxide. But based on some
20 comments we received from industry who had indicated that
21 there were technologies for potential reuse of a metal
22 form, we allowed in our preferred alternative that we'd
23 be open to continued discussions about a metal form,
24 because we did not think it would be appropriate for
25 conversion to metal unless there was a use documented as

1 part of the analysis.

2 MEMBER POWERS: I have a question. A

3 question I'd like to ask is, when you considered

4 conversion of the oxide was there a consideration of

5 converting that to a form that is less water soluble such

6 as a phosphate or a silicate?

7 MS. GELLES: I'm going to summarize one of

8 our scientific studies that evaluated waste forms, and

9 I hope it's responsive, but I think it's going to result

10 in a negative answer of the two forms that you just

11 described were not specifically analyzed. But Jack or

12 Keith, do you guys have an answer to that immediately or

13 should we defer that until we get to Slide 8 or 9?

14 MR. ZIMMERMAN: I don't have a specific

15 answer. I'm unaware of the phosphate form being looked

16 at, but I know all the documentation points to the uranium

17 oxide as being stable in the environment as well as what's

18 molded in other forms. So I don't really know if the

19 phosphate is also a stable, environmentally stable form

20 or not.

21 MEMBER POWERS: Well, the silicate is

22 extraordinarily stable and that's why uranium miners

23 don't like the silicate because it's hard to refine.

24 MS. GELLES: I'm going to keep that

25 question here in the margin of my notes, and we'll revisit

1 it after we talk about the Oak Ridge National
2 Laboratory's assessment of the various waste forms and
3 maybe we can talk about that in a little more detail.
4 Okay?
5 MEMBER POWERS: Sure.
6 MS. GELLES: The other thing about our EIS
7 in the evaluation of the alternative for disposal, it was
8 a generic assessment of disposal in a wet environment as
9 well as a dry environment, and the dry environment was
10 defined as that the ground water being 500 feet. And we
11 evaluated both the grouted oxide form and ungrouted oxide
12 form.
13 But ultimately after the issue of the ROD
14 we initiated a competitive acquisition for the
15 construction of the conversion facilities at the two
16 gaseous diffusion sites and that's Ports and Pad because
17 we had relocated the Oak Ridge cylinders.
18 And in 2002 the first contract was awarded
19 to Uranium Disposition Services and they began
20 development of the facility. And so the selection of UBS
21 was also the ultimate selection of the waste form, and
22 the conversion technology and what they had proposed and
23 ultimately technology that produced the triuranium
24 octoxide of a U308 waste form.
25 And since that was consistent with our

1 previous analyses we were comfortable with moving
2 forward with that. We did need to do some site specific
3 NEPA evaluation related to the actual construction
4 operation of the conversion facilities, and we developed
5 that document between 2002 and 2004. And
6 again just to circle back. And NEPA analyses in the ROD
7 that indicated a preference for conversion to the uranium
8 oxide or metal that opened the question, and as we went
9 through that solicitation we allowed in the RFP, the
10 Request For Proposal that the comment to that could
11 propose an alternative waste forms but also is the one
12 we selected was consistent with the NEPA analysis.
13 Slide 7 please. So in June of 2004 we
14 issued the two site-specific EISs on the construction and
15 operation of the conversion facilities, and in the ROD
16 for these facilities we reconfirmed that we would be
17 converting our inventory to the U308 form and also
18 producing the hydrogen fluoride, the HF product, where
19 the aqueous HF would be sold for reuse in a commercial
20 application and that is in fact happening.
21 And the depleted uranium oxide conversion
22 product would be reused if there was a, to the extent that
23 it could be, and we tried multiple times to provide it
24 for the industry, and there have been no respondents.
25 So we are preparing for storage, or we're providing for

1 its storage until we're able to settle on the final
2 disposal location. And although the
3 site-specific EISs included specific consideration of
4 disposal at two sites, the Nevada Test Site, which now
5 is the Nevada National Security Site, and Envirocare
6 which of course became EnergySolutions' facility, as the
7 destinations for the conversion product, but we did not
8 decide through the instruments of those Records of
9 Decision and I'll explain why in a few moments.
10 MEMBER ARMIJO: Christine, I had a quick
11 question. On the conversion process you use, you say
12 you're going to produce a small amount of calcium
13 fluoride. And I'm familiar with a wet conversion
14 process at a commercial fuel factory, and we produced
15 mountains of calcium fluoride, and that ultimately
16 converted to a dry process where we didn't produce any.
17 So when I saw this yard full of all those
18 cylinders I nearly fell out of my chair. So I don't know
19 how, if you've demonstrated that you produce very little
20 calcium fluoride but you might have another waste stream,
21 big waste stream.
22 MR. ZIMMERMAN: Yes, this is Jack
23 Zimmerman. No, the calcium fluoride is just solely a
24 secondary waste stream. It really comes from
25 regenerating some of our off-gas scrubbers.

1 MEMBER ARMIJO: Okay.

2 MR. ZIMMERMAN: So other than that we don't

3 have a calcium fluoride waste stream.

4 MEMBER ARMIJO: Okay, great.

5 MR. ZIMMERMAN: It's uranium oxide and

6 hydrofluoric acid. And that's, I mean, well, we've been

7 in operation for over two years now.

8 MEMBER ARMIJO: Okay, great.

9 MS. GELLES: Thank you. Slide 8. These

10 are pictures of our facilities. And a quick summary of

11 the respective scale of them. They're practically

12 identical except for the different number of processing

13 lines.

14 At the Ohio facility we have three

15 processing lines. Construction occurred between 2002

16 and 2008. Hot functional testing began in June of 2010.

17 And we're protecting not only 18 years of operation to

18 address the near quarter million metric tons of depleted

19 uranium hexafluoride we have there, and 24,000 metric

20 tons roughly correlates to about 21,000 cylinders.

21 At Paducah where we have a larger inventory,

22 we have four processing lines and a longer operational

23 period projected. Same construction period. Hot

24 functional testing at Paducah occurred a little bit later

25 in 2010. And you can see over half a million metric tons

1 of depleted uranium hexafluoride stored there and that
2 correlates to about 45,000 cylinders.
3 Slide 9, I think, Roger. This is just a
4 diagram of our DUF6 conversion process and I'll summarize
5 it, and if you have any specific questions I'm most
6 confident that Jack can answer that. So to start with
7 the UF6 cylinder there sort of in the bottom left, it's
8 placed into an autoclave and heated to liquefy the DUF6
9 which is set into the conversion unit.
10 DUF6 is mixed with steam and hydrogen in the
11 fluidized bed conversion unit to create a uranium oxide,
12 primarily the U308 and the HF product that we also
13 discussed. The HF is condensed and transferred for sale
14 and reuse, and then the uranium oxide is transferred
15 pneumatically to a hopper and loaded into one of the empty
16 cylinders.
17 And we want to make note that we stabilize
18 any heel quantity that remained in the cylinders when we
19 sent them into the process, and it's stored in those
20 reused cylinders at the storage yard there at the site,
21 pending the availability and selection of a disposal
22 facility or facilities.
23 Are there any questions on that? Or Jack,
24 would you like to amplify that?
25 MR. ZIMMERMAN: No, I think you've got the

basics covered.

MEMBER POWERS: And when you reload the cylinders do you wash them?

MR. ZIMMERMAN: I only heard the first part of the question.

MEMBER POWERS: The cylinders that you reload with this uranium oxide product there is presumably some fluoride absorbed on the surfaces. Do you take that off?

MR. ZIMMERMAN: We basically get, potassium hydroxide is injected into the cylinder. It's a neutralizer that will remain in heel contents and it's basically put on rotation. We basically have a system that rotates the cylinder and basically spins it, so basically neutralizing any material on the sides.

MEMBER POWERS: Good, thank you.

MR. ZIMMERMAN: Also, as they check the pH to make sure it's neutralized and within the right ranges and confirm there's no hydrogen germination as well.

MEMBER ARMIJO: Is it then drained or do you just put the powder right in afterwards?

MR. ZIMMERMAN: No, we put the powder in over the top. The heel quantity is, probably it's less than 20 kilograms in basically a 14-ton cylinder. So it's stabilized with whatever the calculated amount

1 that's basically chapter 18. The proper amount of care
2 is to neutralize the remaining contents.
3 MS. GELLES: Thank you. Could you go to
4 Slide 10 please. This is just a little bit of a status
5 of where we are. Following construction of the
6 facilities, DOE decided to compete in commissioning and
7 operations of the two facilities and in 2010 we awarded
8 that contract to Babcock & Wilcox Conversion Services,
9 called BWCS.
10 As I noted before, hot functional testing
11 began in 2010 and operations began in 2011. But due to
12 the first-of-kind nature of these facilities, a major
13 focus on our path to stable and sustainable conversion
14 operation to this point has been determining the maximum
15 possible throughputs based on actual experience and
16 empirical data and working to refine the systems to
17 achieve that output.
18 We have been focusing on ramping up to full
19 conversion operation. Again I mentioned the essential
20 need to upgrade aspects of the system to achieve that
21 higher throughput and we've been very successful.
22 So whereas in fiscal year '11 we converted
23 270 metric tons, in our second year of operations we
24 converted over 6,100, almost 6,200 metric tons, and in
25 fiscal year '13 we surpassed our goal of 12,600 and

1 actually converted 13,679 metric tons. So we've
2 realized a really steady increase in our production
3 capability.
4 MEMBER POWERS: I hope that you will have
5 an opportunity at some point to document this
6 first-of-a-kind engineering because it sounds like a
7 major success to me. And those are rare enough in
8 first-of-a-kind engineering undertakings.
9 MS. GELLES: Yes, and Jack can comment on
10 this if he likes, but we recognize and were caching very
11 carefully the lessons learned we've encountered here
12 during the commissioning of these facilities. And then
13 we have several other first-of-kind treatment facilities
14 that also stumbled during parts of commissioning --
15 So we have a little community of federal
16 project directors like Jack who are sharing lessons
17 learned on commissioning. Thanks for the comments.
18 Page 11. These are excerpts from, and it's
19 not a comprehensive excerpt. I sort of take the
20 appropriate relevant sections here, from the USEC
21 Privatization Act Section 3113, the low-level waste
22 paragraph that clarifies DOE's statutory
23 responsibilities related to commercial depleted uranium
24 as well.
25 So I won't read it to you, but some of the

1 high points. The Secretary, at the request of the
2 generator, must accept disposal of low-level waste
3 including depleted uranium if it's ultimately determined
4 to be low-level waste if it's generated by, the
5 corporation here refers to USEC, or any persons licensed
6 by the NRC to operate an uranium enrichment facility
7 recognizing that there are other plants and commercial
8 enrichers in development.
9 It also notes that the generator, in this
10 case it could be USEC again or another commercial
11 enricher, could also enter into agreements for disposal
12 with persons other than the Department. So it's not
13 mandatory that they come to DOE.
14 And it acknowledges in Paragraph C that no
15 state or interstate compact shall be liable for the
16 treatment, storage and disposal that a low-level waste
17 including DU that's attributable to commercial
18 enrichment.
19 Now if the generator were to request DOE to
20 accept their waste, including the depleted uranium for
21 disposal, they need to reimburse us for full costs
22 including a prorated share of any capital costs that we
23 develop.
24 And, you know, while I think you've heard
25 Waste Control Specialists, you recognize that we could

1 provide for a federal disposal at a DOE site, we could
2 also provide for access to the federal disposal facility
3 and Waste Control Specialists in that this Privatization
4 Act effectively adds commercial DU to the definition of
5 federal waste for which the Secretary of Energy is
6 responsible.
7 Are there any questions on that slide?
8 MEMBER SKILLMAN: Yes, this is Dick
9 Skillman, Christine. I assume that what you're
10 referring to in the last two minutes of your discussion
11 would be LES and others such as LES that are producing
12 this waste form.
13 MS. GELLES: Yes.
14 MEMBER SKILLMAN: How many other private
15 producers are out there? You've given us the total
16 cylinder count at Paducah and Portsmouth. The backyard
17 of Hobbs looks approximately the same as what you've
18 shown in your slide. So my question is how many other
19 generators are out there?
20 MS. GELLES: There are no others that I'm
21 aware of. There are others planned. For instance,
22 we're aware of other commercial companies who are
23 pursuing licenses to form domestic enrichment activities
24 here in the United States, but to date nobody else has
25 a facility that is currently generating commercial

1 product. There are, through USEC's research and
2 development related to their centrifuge technology they
3 are generating some low-level waste stream that meets
4 this definition, but they're not depleted uranium
5 hexafluoride cylinders.
6 MEMBER SKILLMAN: Thank you, Christine.
7 MS. GELLES: Okay, Slide 12. The next
8 three slides are summarizing, I'm sorry, four slides are
9 summarizing the Oak Ridge National Laboratory report,
10 and the title of these slides is the actual title of the
11 report, Assessment of Preferred Depleted Uranium
12 Disposal Forms.
13 It was developed by the chemical technology
14 division of ORNL in 2000. It is in support of our
15 planning for the two conversion facilities and the
16 site-specific EISs. There are other studies that have
17 been done, but this is the significant one and the most
18 relevant, I thought, to the committee's interest in waste
19 form selection.
20 And so the following slides are going to
21 summarize the evaluations that are contained in that
22 report, and this report is electronically available. If
23 you haven't found it we'll be happy to provide it to you.
24 And following the discussion I'll take a look at the
25 introduction of the report and see if it answers the

1 question of why we selected just these four forms for
2 evaluation.
3 So the forms we considered were depleted
4 uranium metal. I'm sorry, Slide 13, please Roger.
5 Depleted uranium metal, and we're noting here that it's
6 insoluble in water but we're also noting that it reacts
7 slowly with moisture to form oxides in the presence of
8 oxygen; condensed moisture promotes the generation of
9 hydrogen; and reactions may form a pyrophoric surface in
10 the absence of oxygen.
11 So it presents a pyrophoric concern if it
12 were going to be stored for a prolonged period of time,
13 and that's one of the reasons why in our programmatic EIS
14 we indicated our preference against generation of a metal
15 form in that they would have re-used metal.
16 Next slide. The uranium tetrafluoride
17 form is very slightly soluble in water. We know it
18 reacts slowly with moisture to form the uranium dioxide
19 and hydrogen fluoride which of course is a concern as we
20 noted before, and eventually other oxides and minerals.
21 Uranium dioxide, insoluble but we note that
22 the powder, if it's still in a powder form it prevents
23 a pyrophoricity concern when it comes in contact with
24 air. Reacts slowly with oxygenated groundwater to yield
25 more stable oxides and minerals. And Slide 15,

1 our preferred form because it projects the lowest
2 uncertainty and our greatest confidence in performance.
3 The triuranium octoxide insoluble in water, reacts very
4 slowly to a more stable uranium mineral and the product
5 tends to be a fine particulate or powder in which we can
6 address in our modeling as a reliable waste form in our
7 disposal system.
8 Slide 16. We've aggregated a few comments
9 that we've received from the NRC over the years that are
10 relevant to waste forms, and I want to acknowledge that
11 these letters that are cited here actually address a
12 broader set of aspects related to the management of
13 depleted uranium hexafluoride inventory, but we've
14 highlighted the excerpts that were, and specific to the
15 waste form discussion.
16 So in '92 we heard from the NRC staff about
17 a preference for the U308 as the chemical form for final
18 disposition, and that letter also acknowledged that the
19 uranium tetrafluoride form for final disposition would
20 not be acceptable because of its physiochemical and
21 long-term stability being incompatible with the analyses
22 of 10 CFR Part 61.
23 In '95, we again heard in a letter that the
24 DUF6 will likely require conversion to a more stable
25 physiochemical form. In mentioning the triuranium

1 octoxide, the staff recommended the U308 which is
2 thermodynamically stable and relatively unsoluble as a
3 likely form for disposal.
4 And then in 1998, the NRC again expressed
5 a preference for uranium oxides over metal and this was
6 provided to us in comments on our draft programmatic EIS
7 that we were discussing before.
8 So we considered these comments when we went
9 for evaluations and we view them as relatively consistent
10 on the support of our waste form selections.
11 Slide 17, please. This is my final slide
12 before I turn it over to Roger. It gets back to answering
13 the question of the additional analyses that we need to
14 do before we ultimately select disposal sites for the
15 depleted uranium conversion product that we're currently
16 producing at the two facilities.
17 So we've committed to conduct additional
18 analyses on the transportation and disposal of the
19 conversion product. And the reason we did this is in
20 2004, DOE unfortunately had an oversight and we did not
21 adequately serve two of four states, the host states of
22 Envirocare and NTS or Tribes and NNSS now, when the EISs
23 were published.
24 And to remedy that oversight we committed
25 to do additional NEPA documentation to confirm the

1 adequacy of the EISs prior to issuing any Records of
2 Decision. So we've remedied that oversight and provide,
3 you know, update and appropriate service of the EISs and
4 we've been in discussion.
5 And in March of 2007 we took the first step
6 for satisfying the commitment for the additional NEPA
7 analyses by publishing a draft supplement analysis on
8 locations for disposal of the depleted uranium
9 conversion product. We analyzed in this document all of
10 the previous studies including the analyses in the
11 programmatic and the site specific EIS's. We summarized
12 the state of play regulatorily and for both Clive and from
13 the standpoint for Nevada.
14 But we chose to not finalize that document
15 for selected disposal locations in light of the NRC's
16 initiation of the limited rulemaking on uniquely
17 streamed and depleted uranium, which of course is more
18 akin to the site-specific performance assessment that my
19 colleague needs to describe.
20 So we have it out there as a future action
21 for us to undertake. Originally we wanted to finalize
22 all of this analysis prior to the startup of the two
23 conversion facilities so that we could be ensured that
24 we would have the disposal locations for the waste that
25 we would be generating.

1 DOE's waste management policy has a very
2 strong bias against generating waste which they cannot
3 currently be disposed, but we worked through in our
4 startup analysis the appropriate evaluation to ensure
5 that we could provide for safe storage pending some
6 future completion of this document.
7 We have been, as you know, closely
8 monitoring with the NRC staff that they're working on and
9 we're very pleased that we can interact with the
10 committee on these important issues. And we remain
11 uncertain exactly when we're going to resume that
12 additional NEPA analysis and conclude and then show
13 Record of Decision.
14 I'll also note in the last bullet that what
15 we're evaluating is potential sale of a portion of the
16 depleted uranium hexafluoride inventory for reuse,
17 reenrichment specifically. And right before the
18 holiday last week we announced our intent to enter into
19 negotiations with a private company for sale of a portion
20 of the higher assay tails for cylinders for reenrichment.
21 Ultimately -- yes, any questions?
22 CHAIRMAN RYAN: No.
23 MS. GELLES: Okay, sorry. Ultimately, you
24 know, because of the Privatization Act the cylinders
25 produced for those enrichment activities will come back

1 to us, so it's a temporary potential change to the
2 inventory of cylinders that are in the yard awaiting
3 conversion, but ultimately it's quite possible that the
4 tails will be returned to us for future conversion and
5 disposition.
6 CHAIRMAN RYAN: Okay.
7 MS. GELLES: I'm going to turn it over to
8 Roger now, and Roger's going to summarize the more recent
9 analyses again in context of our defense-in-depth
10 results that we presented to you a few weeks ago.
11 CHAIRMAN RYAN: I'll just mention that
12 after Roger's presentation we'll take a short break and
13 then we'll come back and see if there are any final
14 questions and then we'll roll into the last session of
15 the day.
16 MR. SEITZ: Okay, and my part is very short.
17 It's just a couple slides to provoke some thoughts.
18 When you think about disposal of depleted
19 uranium, I think everyone realizes that near surface
20 disposal is a challenge because of the long-lived nature
21 of it. But we believe that there are viable options in
22 the United States. And performance assessments that
23 have been conducted in some of these NEPA analyses that
24 we've heard about to date do support the idea that it can
25 be safely disposed at favorable locations.

1 Three, and I think just a little bit of a
2 repeat of what Christine mentioned, but there's three
3 locations that are currently considered options for near
4 surface disposal -- Nevada, EnergySolutions in Utah, and
5 Waste Control Specialists.
6 DOE has oversight of the Nevada disposal
7 facility and has disposed of depleted uranium in that
8 facility, and the site-specific performance assessments
9 do support those disposals.
10 Moving forward, there's also been
11 evaluations for the larger inventories expected in the
12 future, and I know that EnergySolutions and Waste Control
13 Specialists are both also pursuing the regulatory
14 approvals that they need for disposal at their sites.
15 MEMBER POWERS: Put it in WIPP.
16 MR. SEITZ: That's a bigger change.
17 MEMBER POWERS: Yes, but I mean if I was
18 going to put it anyplace I'd put it out in the mines in
19 grants. But I mean that's where it came from and it'll
20 move out of there. But given that that might pose some
21 political challenges why not WIPP?
22 MR. SEITZ: It's something to be
23 considered. One concern just off the top of my head, one
24 concern with WIPP is if this is determined to be a
25 resource in the future it may preclude --

1 MEMBER POWERS: No, you can recover it.

2 MR. SEITZ: Out of WIPP?

3 MS. GELLES: If I could interject as well,

4 I mean when we were doing our NEPA evaluations on disposal

5 we conducted those within the context of current policy.

6 And we evaluated and given that depleted uranium is by

7 default Class A waste under the Department of Energy

8 classification scheme, we knew that we needed to

9 appropriately evaluate low-level waste alternatives.

10 And our analysis was limited to low-level

11 waste alternatives although we looked at surface

12 facilities, salts and a mine facility, a geological

13 depository, but we ultimately concluded for ourselves

14 that near surface disposal could be protective and for

15 that reason did not see reason to consider WIPP a

16 reasonable alternative given the statutory prohibition

17 against --

18 (Crosstalk)

19 MS. GELLES: -- definition of true waste

20 going there.

21 MEMBER POWERS: Statutes can be changed and

22 they just get you out of all these low-level waste

23 headaches. It's not going to contribute to the heat

24 load, and an inert oxide and an inert salt sounds like

25 a good combination to me.

1 MEMBER ARMIJO: It would have to be a pretty
2 big facility.
3 MEMBER POWERS: It is a big facility. It's
4 huge.
5 MEMBER ARMIJO: For all of those tanks that
6 we saw in the picture?
7 MEMBER POWERS: Well, I understand though
8 is tanks can dip down to about this much oxide.
9 (Crosstalk)
10 MEMBER ARMIJO: Okay, got it. I have no
11 questions.
12 MR. SEITZ: Yes, at this point we're
13 focusing on the near surface option that's been
14 identified. So I'll bring up the figure that we used in
15 the presentation a couple weeks ago, just the idea that
16 I like people to think in terms of disposal and get beyond
17 just this focus on numerical calculations and think of
18 disposal as a full total systems concept.
19 And I think especially when you think of things
20 that are long-lived like depleted uranium it becomes a
21 much more focus on the site. You're looking for good
22 locations. And if you remember the Nevada slide, those
23 that were here, the Nevada slide has an exaggerated size
24 for the site part of this bullet. And I think
25 that highlights the benefit of Nevada is it is a very good

1 location for disposal of waste. It's remote, low
2 rainfall, no residents to speak of, and even historically
3 no residents to speak of.
4 So you've got your site characteristics.
5 We have any facility design. That by choosing the good
6 sites you've reduced the reliance on the design factors.
7 which become less important over time unless you're
8 making copper cannisters or something.
9 And also the administrative and technical
10 controls. Things like, you heard this morning that
11 Waste Control Specialists has the agreement for federal
12 ownership. I understand that's also being considered
13 for the Clive facility.
14 So that adds confidence, the federal
15 ownership aspect. The site-specific analysis certainly
16 was part of it and that is part of the work that's been
17 done to support near surface disposal. A lot of it comes
18 down to the radon. For example, at Nevada it's
19 management of the radon. And you can deal with that with
20 depth.
21 And essentially what the results show, the
22 longer time frame that you choose, you go a little bit
23 deeper and that helps to buffer that radon concern.
24 MEMBER POWERS: Go to deep borehole.
25 (Crosstalk)

1 MR. SEITZ: And I do want to remind people
2 there are in these analyses, and I think this came up,
3 there is a tendency towards conservative bias. And
4 those become more pronounced the longer you go out in the
5 future because you have trouble defending assumptions
6 farther out in the future. And so that's built into
7 these calculations as well.
8 CHAIRMAN RYAN: Okay, terrific. Thank you
9 very much. We are scheduled for a 15-minute break which
10 will begin now and we'll come back at 25 after 3:00.
11 (Whereupon, the foregoing matter went off
12 the record at 3:10 p.m. and went back on the record at
13 3:31 p.m.)
14 Other Stakeholders
15 CHAIRMAN RYAN: We have three speakers in
16 the afternoon session.
17 MR. WIDMAYER: He wants -- he wants to wait
18 there.
19 CHAIRMAN RYAN: Huh?
20 MR. WIDMAYER: He wants to wait there.
21 CHAIRMAN RYAN: Okay. If you want to wait
22 there, that's fine, either way. Okay, okay. Suit
23 yourself. Up first is John Greeves from Talisman, LLC.
24 John, nice to se you.
25 MR. GREEVES: Good to be here, Dr. Ryan.

1 Thanks for inviting me. Just a little background on
2 myself. I actually joined the NRC Waste Program in 1980,
3 when Part 61 was being developed. I worked with the
4 authors of Part 61, and the then-affected Agreement
5 States.
6 It helps give you a context of how things
7 were, as Dr. Ryan said, in the old days. He too shared
8 the experience, maybe from a different position.
9 But subsequently, I was also responsible
10 for managing the staff that developed the guidance for,
11 for example, engineered barriers under the Low Level
12 Waste Amendments Act in 1985. So that was a good
13 experience, and although the NRC staff really didn't
14 license low level waste facilities, they did invoke the
15 performance objectives of Part 61 on a number of
16 occasions.
17 One example was the West Valley
18 Demonstration Act, the Commission Policy Statement on
19 the West Valley Demonstration Act, to write out the
20 performance objectives. So the then-staff had to
21 implement those performance objectives.
22 Then subsequently the National Defense
23 Authorization Act of 2004, which addresses tank waste
24 disposal around the weapons complex also incorporated
25 the performance objectives of Part 61, and while I was

1 on staff we had to implement that.

2 So that body of experience is there, and I

3 retired from NRC as Director of Waste Management in 2004.

4 Since the last ten years, I've had an opportunity to work

5 with the Department of Energy.

6 I understand there was a briefing on the

7 19th. I was unable to monitor that, and I had an

8 opportunity to work with the Department on their

9 implementation of the Order 435.1, and it taught me a lot.

10 My experience base grew significantly by

11 seeing things from a different angle. So I just thought

12 I would share that backdrop with you. I tried to keep

13 my presentation material relatively simple, to just try

14 and hit the key points, and the experience that I have

15 indicates that the regulatory standards should best

16 follow what I call four principles: Adequate

17 protection, travel in the international community and

18 these are the kinds of things you'll run into regardless

19 of what you're regulating.

20 We have the ICRP recommendations to look to

21 and international experiences, which I have some

22 international experience working with other countries.

23 Simple standards. The regulation is not a

24 place to put how to language. It's a place to put clear,

25 simple statements of what the requirements are, and it

1 really should avoid complex how to language.

2 Further, the conversation we've had here

3 this morning. The existing Part 61 and certainly the

4 proposed Part 61 is going to have some clarity issues for

5 all stakeholders. The last one, implementable.

6 Any standard needs to be reasonably

7 implemented and to me, a new standard ought to run this

8 test when you put it down there. Can you make an honest

9 statement that I've met these principles?

10 MEMBER RAY: Let me ask you a question here.

11 Isn't there, maybe implicit in what you've listed there,

12 the idea that a standard should apply to something that's

13 relatively consistent? It seems as if there's low level

14 waste that is separable or is separated now, and which

15 we're having to treat as if it were subject to the

16 standard, whereas it wouldn't necessary need to be?

17 MR. GREEVES: That is a concern. You've

18 heard views around the table about shouldn't there be a

19 separate standard for DU. I've thought about this a lot,

20 and I'm going to articulate what I think is an approach

21 that provides these things, adequate protection, simple,

22 clear and implementable in one standard.

23 After we're done, we can come back to this

24 question. But I understand the question, because I've

25 wrestled with it too, and I've seen others also. I don't

1 subscribe to splitting off some new standard for DU, and
2 hopefully after I'm finished you'll see how I think we
3 need to account for long-lived radionuclides, including.
4 So just a little background. I don't think
5 everybody's in the room's familiar with this, but there
6 were actually six sites back in the time frame on Part
7 61 in '82 as being promulgated, and then three of them
8 actually had to close because of poor performance.
9 I would assert that Part 61 has been a gold
10 standard for low level waste disposal. It's also been
11 adopted in legislation that I identified earlier, and
12 it's been recognized by the international community.
13 DOE's taken Part 61 performance objectives and pulled it
14 into its Order 435.
15 So it's been to me a gold standard. It's
16 done a very good job, and what it did in large part was
17 it cured a lot of the poor disposal practices of the day,
18 and Dr. Ryan said in many meetings that it cut worker
19 doses by factors. So it's really done a wonderful job,
20 and the authors have a lot to be proud of. It's done
21 would it could over these decades.
22 The second point here is performance
23 objectives are primary requirements. The Commission,
24 for example in the West Valley Demonstration Act, and
25 legislation in the so-called WIR, Waste Incidental

1 Reprocessing legislation in 2005 or 2004, pointed out
2 you've got to meet the performance objectives. They are
3 primary.
4 So the technical requirements in Part 61 at
5 the time were and are prescriptive as written. Over
6 time, the Commission migrated to risk-informed
7 performance-based regulation. It came at a later time.
8 We've grown. We've learned since 1982. But the
9 performance objectives stand the test of time, and this
10 regulation has been successfully implemented by
11 Agreement States.
12 So it served well. Does it need to be
13 updated? You'll see later I say yes. Over the years,
14 there's been advances in computational capability, and
15 these have pretty much been implemented through guidance
16 and policy statements, through more than by the way just
17 low level waste disposal activities.
18 The emerging waste streams, as recognized
19 by the staff, they've done a good job, require an updating
20 of Part 61, in my view.
21 Just a little bit more on the background.
22 To me, Part 61 as written combines deterministic and
23 performance-based approaches. It's easy to point to the
24 classification tables. They're really a generic set of
25 criteria that were created with the technology and

1 calculational capability available in the late 70's, and
2 it's very prescriptive.
3 The performance objectives can be used to
4 evaluate what we call now performance assessment
5 techniques, and I would point to the language that's now
6 in 61.13. It calls for a technical analysis. That
7 particular statement can be used to invoke risk-informed
8 performance-based processes, and frankly everybody's
9 been doing that for the last decade.
10 You've heard here that all of the sites do
11 a waste acceptance criteria. How do they do a waste
12 acceptance criteria? It's informed by performance
13 assessment activities. So effectively people have been
14 doing this, and a reading of 61.13, I think, you could
15 potentially come to that conclusion, that that's what's
16 needed.
17 It's not clear enough, so and the last point
18 here is that the staff, I think, has done a good job
19 identifying the gaps. The DU issue, you've heard a lot
20 about it today. It really is a gap in the thinking that's
21 contained within the confines of the existing Part 61.
22 All of that were what are called blending
23 issues. There's been meetings on that. I'm not going
24 to go into that. But evaluating of long-lived
25 radionuclides needs an adequate protection standard, and

1 so I think that's fundamentally why we're here.

2 I have a bit of preliminary thoughts. The

3 reason I'm saying that is that I'm waiting to see what

4 the Commission has to say with the SRM. The Commission

5 has this material. I'm given to understand the votes are

6 in, and their due process has come out with a staff

7 requirements memo and some follow-up action.

8 So I fondly hoped I would have that, and be

9 able to articulate my views as to okay, where are we going

10 to go from here? We don't have that. So that -- I

11 actually concluded some time ago that Part 61 needs an

12 update in a few areas.

13 It needs to clarify that site-specific

14 performance assessment of all, underline all, all waste

15 streams needs to be done. The way it's being interpreted

16 now is you don't have to do waste site-specific

17 performance assessment for Class A waste, for example.

18 So hey, if that's not the way to interpret 61.13, then

19 fix 61.13 and say it's all waste streams, not just

20 selective ones.

21 The intruder standard. Listening to

22 people here throughout my career, the royal "we" have

23 always used 500 millirem as a standard to evaluate

24 intruder protection, whether it was in the rule or not.

25 By the way, you'll find that number in the

1 statement, the work that went into the thought process
2 of the people in 1980, that they were looking at the 500
3 millirem standard.
4 It just didn't end up in the rule. So I
5 think an update needs to include an explicit statement
6 about the 500 millirem standard. I think there's a
7 consensus to use ICRP modern dose methodology. I'm not
8 going to dwell on that, but that's one of the things that
9 should be updated, and a key is the Advisory Committee
10 on Nuclear Waste and others recognized the need for a
11 two-tier standard, years ago. I think there's a
12 consensus that we need to have a two-tiered standard.
13 My view is that the first tier, 1,000 year
14 period, as implemented by the Department of Energy, which
15 I spent basically the better part of the last ten years
16 getting insight on, has proven to be effective without
17 using a very prescriptive classification table.
18 They don't have -- they don't use
19 classification tables, and they are able to do
20 performance assessments, and they look at compliance for
21 1,000 years. I think it's a good first tier number, and
22 the thing you have to do is to look at it as the two tiers,
23 and what is the definition of the second tier?
24 To me, the Commission really regulates by
25 dose. So I think it has to have some dose component and

1 how far to go, peak, impact peak, dose. Some people talk
2 about impact; others talk about dose out to the peak is
3 a defensible way to look for adequate protection for
4 long-lived radionuclides.
5 The art here is combining the two tiers.
6 I've heard some people say well 1,000 years is not safe,
7 it's not adequate. Well, by itself it's not. You have
8 to look at it as a construct. It's a two-tier construct.
9 The table you looked at earlier shows you
10 boy, we've got a lot of stuff we've got to watch for the
11 first 1,000 years. So that's the 1,000 year compliance
12 approach. There are long-lived radionuclides DU
13 actually grows, that I think call for an adequate
14 protection standard to have a second tier to it, and you
15 don't really need any more than that. The two of them
16 together will provide adequate protection and fill what
17 really now is a regulatory gap.
18 So to me, these two tiers work in
19 combination. We've got camps of people who want the
20 first one. We've got camps of people who want you
21 actually need both of them for adequate protection.
22 MEMBER RAY: You're using the words
23 "address for 1,000 years" and "evaluate for longer
24 periods." I keep looking at the differences in the way
25 these tiers are described, the verbs, adjectives and so

1 on.

2 MR. GREEVES: Well, my advice is keep the

3 rulemaking language pretty simple, but we could probably

4 spend a session talking about okay, how do you do analysis

5 for the first thousand years, and how do you do analyses

6 throughout the time frame.

7 You know to me, lots of speakers already

8 before me feel comfortable with the calculation that they

9 can make out to 1,000 years, and some people aren't even

10 comfortable going that far, by the way. But I think the

11 consensus is we have some comfort, confidence in our

12 ability to understand the uncertainty and the issues

13 involved out to 1,000 years. So that's what I'll call

14 Tier 1.

15 Then you've got a Tier 2, and you might

16 listen to some of these speakers and it sounds like they

17 don't think we need a Tier 2. We need a Tier 2. You

18 cannot point to stakeholders and say okay, how are you

19 -- if you're going to consider these long-lived nuclides

20 in this first term, how are you going to protect me? So

21 you'll need a Tier 2.

22 How you frame that Tier 2, how you analyze

23 it, it's subject to discussion and what is not negotiable

24 is that you have to make a decision. So as you'll see

25 later, I subscribe to setting a quantitative criteria for

1 Tier 2, evaluate it and I want that analysis and that
2 uncertainty, and I think informed decision-makers will
3 be able to deal with that.
4 What they have to do is they have to make
5 a decision, and what I cannot conceive of is how am I going
6 to make a decision with terms that say minimize releases?
7 I don't know what minimize releases means, by the way.
8 That's not helping me. So but let me get through my
9 slides and we can come back.
10 MEMBER RAY: John, before you do that, in
11 the original -- in the Part 61, the 1982 version, how was
12 the idea of a Tier 2 treated? Was it implicit in the --
13 or was it --
14 MR. GREEVES: Let me -- you know, my friends
15 will talk to me about this stuff. They didn't look at
16 a Tier 2, because you see things depleted uranium, were
17 not on the plate at the time. So they -- you can look
18 at the EIS, and the EIS actually did calculations out in
19 time, certainly to 10,000 years.
20 MEMBER RAY: So but then what I'm trying to
21 get at is if -- is Tier 2, from your view, a necessity
22 for short-lived?
23 MR. GREEVES: No.
24 MEMBER RAY: Not, okay. So you don't need
25 it for short-lived. You only need it for DU and stuff

1 like DU?

2 MR. GREEVES: I subscribe to adequate

3 protection for service disposal, you need a second tier

4 if you are contemplating long-lived. And oh by the way,

5 a very large fraction of the long-lived material is

6 actually in A waste.

7 I think, I'm pretty sure that line -- if the

8 other stuff goes away, but there's, you know, Gary

9 Lowells pointed this out early on, that you know, the real

10 enemy here is the long-lived waste in the Class A

11 fraction, and you can't ignore it. You need a two-tiered

12 system, and you know, I think the DU and the blending

13 issue sort of lifted this issue, and Part 61 was ripe for

14 an update, so let's get it done in one spot, not two.

15 So okay. I'm on -- so did I go through all

16 of these?

17 MR. WIDMAYER: You're good.

18 MR. GREEVES: Okay.

19 MR. WIDMAYER: You want to do Slide 6.

20 MR. GREEVES: All right. I'm up to 6 then.

21 There's one missing then, because I thought about these

22 quite a bit. To me, the performance objectives are the

23 gold standard. I've said this before, that they've been

24 recognized by the Commission in the West Policy

25 Demonstration Act.

1 They are in legislation. The National
2 Defense Authorization Act that NRC, by the way, has a role
3 of doing an evaluation of those tanks around the weapons
4 complex, and they both recognized it's the performance
5 objectives.
6 The problem we've got is this proposal is
7 messing with the performance objectives, and it's
8 actually stringing them back to, for example ,61.30 --
9 13, which didn't happen in the past. So these proposed
10 additional requirements in the two performance
11 objectives we mostly talk about, 41 and 42, the public
12 does --
13 Intruder actually now have provisions that
14 reach back to 61.13(e). I think this is a problem. It's
15 going to cause a question with this legislation, and
16 implementing that, with all the new language in 61.13,
17 is something we need to think long and hard about. So
18 I'll look forward to the Commission SRM and probably have
19 some comments about that at a later time.
20 But the legislation recognized the need for
21 clear standards, and the new 61.13 language is very
22 prescriptive. It's really "how to" language, and once
23 this comes out for comment, I would think about
24 commenting, take a lot of that language and put it in.
25 It reads like, it feels like guidance. Put

1 it into guidance, because you put all that into a
2 standard, and it's going to create opportunity and
3 mischief for interpretation.
4 CHAIRMAN RYAN: John, we're running a
5 little bit tight on time.
6 MR. GREEVES: Okay, so I'll speed up. The
7 second tier, I spoke earlier and questioned, needs a
8 quantitative metric. I don't know how to regulate
9 minimizing releases, which is the language that's in
10 there now, and it could be interpreted differently.
11 The key with the second tier is avoiding
12 catastrophic consequences, and the other thing that
13 really caused me to want to move away from this, dig this
14 up and so what's a metric for that? Others have put
15 numbers out there. One rem; maybe it's 500 millirem.
16 I don't know. But to make a decision, I
17 need a figure of merit that I can do my uncertainties
18 around, and so I think you need a figure of merit to make
19 that decision.
20 The long-term analysis concepts in Section
21 61.7, which is the concept Section 13, which is technical
22 analysis and 58, become quite complicated and again, it
23 feels like guidance to me. To me, it loses the context
24 intended originally by the authors.
25 This is going to be implemented by multiple

1 Agreement States, and finally, I think, the
2 site-specific waste acceptance criteria approach, as
3 shown by DOE, is effective and protective, and we need
4 to be able to just build that in, in a way that allows
5 that to move forward.
6 I'm just trying to speed this up.
7 Performance objectives have and should have the highest
8 level of compatibility. One of the things you started
9 this meeting, there's just not time to do it --
10 MEMBER BROWN: Flip your slide so everybody
11 can see it. He flipped the slide. He was on Slide 7.
12 MR. GREEVES: Oh, yeah. I went to Slide 7.
13 The performance -- the compatibility is an issue, and
14 it's probably worth a meeting of its own. There's very
15 few people who actually understand that compatibility
16 status issue. But the performance objectives to me need
17 to have the highest level of Agreement State
18 compatibility.
19 Grandfathering was discussed this morning.
20 I think there needs to be a clear grandfather. It can't
21 be "I wonder," it can't be "I doubt or wonder about it."
22 It needs a grandfathering provision to -- these people
23 work on these sites for decades, and now a new set of
24 standards is going to confront them. It's got to be some
25 room for grandfathering.

1 Not to kind of dwell on it, point of
2 compliance, I think, is an important issue. The buffer
3 zone concept is in Part 61. I think it needs to stay
4 there just the way it is, and then last, as I've talked
5 about, site-specific performance assessment, I think,
6 will resolve a lot of the issues that revolve around the
7 outdated classification tables.
8 MEMBER ARMIJO: You would retire the
9 classification tables?
10 MR. GREEVES: No. I subscribe to that.
11 Well first, the classification tables are in
12 legislation.
13 MEMBER ARMIJO: So you can't retire them.
14 MR. GREEVES: You can't retire them. Now
15 enlightened people know that all the legislation did was
16 use them as a marker for separating state and federal.
17 So they exist, and they're not going to go away.
18 I know the Agreement States like the
19 classification tables. I don't want to go there. I
20 don't want change those classification -- they're just
21 fine. What they do for me are generic screening values
22 that are dated in the 70's, early 80's.
23 Let them sit there and then move towards
24 waste acceptance, site-specific performance assessment
25 approach, and allow that to do what effectively is being

1 done. All these Agreement States, all the licensees are
2 using performance assessment techniques to come up with
3 a waste acceptance criteria that's risk-informed,
4 performance-based, and it to me tells you where you
5 really are, versus some screening table that was
6 developed --
7 CHAIRMAN RYAN: The Agreement States have
8 all the authority they need, because they can write
9 site-specific license conditions and take care of all of
10 this, John, and they do.
11 MR. GREEVES: Mike, I think that there's a
12 very simple rule that they could invoke, clarifying the
13 need for site-specific performance assessment, provide
14 for a waste acceptance criteria, get the dose limit for
15 the intruder at 500, and invoke a two-tiered approach.
16 It's not that hard.
17 MEMBER ARMIJO: I guess I'm just thinking
18 about, you know, how much of that's already been done.
19 MR. GREEVES: Well, it's not in regulation.
20 There's no two-tiered approach in the regulation.
21 There's no --
22 MEMBER ARMIJO: It's been done.
23 MR. GREEVES: Oh, it's been done, yes.
24 MEMBER ARMIJO: Licensees invoke it all the
25 time. But I just want to -- it's something to think

1 about.

2 MR. GREEVES: Yeah. But I don't think you

3 could get through a hearing, a licensing activity without

4 a new rule if you were contemplating DU or some of the

5 other voice forums --

6 CHAIRMAN RYAN: Okay. Well, the clock's

7 ticking, so must we. John --

8 MEMBER ARMIJO: I had just one question.

9 On Chart 6, you talk about a quantitative metric of 1R

10 should be considered, one rem, I mean, for the -- and that

11 would be a --

12 MR. GREEVES: It's just a metric. The high

13 level waste standard has a metric. If I'm a

14 decision-maker, I do not want to be left with John,

15 minimized releases. I don't know what "minimized

16 releases" means. I need some kind of an anchor to be able

17 to defend my decision that -- short of that, you're going

18 to have a bunch of people making it up as they go. It's

19 going to be freestyle, and you'll have a decision in this

20 state that's different from that state, and you might

21 throw away a perfectly suitable --

22 CHAIRMAN RYAN: John, I understand what

23 you're saying, but on the face of it, minimizing releases

24 to the public would be difficult to implement. 1R should

25 be considered. I guess I understand that, but one rem

1 to who? One person, everybody?

2 MR. GREEVES: It would be to the critical

3 group. I subscribe to it --

4 CHAIRMAN RYAN: What's critical group?

5 MR. GREEVES: Whatever the critical group

6 is.

7 CHAIRMAN RYAN: Well --

8 MR. GREEVES: Out at this time frame, you

9 know, it could be stylized approach like they did for --

10 CHAIRMAN RYAN: Right. So a lot of thought

11 would have to go into making that --

12 MR. GREEVES: Absolutely, you know. These

13 are preliminary thoughts.

14 MEMBER ARMIJO: Okay, great.

15 MR. GREEVES: I don't see how you can do it

16 without a metric.

17 CHAIRMAN RYAN: Okay, and that's a good

18 point too. I understand.

19 MALE PARTICIPANT: I guess we switch.

20 CHAIRMAN RYAN: Thank you, John. I

21 appreciate you being here.

22 MR. GREEVES: Okay.

23 CHAIRMAN RYAN: Well you both have

24 microphones. You really, you don't need -- oh yeah.

25 You've got to operate the slides. And just a caution.

1 Don't whack the microphones too hard. Our recorders get
2 a big bang in his ear if you do.
3 MEMBER POWERS: But it is kind of fun to
4 watch when it happens.
5 (Off record discussion.)
6 CHAIRMAN RYAN: Go ahead, please.
7 DR. TAUXE: John Tauxe with Neptune and
8 Company. I'm here with my colleague, Paul Black, who's
9 in the audience, one of the founders of Neptune and
10 Company, and I'd like to thank the Committee for inviting
11 us to offer our opinions here.
12 My slides are oriented towards my
13 understanding of what the questions before us were, to
14 address some specific issues and then other issues too,
15 and I have a lot of slides for ten minutes, so I'm going
16 to just start going through.
17 First about site-specific performance
18 assessment. I have an awful lot to say about performance
19 assessment, because that's my bread and butter, and but
20 that's --
21 I'm not going to have that the focus of this
22 discussion, except to say that the way we view
23 performance assessment, especially site-specific PA is
24 to help in decision-making at even a most basic level,
25 just to show differences between sites and get away from

1 this idea of cookie-cutter analyses and assessments that
2 are often applied, and yet don't provide as much
3 information and utility in decision-making as
4 site-specific PA would do.
5 Now Mike Ryan had brought this -- he's
6 mentioned this a couple times this meeting, is features
7 of instant processes, and that's what we feel is the
8 fundamental place to start in doing PA.
9 You have to identify what features, events,
10 processes and I would enhance that to include exposure
11 scenarios are important in any particular given site, and
12 for any particular waste form or waste type, radioactive
13 waste type.
14 So you know, considering the standard steps
15 as we call them, I'll use that acronym, these physical,
16 chemical types of things that can happen at the site, that
17 at least should be considered. A lot of them will be
18 dismissed, not --
19 I don't think any U.S. sites are going to
20 be targets of tsunami, but a lot of these others would
21 apply in different ways to different sites. It's
22 important to pick those that apply to a given site, and
23 not pick those that don't apply, so that you're not
24 spending time, wasting time evaluating FEPs that don't
25 matter for a particular site.

1 And I would expand this to include exposure
2 scenarios. So I'll call it FEPses or something like
3 that. I don't know, but in the same vein, there are
4 exposure scenarios that apply at a particular site, and
5 certainly don't apply at a particular site.
6 We've heard examples, and I could go on and
7 on about examples of different PAs that I've worked on,
8 and this really helps discriminate one site from another.
9 It's very useful, very important, and again, only some
10 of these apply to some sites.
11 As an example, here are five real sites, V,
12 W, X and Z, and the different site-specific exposure
13 scenarios that would apply to these sites, as everybody
14 turns their head sideways to read the headings.
15 So as an example, this Site V here has a lot
16 of exposure scenarios that really can matter and awful
17 lot. Fishing, water well drilling, on-site resident and
18 that sort of thing, and if you compare that to Site X,
19 there's a lot of scenarios that just simply don't apply
20 there.
21 Does that make it a better site or not? Not
22 necessarily. You've got to do the performance
23 assessment to find out. But there's no point at Site X
24 in doing oil and gas well drilling that might be
25 applicable at Site Y, but not Z or V or W.

1 So there's no point in going there, and it's
2 important to get the FEPs agreed upon ahead of time with
3 the regulator, with the licensee in this case, with
4 stakeholders, so that everybody starts on the same page,
5 and say okay, this is -- this makes sense.
6 This is what we're going to do for this site,
7 and then you do the analysis, and the way I say it is then
8 let the chips fall where they may, and then we see --
9 MEMBER SKILLMAN: Please go back.
10 DR. TAUXE: Yes, certainly.
11 MEMBER SKILLMAN: Why do all of the sites
12 have hunting and recreation?
13 DR. TAUXE: Yeah. All five of these sites
14 are on lands that are currently hunted, and all five of
15 these sites could involve recreation in the future,
16 recreational user. A hiker, someone in a vehicle
17 driving around, these sorts of things.
18 MEMBER BLEY: These are dual sites. These
19 are -- these are the X's just hiding what they are.
20 DR. TAUXE: Dual sites.
21 MEMBER BLEY: These are the X's just
22 hiding.
23 DR. TAUXE: Yeah. I mean I can tell you.
24 MEMBER BLEY: No, that's all right.
25 DR. TAUXE: It's no secret.

1 MEMBER ARMIJO: But these are transient
2 groups, people.
3 DR. TAUXE: Well, the on-site resident --
4 MEMBER ARMIJO: No. I'm talking about for
5 the hunting and --
6 DR. TAUXE: The hunting and the recreation,
7 yes. Those are short-term exposures.
8 MEMBER ARMIJO: And so why is that
9 important?
10 DR. TAUXE: Because those things can
11 happen, and it very well could be. It's not safe to
12 presume that they couldn't be the controlling factor in
13 determining the highest dose, for example. Those
14 particular scenarios could.
15 So the idea with FEPs is you screen out
16 things that couldn't happen like tsunami. Those things
17 that could happen, you need to analyze before you dismiss
18 them, unless there's some extremely low probability like
19 meteorite impact or something like that.
20 But hunting occurs at all these sites now.
21 So hunters are part of an exposed group. We don't know
22 until we run the analysis how exposed they are. Are they
23 going to get higher doses than an on-site resident? It's
24 possible.
25 MEMBER ARMIJO: I don't think so. It's a

real stretch.

DR. TAUXE: They're not there to presume, I would say.

MEMBER ARMIJO: Well, you can presume. You can put everything under this thing. I just wonder --

DR. TAUXE: Well, no. You'd screen it out, and this, you know, you talk with people who live there. You talk with BLM. You talk with DOE. You talk with whoever owns the site.

MEMBER POWERS: I'm wondering how do you screen out, for instance, gas well drilling?

DR. TAUXE: How do you screen out gas well drilling?

MEMBER POWERS: Yeah. I can pick places. I'm thinking off-hand of Great Britain. There are locations there that nobody for the last 200 years thought they would ever drill a gas well. They're not contemplating drilling gas wells. But how I go about doing this screening when confronted with that example?

DR. TAUXE: Umm, well you use your best knowledge. The best knowledge may be incomplete. We all know that our best knowledge today is incomplete, and this is part of the problem, but it's something that you try to account for here. I would say that, you know,

depending on the geology. In Britain there might be places where gas was found that they hadn't expected to.

But I would posit that gas and oil well drilling is not going to happen in Los Alamos, for example.

MEMBER POWERS: But they're very, very likely to drill for geo energy there.

DR. TAUXE: Up in the Caldera. Geothermal. There's a good one. We should add that to the FEPs list. See, so this is why we have this discussion, see geothermal exploration as a perfectly reasonable thing to come up with, and say well geothermal would be good here. It wouldn't make much sense at Clive.

But it might make a lot of sense at Los Alamos. That's good. So geothermal exploration should be on the list of FEPs, should be examined as a scenario. And then -- or people may argue to dismiss it. But it's something that should be discussed and evaluated.

I like the geothermal exploration. Actually, that is on most FEPs lists, but not every site goes through FEPs. I think every site should go through FEPs. It sort of levels the playing field for everybody. But it's not a requirement. I think it's sort of a prerequisite, to make sure that all your thinking is

1 even.

2 Intruder assessment. There was a question

3 about whether we should do intruder assessments. And

4 we, meaning we at Neptune, we don't really see the value.

5 I don't see the value of separating inadvertent human

6 intruders from your standard member of the public, and

7 in fact there are a lot --

8 There are examples where it's very fuzzy and

9 difficult to separate them. I'll bring one up soon, but

10 just go through all those scenarios that we just talked

11 about, and if someone, you want to call them an intruder,

12 you want to call them member of the public. Everybody's

13 sort of a member of the public.

14 You determine who's there, what they're

15 doing, what sort of risk is posed for them, and go from

16 there. The utility of the intruder assessment in

17 setting up Part 61 is recognized, but I'm not sure that

18 it is still necessary.

19 But if you're going to do an intruder

20 assessment, it needs to be site-specific intruders.

21 Here, we might have someone drilling for water. Here,

22 we might have someone drilling for oil. Here, we might

23 have a resident. Here, we might have a hunter. We're not

24 going to have a fisherman in Nevada, and you're not going

25 to have one at Clive for a while.

1 So also what makes an intruder not so clear.
2 So here's an example. Let's say one person comes along
3 to the site. They do something to disturb the site, that
4 doesn't actually expose them to waste. They leave.
5 What they've done to the site ends up exposing waste.
6 Someone else comes along, is exposed to that
7 waste. Who's the intruder? Neither is a classic
8 intruder, but this is a real scenario, and it falls
9 through the cracks as an intruder scenario versus member
10 of the public, and it muddies it all up.
11 Federal versus commercial facilities.
12 Well first, there's no difference. Why should they be
13 evaluated separately? It's waste X, waste Y going into
14 site A or B or W. Why would they -- why would we evaluate
15 that differently if -- you know, federal versus
16 commercial facilities, if you're talking DOE versus NRC,
17 should be the same.
18 If it's federal and commercial facilities
19 at site like WCS where they're missed together, they
20 should be the same analysis. And we've done our best at
21 Neptune, having worked on both DOE and commercial
22 facilities, to follow the same basic principles. The
23 performance metrics might be different, but that's not
24 really part of the PA in a way.
25 You do the analysis and then you can measure

1 it against whatever a decision-maker wants to measure it
2 against.
3 Other issues. Now I will say that there are
4 those in the room who told me I should, you know, keep
5 my nose out of policy. But I was asked to come here, and
6 I'm sticking my nose in policy because as a practitioner,
7 I have a very practical interest in the policy.
8 If it's vague, if it's difficult to
9 implement, that's a problem for me in writing a
10 performance assessment model. If I have to ask a lot of
11 questions about well, what do you mean by "commingle"?
12 What do you mean about "associated waste," what do you
13 mean by this or that, what do you even mean by "the site,"
14 basic things like that.
15 You know, we have to make our best guess and
16 see if it's defensible. That's the situation we're in
17 now. So vague and inconsistent language, even in 61
18 Section 41. It's called "Protection of the General
19 Population." In that, the text is to protect any member
20 of the public.
21 Well, which is it, because those are
22 different assessments. One is a population assessment;
23 one is an assessment of an individual. It's different,
24 different approaches, different math that goes into it.
25 You can't combine them. You can do a whole bunch of

1 positive individuals and combine them to make a
2 population dose assessment, which we have done in the
3 past.
4 But the language is inconsistent. It
5 causes a problem for me. Inadequate definitions of
6 "person" and "occupy." If you look, and these words are
7 used throughout the proposed rule, and it's -- there's
8 some clarification needed, and if you're interested in
9 the particulars of it, we did make comments this last
10 January on the rule. I got about 27 pages of comments
11 about things like this.
12 I know it gets overly-detailed and
13 nit-picky it seems, but these are things that pain me.
14 MEMBER ARMIJO: John, you raised the issue
15 on your first bullet, about vague and inconsistent
16 language.
17 DR. TAUXE: Yeah.
18 MEMBER ARMIJO: In that same, almost the
19 same sentence, after "any member of the public," it says
20 "for all time into the future -- at any time in the
21 future," which is rather open-ended.
22 DR. TAUXE: Rather.
23 MEMBER ARMIJO: And so, you know, I
24 appreciate that you're bringing this up, because I think
25 the regulation should be very, very clear and specific

1 and limited, so that you can -- you don't have these
2 open-ended infinite time, infinite populations, where
3 everybody's guessing. If you have to do performance
4 assessments, you need some guidelines that are clear and
5 --
6 DR. TAUXE: Well and actually, you know,
7 both are laudable goals. General population under some
8 kind of a LARA assessment, and how do we reduce doses to
9 everybody, and any member of the public. Do we want to
10 protect the dirt, the child who eats a lot of dirt and
11 lives as a resident on the site, maybe the most exposed
12 person?
13 Do we have to protect him? Is it going to
14 be show-stopper for the site? Those are decision
15 questions. But any member of the public tells me, you
16 know, you pick your worse person and do that. Is that
17 really where we want to go? I mean we could. We could
18 at least do the analysis and then let the decision-maker
19 decide if that's worthwhile.
20 But the language, at least in guidance,
21 somewhere the language could be -- I think it should be
22 a little more specific in the rule.
23 Stability. The definition of the current
24 one is "stability means structural stability." Well,
25 it's tautological. It doesn't -- that's not a helpful

1 definition to just say "structural stability." For how
2 long? What kind of stability? Stability that exposes
3 waste or something like that.
4 CHAIRMAN RYAN: Forgive me John, but time
5 is running out.
6 DR. TAUXE: Okay, and this one. There are
7 places in there that say well, to see if it's a
8 significant dose, we'd have to do an assessment. Or if
9 it's a significant hazard, an assessment should be done.
10 But how can you know if it's significant or not until
11 you've done the assessment side? So either way, an
12 assessment must be done.
13 And correct me if I'm wrong, but the way I
14 read 61.7(e)(3) is that depleted uranium would be a Class
15 E waste, because it says "any waste with a hazard of more
16 than 500 millirem in a year is a Class E waste."
17 So there might be some language cleanup that
18 is desired there, but the way I read that is do you use
19 now Class C? Well then, you know, there are other places
20 where it says it isn't, so --
21 CHAIRMAN RYAN: I'm not sure that's right.
22 I won't -- I'll just make a comment like that.
23 (Simultaneous speaking.)
24 CHAIRMAN RYAN: I don't think you're
25 looking at the body of definition in its totality. So

1 I disagree with your assessment.

2 DR. TAUXE: Okay. Well, all right. Maybe

3 it could be clarified. Environmental impacts are

4 brought up, but there's very rare -- there's no ecorisk

5 assessment. There's no environmental assessment.

6 It's all human oriented. If we want to get into

7 environmental assessment, I'd love to help do ecological

8 risk assessment.

9 And dose is still used as a proxy for risk.

10 I think risk is where it's at, and dose is part of the

11 risk, but as we saw before, uranium toxicity is part of

12 the risk. We did at the Clive DU PA. We included

13 uranium toxicity.

14 How long is dose relevant? Well, I'm going

15 to go through this very quickly. You can read. But the

16 problem with deep time, I like the two-thirds system. I

17 think when you get way out in time, geologic things can

18 happen, and at some sites, it's obvious what's going to

19 happen.

20 And where that is, I think that should go

21 into some decision-making. Los Alamos, where I live, my

22 house is, you know, the property I'm on is going to be

23 washed into the Rio Grande within 100,000 years, and all

24 the waste that's disposed of there. So future risk.

25 The time of compliance is this arbitrary

1 line there. It has no basis. Even Chairman McFarland
2 has said there's no technical basis for any kind of number
3 like 1,000 or 10,000 years. It's because we have ten
4 fingers is where that comes from.
5 And if you just impose that line on the first
6 stage of the two-stage idea, then you get something like
7 this. So risk has gone up, and often it's still
8 increasing at that point, and then boom. You decide
9 okay, we're not going to -- we're going to discount risks
10 after that make it zero. Full burdens on the current
11 generation are on the next few.
12 MEMBER ARMIJO: Why isn't the risk going
13 down with time?
14 DR. TAUXE: Why isn't it?
15 MEMBER ARMIJO: Yeah --
16 DR. TAUXE: Because despite what you've
17 seen, at a low level waste performance assessments, we
18 find the risk continues to rise for quite some time after
19 1,000 or even 10,000 years, generally due to
20 radionuclides that I've heard dismissed here like
21 Iodine-129, Tech-99.
22 These actually do have some serious
23 impacts, not so much for the intruder necessarily, but
24 I can show you some performance assessments where those
25 are the driving risk factors.

1 MEMBER ARMIJO: Well, that certainly looks
2 different than the EPRI curves, and I just --
3 DR. TAUXE: Yes, it does.
4 CHAIRMAN RYAN: And is this published and
5 you have any kind of document that we could read?
6 DR. TAUXE: The performance assessments
7 are. This is -- and we presented this at Waste
8 Management.
9 CHAIRMAN RYAN: Is this a performance
10 assessment of a specific site?
11 DR. TAUXE: No. This is a generic look.
12 CHAIRMAN RYAN: A generic look at what?
13 DR. TAUXE: At risk over time. We often
14 see the risk still increasing.
15 CHAIRMAN RYAN: This is just a construct.
16 DR. TAUXE: Yeah, but it's valid. I mean
17 if I plotted all the performance assessments we've done
18 on top of this, they would, you know. Depending on which
19 end point you're looking at. Are we looking at -- well,
20 performance assessments have a lot of end points.
21 There's a member of the public. There's
22 groundwater protection limits. There's a lot of
23 different end points that have to be met for risk or
24 other things. I could just say "end point" there.
25 But often things, you know, one thing that

1 got me excited when I first started this was seeing a
2 performance assessment done at the Savannah River site,
3 when they had stopped at 10,000 years. Then I saw
4 another graph later on down in the performance
5 assessment, where the dose, the peak dose that they had
6 calculated some time later was 18 orders of magnitude
7 higher than the 10,000 year dose. I thought well, that's
8 why you don't not do that.
9 MEMBER POWERS: But the base of the dose is
10 10 to the minus 36. I don't care.
11 DR. TAUXE: The actual doses are not 10 to
12 the minus 36. They're, you know, 21 out of 25 is
13 considered passing, and there's a cutoff. Without the
14 cutoff, it would be different.
15 So what's happening here is we're imposing
16 this discounting. Up until that time the compliance
17 we're considering the calculations with a value of one,
18 and afterwards we're giving it zero.
19 So we're convolving the risk plot there with
20 this discounting plot, and cutting it off. Here's
21 another idea. An idea. Discounting in human society --
22 human society seems to value -- I'm not saying they
23 should, but they seem to value the distant figure much
24 less than the current and near future. We just heard
25 that two weeks ago in front of this Committee.

1 CHAIRMAN RYAN: Again, I want to remind
2 you, Dr. Makhijani's been patiently waiting and been
3 around --
4 DR. TAUXE: Where this goes, though, is
5 this figure on the right, which obviates the whole
6 question of when is the right time to look. It shows
7 you the right time to look.
8 MEMBER BLEY: John, following up on Sam's
9 question. Are there any of the assessments that you've
10 been involved in, that showed the kind of behavior with
11 things going up well out in time, that are public
12 documents that we could see?
13 DR. TAUXE: All these PAs are public
14 documents.
15 MEMBER BLEY: Are they? Okay.
16 DR. TAUXE: Yeah. So I'm done.
17 MEMBER ARMIJO: Okay. I'd just like to
18 mention that at one point you brought up that I, you know,
19 I haven't heard much from anyone else in all of this, is
20 that a great deal of what's in the draft regulation could
21 well be or should be guidance rather than regulation.
22 That's similar to what we see for reactors
23 for those same kind of things, for risk assessment, and
24 that might really help avoid some of these definitional
25 things that will get anchored in rule, that could lead

to a cookie cutter kind of analysis, where we're doing a lot more than we need to.

The basic idea that you start qualitative as complete as you can, sure fits with the regime we proposed. But can you -- I'm just curious why we haven't heard that idea much more than we have, that a lot of this ought to be guidance, so that it's easier to deal with in the future, when you get disagreements from regulation changes?

MEMBER RAY: Well, people want regulatory certainty though too. I mean if they develop an application, invest in it, they want to have some --

MEMBER BLEY: Yeah, but if your certainty is overload.

MEMBER RAY: I understand that. I've been there. I'm just telling you that there's a downside to just saying well, bring it in and we'll let you know.

MEMBER BLEY: We'll take a look. Well have guidance is different from that.

MALE PARTICIPANT: Maybe.

MEMBER RAY: Yeah. It might well be that people would take the heavy burden, knowing what it's going to be in reference. Okay.

MEMBER ARMIJO: Okay. Arjun.

DR. MAKHIJANI: Well, thank you very much.

1 I really appreciate being asked to come before you. I
2 believe it's the first time I've been in this forum.
3 Your water fountain is to be felicitated. The best water
4 fountain ever.
5 In a way, my Institute started this whole
6 depleted uranium debate during the LES hearings in the
7 1990s. We pointed out that DU in large amounts was not
8 covered by the low level waste regulation explicitly.
9 It was dropped between the draft and the final EIS.
10 It was considered in the draft EIS, but it
11 was dropped in the final because it was not considered
12 waste and wasn't anticipate to be a waste. Then 2004,
13 the NRC acknowledged that asked the staff to develop a
14 regulation about it.
15 So we've done a lot of -- the point of saying
16 that is not to take ownership of it, but to say that we've
17 done a lot of analysis of this question and I'll give you
18 some examples. But before I launch into that, I do want
19 to agree with some of the things that were said earlier,
20 and disagree with a couple of them.
21 I agree with the sense that I've heard from
22 the members of the Committee that it's not reasonable to
23 think of long time frames in the sense of physical
24 compliance, but that we may learn something by doing a
25 calculation and that ought to inform how we think about,

1 in this case, depleted uranium.

2 But if we are not comfortable with waste for

3 which compliance in the physical sense would be required

4 for very long periods of time, in this case hundreds of

5 thousands of years, millions of years, as John has just

6 pointed out, then we ought to think of some other way of

7 managing it, because we're not protecting future

8 generations.

9 This concept of discounting really came

10 from economists who think about putting in the money. So

11 future money is less valuable than today's money. And

12 from King, a famous economist, did say that in the long

13 run we're all dead.

14 But this was a very peculiar idea I thought,

15 because in the long run we're dead as individuals, and

16 there's a difference between dead as individuals and

17 being dead as a society.

18 In the long run, you want society to go on.

19 In my view -- so that's a profoundly wrong idea to think

20 about in the long run we're all dead, and therefore on

21 social things we ought to be imposing some kind of

22 discounting.

23 On the other hand, I think morality for a

24 very long time has required that we treated future

25 generations at least as well as we do ourselves,

1 especially as in this case we're getting all the benefits
2 and we're dumping all the waste and risk into the future.
3 That's very important. If anything, we
4 ought to be protecting future generations more than we
5 are today. So this idea that we ought to have a separate
6 higher dose for the intruder of 500 millirem, when
7 intruder actually, as John has said, and as you
8 yourselves remarked, ceases to have any meaning after
9 you've lost institutional control.
10 It's just people, and if people go there,
11 and whatever, hunters or residents or whatever, then
12 they ought to be protected to the same extent that we want
13 to protect ourselves today. I think the idea of a
14 separate intruder dose, just because we have a harder
15 time calculating it or uncertainties, this is our
16 problem.
17 You know, if we can't manage to keep the
18 risks to future generations within bounds, maybe you
19 ought to be doing something else. Maybe solar energy
20 might be a good idea. That's a different debate.
21 MEMBER ARMIJO: I don't understand your
22 thinking. Future generations have no responsibility to
23 protect themselves. That's what I'm hearing from you,
24 that all the burden is placed on the present generations,
25 not matter what it costs, in order to protect his

1 hypothetical population that somehow will be unable or
2 unwilling to protect itself.
3 I just don't see that as an issue, as
4 anything that makes sense to me. So maybe that's an
5 issue of your morality versus mine, but the real issue
6 is, based on history, each generation has become a little
7 more knowledgeable, adept, capable than previous
8 generations.
9 So there's a rolling ability to protect
10 yourself as you move forward, unless there's some massive
11 gap where knowledge is lost, society crumbles, and then
12 the future generations are unable to protect themselves.
13 They're just wandering around finding, looking for
14 something to eat. So I don't understand, you know.
15 DR. MAKHIJANI: Okay. Let me respond.
16 MEMBER ARMIJO: I don't, you know, I
17 understand what you're saying, but I just can't buy it,
18 which is --
19 DR. MAKHIJANI: And maybe it is different
20 morality. Maybe it's a different way of thinking about
21 it, rather that morality. I think that to the extent
22 possible, we ought to take -- not be imposing risks from
23 our activities on future generations. We've talked
24 about inadvertent intruders all day. So future
25 generations won't be able to protect themselves if they

1 don't know there's a risk.

2 That is a large part of the problem that

3 we've been talking. We're talking about creating risks

4 where future generations won't even know the risks are

5 there, because there will be this inadvertent intruder.

6 That is a very large part of the problem.

7 Future generations certainly we hope will

8 be able to protect themselves, and they should protect

9 themselves from the risks they create, not from the risks

10 that we're dumping on them, as a general idea. At least

11 that is my frame of reference. You can take it or leave

12 it. Obviously, you leave it.

13 But I think that it's something that should

14 be considered, in the sense of how you set -- and my

15 statement is very specific, that we should not be setting

16 a separate dose standard from our activities. I'm not

17 saying we should reduce the risk of future to zero.

18 That is not possible for any generation.

19 What I'm saying is it is hypocritical to say that we

20 should protect future generations at 500 millirem, and

21 we should protect ourselves to 25 millirem. The cancer

22 risk is not going to change unless our biology changes.

23 Why should we be imposing a cancer risk that

24 is bigger on our children and grandchildren and great

25 grandchildren than we are ready to suffer ourselves, from

1 our own activities? That's what I say is immoral. So
2 I believe that this proposal is immoral.
3 I also believe that the issue of large
4 amounts of depleted uranium is driving this debate, and
5 there was some sentiment that there should be a separate
6 rule, perhaps, for depleted uranium. I would suggest to
7 you that this rule already actually exists. It's called
8 40 C.F.R. 191.
9 If you look at 10 C.F.R. 61, Table 1, it has
10 that one line item for transuranic alpha-emitting waste
11 greater than five years, limited to 100 nanocuries per
12 gram. Well, the word "transuranic" is entirely
13 arbitrary. The characteristics of depleted uranium in
14 every way, as the National Research Council has remarked,
15 not only me, but I have remarked this at great length in
16 official testimony, repeated times, over more than a
17 decade now, are identical in every essential respect to
18 transuranic waste.
19 400 nanocuries per gram is long-lived with
20 alpha-emitting waste. It has the same radiological
21 characteristics, and it is an accident or basically a
22 characteristic of the time that radionuclides like
23 radium, thorium-232, thorium-230 and the uranium were
24 not in Table 1.
25 It would not be hard to fix. It is really

1 greater than Class C waste. I don't see what this -- it
2 is not Class C waste, not Class A and not Class B, and
3 we shouldn't be getting rid of those tables. We
4 shouldn't be going from, you know, essentially even
5 though you can't rid of them, but transitioning by going
6 around the law and saying we're going to some waste
7 acceptance criteria.
8 Let me give you an example of what waste
9 acceptance criteria have meant in practice, in terms of
10 one of the companies that testified before you. In one
11 of the early versions of the license application of Waste
12 Control Specialists to the Texas authorities, they said
13 that they were going to receive 30,000 curies of
14 uranium-235 as waste from the Department of Energy.
15 They also had a corresponding number for
16 U2-34 and U2-38. The isotopic ratios were physically
17 impossible. The amount of uranium-235 stated 31,000
18 curies, was much larger the amount than the amount of
19 uranium-235 than the country has ever possessed, much
20 less in any waste stream.
21 I'm talking about the total quantity that
22 it has ever possessed. Apparently, there was nobody
23 qualified within the company at that time. For me it
24 took five seconds to know it was completely wrong. But
25 there was nobody qualified in proofreading that

1 application that was submitted. It was corrected after
2 I made this question public, to the best of my knowledge.
3 I'll give you another example from the Clive
4 site. One of the -- one of the technical documents that
5 led to the license had some performance assessment
6 calculation that said, I don't know, 10 to the 37
7 picocuries per gram of uranium-238 would be a suitable
8 concentration for upper limit for disposal at Clive.
9 Well, it turns out that that's more than the
10 weight of the earth, per gram of Utah soil. I pointed
11 this out after an NRC staff person had testified under
12 oath that that was a scientifically suitable appropriate
13 document.
14 The error has never been corrected. I even
15 protested to the Chairman of the NRC, the new one, who
16 I've known for quite a long time. When I met with her
17 last November, November of last year, that it was absurd
18 that this error had never been corrected, even though I
19 testified under oath. I protested in public and in
20 private, including the Utah Division of Radiation
21 Control, and the reply I got back was simply that this
22 is no longer a valid document.
23 How the error came about is that faulty
24 computer -- there's a faulty computer program somewhere.
25 They were had chose to divide by zero probably somewhere.

1 Is that still in use? I think it is still in use, because
2 I see the thing popping up in many different places.
3 But the NRC -- neither the NRC nor the
4 company, nor the Division of Radiation Control in Utah
5 has had -- we can't go to a system of waste acceptance
6 criteria alone. This thing has to be bounded pretty
7 carefully. I think clearly the rule is insufficient.
8 Clearly depleted uranium is a problem. I think there is
9 a solution that is staring us in the face.
10 We ought to treat it like transuranic waste.
11 It has come up that, you know, why not the repository.
12 Well, the repository is bounded by law, and whether we
13 can change that law or not -- or whether it would be a
14 good thing for the federal government to go back on one
15 more commitment to the people of New Mexico.
16 But certainly we have advocated that a
17 repository, deep geologic disposal for depleted uranium
18 would be a good idea, and that it ought to be treated as
19 greater than Class C waste. It's not a complicated
20 problem. We have a solution staring us in the face, and
21 I believe the reason we're not accepting it is the
22 industry is probably unwilling to accept the cost of
23 that, because there may be an order of magnitude higher
24 than shallow land disposal.
25 I think there are other wastes that are

1 GTCCs-like that the DOE is considering. We haven't seen
2 a final EIS out of the DOE for greater than Class C waste,
3 but this problem is clearly related to that. There also
4 ought to be curie limits.
5 This idea that we're going to blend down and
6 indefinitely increase the number of curies is a little
7 ridiculous because it should have been discredited. The
8 dilution to the solution is the solution to pollution.
9 And I'm glad that we seem to be on the road
10 to ruling it out at least more or less, but it should be
11 ruled out out of hand. It has no place in waste
12 management, and the way to rule it out is to put curie
13 limits.
14 Actually, on depleted uranium, the draft
15 EIS to the low level waste rule had 50 nanocuries per gram
16 as a limit, and I was consulting with Dr. Esch earlier
17 on, and he affirmed my memory that it said 17 curies as
18 a total limit.
19 I believe that they should be total curie
20 limit, especially on long-lived radionuclides. I agree
21 with the sentiments that, you know, 100 years, 300 years,
22 we can think about them. We know enough to do reasonable
23 performance assessments.
24 Beyond that, when the curie amounts and
25 concentration amounts are large enough, we ought to think

about properly engineered deep geologic disposal.

A couple of other things. The analysis of where's there is a comparison made on page 14 of the Notice, it's ML-13291A262. The table that compares the present rule with the proposed rule is very misleading in how it presents its doses.

It says that the current -- it misrepresents the current rule. It says the current rule performances, .25 millisieverts annual whole body dose. But it does not mention that the current rule also has organ dose limits. I have pointed this out a number of times.

I am shocked that an official document does not even represent the content of the existing rule properly, because it has proposed to drop the organ dose limits. The practical effect of dropping the organ dose limits would be thorium-232 to relax the allowable concentration by more than two orders of magnitude, because in the case of thorium-232, bone surface dose would be the controlling dose, and its dose conversion factor is more than two orders of magnitude greater than the whole body dose.

In the case of other actinides it will be the same. Strontium-90 would be an order of magnitude. So this is a real problem. Not representing the current

1 regulation, misinforming the public and then quietly
2 dropping the organ dose limits, which would allow a very
3 serious relaxation of the rule.
4 I think the organ dose limits are more
5 fundamental, because in going from organ doses to whole
6 body effective dose equivalents, you're using weighting
7 factors and today is breast is one weighting factor,
8 tomorrow it's another. You know, it depends on whether
9 feminism or masculism is dominant in society or
10 something.
11 But I've seen that, you know, if you look
12 at how the weighting factors have changed, they're
13 actually not changed in one direction but actually
14 oscillated. So they're clearly fairly arbitrary, and
15 organ doses should be the controlling doses. In the
16 compensation program that the government is carrying
17 out, the cancer risk are calculated -- the doses are
18 calculated according to organ doses, and that's how the
19 cancer probability is calculated.
20 We don't get cancer on the whole body,
21 except when it spreads. We get cancer in particular
22 parts of the body.
23 CHAIRMAN RYAN: While I appreciate your
24 comments, we're kind of drifting off of our topic.
25 DR. MAKHIJANI: Well, it is part of the

1 proposed regulation, and I found it egregious that the
2 public is not even being properly informed of the content
3 of the existing regulation.
4 CHAIRMAN RYAN: No, I'm not criticizing.
5 I'm simply saying our time's running short, and I want
6 you to make sure if you had other points you'd like to
7 make, we'd like to hear them.
8 DR. MAKHIJANI: Let me look over my other
9 points. I did -- we don't have a good definition of
10 members of the public. I have asked for a long time that
11 members of the public be explicitly defined to include
12 children and women, because risks to women are much
13 higher than risks to males, radiation risks, and risks
14 to children are much higher. There's also an executive
15 order about it, Executive Order 13045, which is being
16 ignored here.
17 A couple of things I did not agree with some
18 Commission members about. DU is not like mill tailings.
19 Mill tailings are in the nanocuries per gram. DU is in
20 the hundreds of nanocuries per gram. You're impaling
21 radioactivity overall, a long period of time thorium-230
22 controlling declines over time. DU radioactivity
23 increasing over time, because not equilibrium to start
24 with.
25 I also disagree that a depleted uranium

1 remain is essentially a chemical toxin. Depleted
2 uranium is really like radioactive lead. At the amount
3 at which it is chemically toxic, it is also
4 radiologically significant. Perhaps I pointed out to
5 Dr. Ryan that the most recent research from the Armed
6 Forces Radiobiological Research Institute will
7 illuminate this.
8 We've looked at it with some considerable
9 care. I do not believe that the radiation aspects of
10 uranium should be ignored, especially as you -- you have
11 the ingrowth of the daughter products over time. We did
12 some calculations about depleted uranium at a site like
13 Utah, although not the physical configuration of the Utah
14 site.
15 But burial, shallow land burial. We also
16 did an explicit calculation on a Texas site when we were
17 looking into depleted uranium during the LES licensing
18 hearing.
19 Our generic site analysis for a dry site
20 like the site at Utah for shallow land burial resulted
21 in doses that were between 179 rem per year and 795 rem
22 per year, with peak doses being in the 10-20 thousand year
23 range.
24 This is one of those heuristic
25 calculations. You don't necessarily believe those

1 numbers, but it tells you something. I'm not talking
2 millirem; I'm talking rem. We're talking multiple
3 sieverts of dose per year.
4 In the Waste Control site, the idea was that
5 -- the conversion factor is clearly erosion. The
6 company said the site's actually going to build up
7 because erosion is less than deposition, and so we don't
8 have worry about that.
9 Of course, there's more than one opinion
10 than what was in the company's application. We actually
11 hired an independent -- not hired. He actually gave us
12 free advice, because he didn't want to be paid for it or
13 any impression that we were paying for his advice.
14 And then among the range of erosion
15 estimates that out there from experts, we find that with
16 most erosion estimates you're going to wind up with doses
17 in the tens of rem per year at the Waste Control
18 Specialist site at long periods of time.
19 So clearly, we are with the material that
20 at long periods of time has the potential in wet sites
21 to screw up your water and give you high doses via water,
22 and in dry sites, to uncover the waste by erosion and give
23 you high doses by external dose and inhalation dose.
24 This is not suitable material for disposal
25 and so we have to -- we have to -- so for, I think 500

1 years is not a bad limit for time frame, but only if we
2 adopt total curie limits, and only if we rule out large
3 quantities of long-lived radioactive --
4 CHAIRMAN RYAN: Dr. Makhijani, let me just
5 take a minute and see if there's anybody else on the
6 bridge line, because we are over time, and if there is
7 somebody there, I'd like to give them an opportunity to
8 speak as well. Is anybody on the bridge line at this
9 point? Is it open?
10 MR. WIDMAYER: I believe it's open.
11 CHAIRMAN RYAN: Okay. I wonder if there's
12 anybody on it.
13 MALE PARTICIPANT: It seems to be open.
14 CHAIRMAN RYAN: We'll just check. Sure,
15 thank you.
16 (Pause.)
17 MEMBER POWERS: Let me ask one question. I
18 actually have several, but one question on this 500
19 millirem standard for an intruder.
20 Public Comments
21 MR. DORNSIFE: Hello?
22 CHAIRMAN RYAN: Yes.
23 MR. DORNSIFE: Hello?
24 CHAIRMAN RYAN: You don't need to yell.
25 MR. DORNSIFE: Well, you weren't

1 answering.

2 CHAIRMAN RYAN: Well, that's because it

3 just came on.

4 MR. DORNSIFE: Okay. This is Bill

5 Dornsife. I'm Executive VP for Licensing.

6 CHAIRMAN RYAN: Bill, Bill, Bill. Excuse

7 me, Bill. You're blowing out the room here. Either

8 we've got to turn down the microphone or turn down your

9 microphone.

10 MR. DORNSIFE: All right. I'll get a

11 little bit further away.

12 CHAIRMAN RYAN: There we go. That's much

13 better.

14 MR. DORNSIFE: Okay. I have a couple of

15 brief comments concerning some of the questions that the

16 Committee had. First of all, I don't think anybody

17 mentioned that the PA is not the ultimate yardstick for

18 compliance. It's just a tool.

19 MR. JANATI: Hello Mike?

20 CHAIRMAN RYAN: I'm sorry. Somebody just

21 added to the bridge line and --

22 MR. JANATI: Mike Rich Janati here.

23 CHAIRMAN RYAN: Dornsife is speaking at the

24 moment. Would you stand by?

25 MR. JANATI: Oh, I'm sorry. Go ahead.

1 CHAIRMAN RYAN: Okay.

2 MR. DORNSIFE: So in order -- because of
3 that, we typically look at a number of different
4 scenarios in our site-specific performance assessment.
5 For example, we do a probabilistic analysis, which
6 includes distributions for the various hydrogeological
7 factors and infiltration and other things, and we also
8 look at the probability of an intruder inhabiting the
9 site, based on history of ranches in the area and also,
10 you know, the probability of being on the disposal site
11 the entire, entire ranch, and that turns out to be about
12 sub 5 times 3 to the minus 5 here.

13 We also do a most likely case, which turns
14 off the driller and residents, because they are very low
15 probability events based on those parameters. We also
16 do what we call a deterministic analysis, which looks --
17 which assumes the intruder is there, probability of one.

18 Then finally, we do a climate analysis,
19 which shows the impact of greater rainfall that Scott
20 cited. So you know, those things hopefully will help the
21 regulator make an informed decision on reasonable
22 assurance.

23 Also, based on my modeling experience,
24 there are really two categories of radionuclides that
25 cause dose to the public. There's radionuclides that

1 come out in the form of gases, and they typically have
2 an impact very early in time, prior to 1,000 years. And
3 of course depending upon what engineering barriers you
4 have.
5 The other category is the long-lived mobile
6 radionuclides that really don't show up for a very long
7 time typically, and 1,000 years may not capture the
8 impact of those. The primary pathway for those are
9 either diffusion to the surface or ground water.
10 I would suggest that ground water, there
11 isn't a lot of uncertainty in the hydrogeological
12 characteristics under the site, and ground water is
13 always going to be a very important commodity, a
14 resource. So again, 1,000 year compliance period may
15 not capture that impact of ground water.
16 CHAIRMAN RYAN: Thank you, Bill. We have
17 one other new speaker on the bridge line, and I'd like
18 to ask that speaker to make his or her comment now.
19 MR. JANATI: Mike Rich Janati,
20 Pennsylvania.
21 CHAIRMAN RYAN: Hi Rich, nice to talk to
22 you.
23 MR. JANATI: Just a couple of comments.
24 I'll try to make it as quickly as possible. Can you hear
25 me?

1 CHAIRMAN RYAN: Yes. We can hear you fine.
2 MR. JANATI: First of all, I mean a couple
3 of general comments. First of all --
4 CHAIRMAN RYAN: In fact, you could even
5 lower your voice a notch, and it will be okay.
6 MR. JANATI: All right. Is it better?
7 CHAIRMAN RYAN: Just pretend we're in the
8 room talking to you. You don't have to holler.
9 MR. JANATI: First of all, I think there
10 needs to be a distinction between unique wavestreams, in
11 this case depleted uranium, and routine low level waste
12 from commercial facilities, due to the differences in the
13 toxicity of the two, and mainly by toxicity, I mean
14 chemical and physical form of the inertial property.
15 CHAIRMAN RYAN: Rich, Rich, Rich, Rich.
16 We're really having a hard time hearing you. You've got
17 to lower the volume of your voice.
18 MR. JANATI: Okay. Can you hear me now?
19 CHAIRMAN RYAN: That's a little better.
20 MR. JANATI: Is it better?
21 CHAIRMAN RYAN: Yes.
22 MALE PARTICIPANT: Keep going.
23 CHAIRMAN RYAN: Keep hitting the button.
24 It will be even better yet.
25 MR. JANATI: Is it better now?

1 CHAIRMAN RYAN: Yeah. Just hold the phone
2 --
3 MR. JANATI: Because I don't hear you very
4 well. But if you hear me, that's fine.
5 CHAIRMAN RYAN: Yep.
6 MR. JANATI: So what I think the issue is,
7 you know, there has to be a distinction between unique
8 wave streams, and in this case, depleted uranium, and
9 routine low level waste from commercial facilities.
10 That's mainly due to the difference in the toxicity of
11 these two, and by toxicity, I mean chemical, physical
12 form of the inertial property.
13 Now I believe a more efficient and effective
14 approach for NRC would have been to address the disposal
15 of DU separately. Do a separate rulemaking, or do a
16 separate regulatory document. Now as far as health and
17 safety point of view, I don't believe the NRC proposed
18 changes will result in any additional health and safety
19 benefits for the disposal facilities that accept routine
20 low level waste only.
21 Now to give you an example, you know, in
22 Pennsylvania, and (name) knows this. He was very much
23 involved in this. We went through a very extensive
24 public involvement process, to develop our low level
25 waste regulation. Some of key provisions of our

1 regulations are facility surface design, above ground,
2 three layers of protection, overpacked disposal module,
3 engineered solid.
4 We have a zero release goal. We have an
5 intruder dose limit of 25 millirems a year. The
6 regulations specifically said that the facility design
7 shall, to the extent practical, limit the radiation
8 exposure to a 25 millirem per year limit. We will not
9 accept depleted uranium. I don't think we would accept
10 any, and unfortunately, this is not an Agreement State
11 and because of compatibility purposes, we might have to
12 end up opening up the (inaudible) and that's going to be
13 very controversial.
14 I can tell you, it's not going to --
15 absolutely not going to benefit us at all, from a health
16 and safety point of view. Looking at performance time
17 frames, my view on that is that it has to be done on a
18 case-by-case basis, and it has to be decided by Agreement
19 States, by looking at, you know, projected waste streams,
20 site-specific characteristics, and waste acceptance
21 criteria.
22 A 10,000 year compliance period, I think for
23 a facility that accepts routine waste streams, and all
24 the services associated with it, is going to make the
25 licensing process very difficult and complicated. We

1 modeled as a worse case scenario for Pennsylvania waste,
2 that was for 2007, thousands of curies of related
3 components, (inaudible), DAW that was shipped to
4 Barnwell prior to the Barnwell being -- not being
5 available to us in 2008.
6 So we started with 70,000 curies, and we
7 ended up with 60 curies after 1,000 years, mainly
8 nickel-59 and nickel-62. So now looking at, you know,
9 the development started at a specific (inaudible). I
10 don't understand why that would require a change to Part
11 61. Why couldn't they have gone to regulatory
12 documents, have you looked at 61.58?
13 And the other thing I wanted to point out
14 is that the Nuclear Regulatory Commission, NRC
15 implemented a new reactor oversight process, which is a
16 much better system than the old process, without changing
17 regulations at all. They did it through guidance and
18 procedures.
19 The new reactor oversight process, as I
20 recall, did not require any changes to the regulations.
21 So the bottom line is that I believe that it has to be
22 a separate rulemaking, a separate process for depleted
23 uranium.
24 I think it's going to be an unnecessary
25 burden on the Agreement States like us, Pennsylvania, who

1 will have to go through the process again, opening up a
2 regulatory low level waste regulation, and it would
3 create issues and concerns and problems for us.
4 If you want to proceed with this rulemaking,
5 let's go after the disposal facilities, make exempt
6 facilities that are not going to take unique waste
7 streams or depleted uranium. Also just one other thing.
8 Lisa Edwards, as I recall, I was on the bridge and I was
9 listening throughout the process.
10 She mentioned that this is not a
11 comprehensive change. This is not a comprehensive
12 change at all, which means at some point in the future,
13 we're probably going to have to go back and visit the
14 process and visit Part 61 again.
15 So I don't -- I personally don't believe
16 that -- and this relates to Pennsylvania -- I don't
17 believe this rulemaking going to have any benefit to
18 health and safety, health and safety benefit, at least
19 not in our case. Thank you, Mike.
20 CHAIRMAN RYAN: All right, Rich. Thank
21 you for your comments. We appreciate you being on the
22 line and being patient with us. Is there any other
23 speakers on the line?
24 MR. DORNSIFE: Hey Mike?
25 CHAIRMAN RYAN: Yes.

1 MR. DORNSIFE: I just have one other really
2 short comment.
3 CHAIRMAN RYAN: Bill Dornsife again.
4 We'll just confirm that for the record, please.
5 MR. DORNSIFE: Right. I just want to note
6 that two Agreement States use compliance periods that are
7 longer than 1,000 years. Obviously, Waste Control and
8 Utah for the depleted uranium, and most of the waste goes
9 to those states. I think lowering or mandatory lowering
10 of the compliance period in those states will have a real
11 impact on public confidence.
12 CHAIRMAN RYAN: Okay. You cut out, Bill.
13 MEMBER POWERS: Must have lost him.
14 MR. DORNSIFE: Well no. I'm still here.
15 CHAIRMAN RYAN: Oh, okay. Oh, you're
16 there. Okay. Very good. Now we are at the appointed
17 -- I'm sorry. One more comment. I'm sorry, excuse me.
18 MR. MAGETTE: May I comment?
19 CHAIRMAN RYAN: You may, now.
20 MR. MAGETTE: My name's Tom Magette. I'm
21 with PriceWaterhouseCoopers, and I would just like to
22 make two comments.
23 First of all, I would like to address the
24 question of whether or not uranium or depleted uranium
25 could be appropriately addressed in this rulemaking

1 regarding Part 61, and secondly, I'd like just to talk
2 a little bit about the need for another rulemaking.
3 I would say it is entirely appropriate to
4 address uranium in this rulemaking. It can be done
5 without compromising or complicating the current
6 regulatory regime for the disposal of unknown commercial
7 waste streams.
8 Secondly, I would suggest that once you
9 finish this rulemaking as it's constituted, then you can
10 be done. There is nothing that needs to be done to
11 further improve Part 61. The beauty of the language that
12 the staff sent to the Commission for the site-specific
13 rulemaking is twofold.
14 First, the two tier approach, and secondly,
15 the use of a waste acceptance criteria from a
16 site-specific performance assessment.
17 The two-tier approach with a reasonable
18 compliance period, which I don't think can be more than
19 1,000 years, allows you to have essentially a status quo
20 for regulating the commercial waste, the non-uranium,
21 the non-long-lived waste, and it allows for a performance
22 period to look at long-lived waste.
23 The reasonableness of that is that you
24 simply cannot create an effective, quantitative standard
25 out many, many thousands of years. It doesn't matter

1 what regime you're looking at, whether it's low level
2 waste, surface disposal, it doesn't matter.
3 You cannot with confidence come up with a
4 quantitative standard. You can create a reasonable,
5 quantitative standard that you have to demonstrate
6 compliance with at 1,000 years or less, so you have
7 addressed both parties of the problem.
8 The beauty of the WAC is that it creates a
9 much more accurate and precise way to regulate the waste
10 that we're already regulating. There was a comment made
11 this morning that the WAC would never be equivalent to
12 or as good as the tables, because the WAC just comes from
13 a model.
14 Well, the numbers in the tables in 6155 also
15 come from models that are based on generic sites,
16 disposal technologies that aren't used at any sites in
17 the country, and other old methodologies, including a
18 generic assumed waste stream that we also don't dispose
19 of.
20 Yet Lisa was able to present a more accurate
21 reflection of the waste stream today. We know we have
22 better data. So you can significantly improve upon
23 that, and a site-specific PA-driven WAC will be far more
24 accurate than what's in the tables, and it will be
25 something that you can also respond to, if there are

1 changes in things like organ weighting factors in the
2 future.
3 So ultimately, there's a common notion that
4 it's harder to regulate. I don't understand how that can
5 be either. If I simply take one number and replace it
6 with another number, I haven't really changed anything
7 about the regulatory process.
8 Generators and processors are today
9 required to certify that their shipping waste is in
10 compliance both with the regulations and the WAC for any
11 given site that they're shipping to. Merely changing a
12 number doesn't affect that process. It doesn't impose
13 any new burden on a state, on a disposal site operator
14 or a generator or a processor or a shipper.
15 So by virtue of implementing a WAC in lieu
16 of the tables, you have in fact, I believe, implemented
17 what constitutes a gold standard. You could have
18 another rule, but what would you do that would be more
19 effective than a site-specific analysis. You simply
20 cannot put in a rule, in new Part 61 tables, something
21 that is more effective and does a better job of defining
22 what can safely be disposed of at any given site. Thank
23 you.
24 CHAIRMAN RYAN: Thank you, Tom. I
25 appreciate your comment. Let's see.

1 DR. MAKHIJANI: Can I have a moment of your
2 time?
3 CHAIRMAN RYAN: We've kind of -- we've got
4 one more speaker here, so we did kind of interrupt your
5 flow. So why don't you finish up, and then we'll let this
6 gentleman finish.
7 Other Stakeholders (continued)
8 DR. MAKHIJANI: I just want to give you one
9 important example of why curie limits are important.
10 Today, the graphite blocks at Hanford from the Manhattan
11 project reactors would be considered as Class C waste.
12 They're about 85 percent of the Class C limit, by my
13 calculation.
14 And the Department of Energy proposes to
15 dispose of them off in the plateau there at Hanford in
16 shallow land burial. But by their own calculation, the
17 drinking water limits would be exceeded by hundreds of
18 times from disposal of Class C waste. We clearly need
19 curie limits, and I believe these graphic blocks actually
20 belong in deep disposal.
21 We're often admiring the French when it
22 comes to their nuclear reactors. I've been involved in
23 the French nuclear waste discussion officially, and I
24 know French, I write in French, speak in French and have
25 done so. We're not paying attention to the fact that

1 they actually do have something called medium activity
2 long-lived waste that they plan to co-locate in the same
3 repository that they're planning in the east of France.
4
5 It's a separate section of that repository.
6 The Swedes also have deep disposal of the same kind of
7 waste, intermediate level long-lived waste, and they
8 have a deep repository, but they have a separate one. I
9 don't really care whether we adopt a separate one or the
10 same one.
11 A separate one is probably cheaper, but we
12 should have deep disposal of a much larger set of waste
13 than we currently plan, or that are even currently
14 indicated by greater than Class C, or at least greater
15 than Class C.
16 Finally, I would just say that the
17 definition of "long-lived" in the proposed rule of 10,000
18 years and ten percent and all that, all of three
19 alternatives, is a little ridiculous. It's far too
20 long.
21 Long-lived should be linked to
22 institutional controls. By that definition, anything
23 with a half life of more than ten years, so gone in 100
24 years, should be defined as long-lived.
25 Maybe, you know, cesium and strontium I

1 would agree. You can deal with the kind of performance
2 calculations that you're talking about. That's an
3 intermediate half life. But certainly 10,000 years at
4 ten percent, which means a half life of about 3,000 years,
5 by my calculation, is far too long. I mean it does --
6 in the spirit of some of what you've been talking about.
7 CHAIRMAN RYAN: Well, I think quite frankly
8 that a short time and intermediate time and a longer time,
9 maybe it's three instead of just --
10 DR. MAKHIJANI: It might be three. I would
11 agree that some 30 and more than 30. It would be not
12 unreasonable.
13 CHAIRMAN RYAN: Well, I might not agree
14 with 30, but you know --
15 (Simultaneous speaking.)
16 DR. MAKHIJANI: --with strontium and
17 cesium, and there's a cutoff with strontium and cesium
18 because above that --
19 CHAIRMAN RYAN: No, I understand.
20 DR. MAKHIJANI: --the next one, the next
21 most important one you are running into nickel.
22 CHAIRMAN RYAN: Food for thought for
23 another day.
24 DR. MAKHIJANI: Yes.
25 CHAIRMAN RYAN: One last comment from

1 another new speaker, and thank you for your patience.
2 DR. MAKHIJANI: Sure, no problem.
3 MR. ROBERTSON: My name is Gary Robertson,
4 and in the past, I was in charge of regulating the Hanford
5 low level waste site for U.S. Ecology, and I was the
6 director of the State of Washington, and went through the
7 whole process and evolution.
8 I can say NRC did a good job and it is the
9 gold standard what they came up with in Part 61. Today,
10 we're looking at new waste streams, and I actually have
11 said this several times. There is a problem about
12 consistency within the NRC regulatory framework, and
13 I'll give you a couple of examples.
14 I'm sure it's not going to get addressed,
15 but if you look at the uranium mill regulations, you're
16 able to not just go to 100 years but to perpetuity to
17 protect the sites. I think somebody has to address that,
18 either you adopt 100 years or you change the low level
19 waste so it's protected for perpetuity.
20 Now with depleted uranium and the problems
21 associated with it, it seems like adoption or at least
22 looking at the uranium mill standards for a compliance
23 period would be the way to go. For example, the uranium
24 mill regs say you can go out to 1,000 years, but no less
25 than 250.

1 I think they acknowledged the qualitative
2 versus quantitative nature there. I'd recommend the 250
3 years, and then out to 1,000. Then if you want to go off
4 for peak doses to look at things that aren't very
5 realistic, to go on out to that, the sited states have
6 a problem, I believe, with compatibility.
7 Here's the issue. If you change that to
8 compatibility C, I see at least one problem with, for
9 example, the state of Washington and South Carolina, who
10 have adopted a time period. If you end up setting it at
11 10,000 years, even though they're allowed to be flexible,
12 they're really going to get a push from the public to do
13 the 10,000 years.
14 I think this group can push back and look
15 at what's realistic, and that's no more than 1,000. If
16 a state cannot defend properly the 1,000 years, then roll
17 it back to 250.
18 CHAIRMAN RYAN: Thank you very much for
19 your comment. Any other commenters?
20 (No response.)
21 Subcommittee Discussion
22 CHAIRMAN RYAN: Hearing none, I want to
23 thank all the participants, the staff speakers and our
24 members of various interest groups who have come today.
25 We really appreciate your input. It's been, I think, a

1 very lively and fruitful discussion all day, and you've
2 all given of your time and your talents and I appreciate
3 that very much.
4 With that, Mr. Chairman, I'll turn the
5 meeting back to you for a close out.
6 MEMBER ARMIJO: Well, I would like to add
7 my thanks to all the presenters. Even though our
8 questions may have seemed a little bit --
9 CHAIRMAN RYAN: Pointed.
10 MEMBER ARMIJO: Pointed, I was going to say
11 "aggressive," please take it as an intention to get more
12 information. The presentations were excellent. The
13 comments and the discussion was very good. It's exactly
14 what we were looking for. Together with the previous
15 input from the prior meetings, the Committee will hear
16 --
17 The full Committee will hear from the
18 Subcommittee, and we expect the -- depending on the
19 decision, the full Committee is likely to be writing a
20 letter to the Commission based on this input. So again,
21 thank you very much, and I'll turn it back to you, Mike.
22 CHAIRMAN RYAN: Again, I'll add my thanks
23 to the Chairman's thanks, and we had a good meeting with
24 lots of very, very good input all day, and I wish the staff
25 from this morning were all here. Some of you are here.

1 Thank you again for your time and talents, and with that,
2 Mr. Chairman, we'll adjourn the meeting. Thank you very
3 much.
4 (Whereupon, at 5:09 p.m., the meeting was
5 adjourned.)
6
7
8

South Carolina Perspective on Part 61 Proposed Revisions

Prepared for the ACRS Radiation Protection and Nuclear Materials Subcommittee Meeting

December 3, 2013

South Carolina Department of Health and Environmental Control

Promoting and Protecting the Health of the Public and the Environment

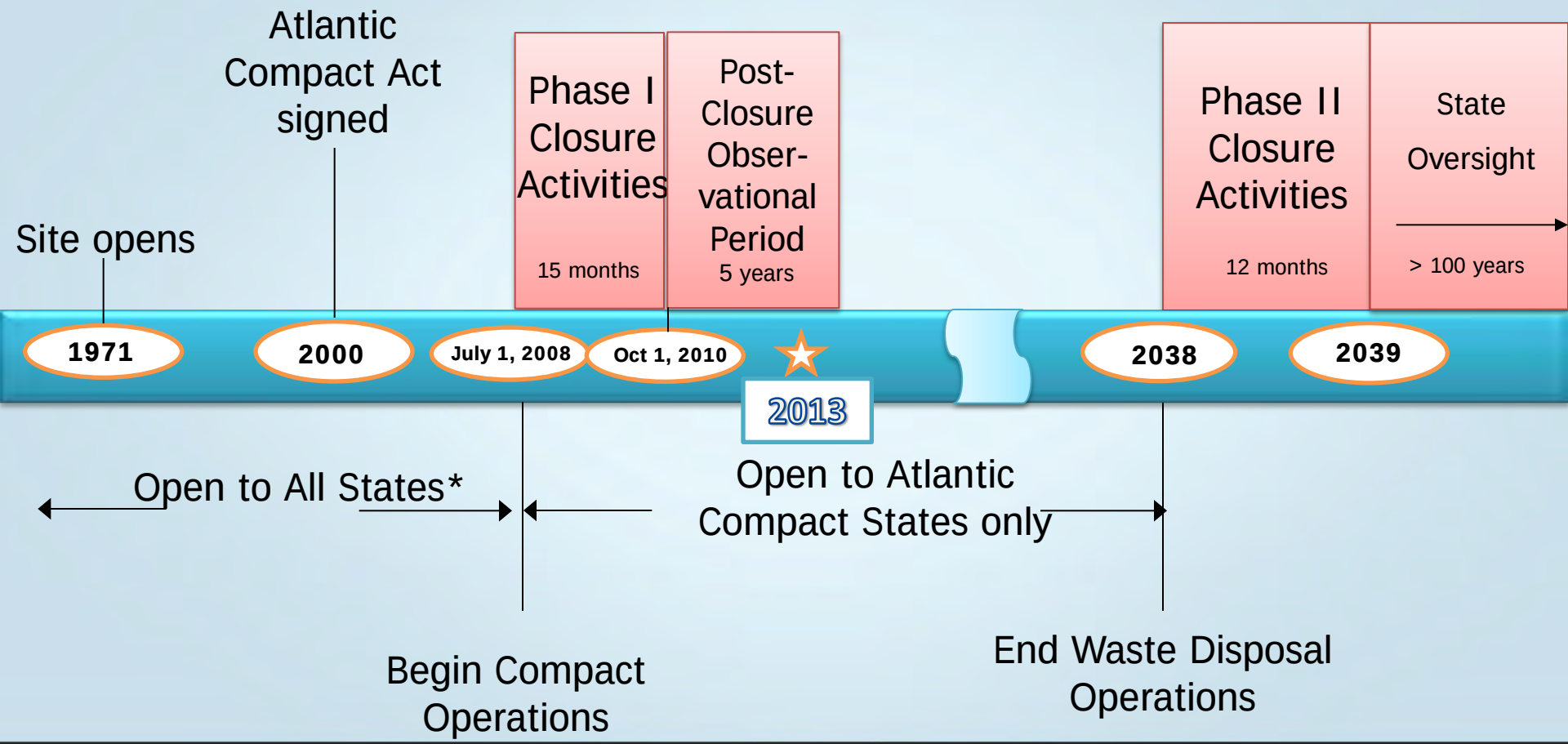
Barnwell LLRW Disposal Facility

Started operating in 1971

120 acres capped

235 acres used for disposal and site buildings

Projected Timeline

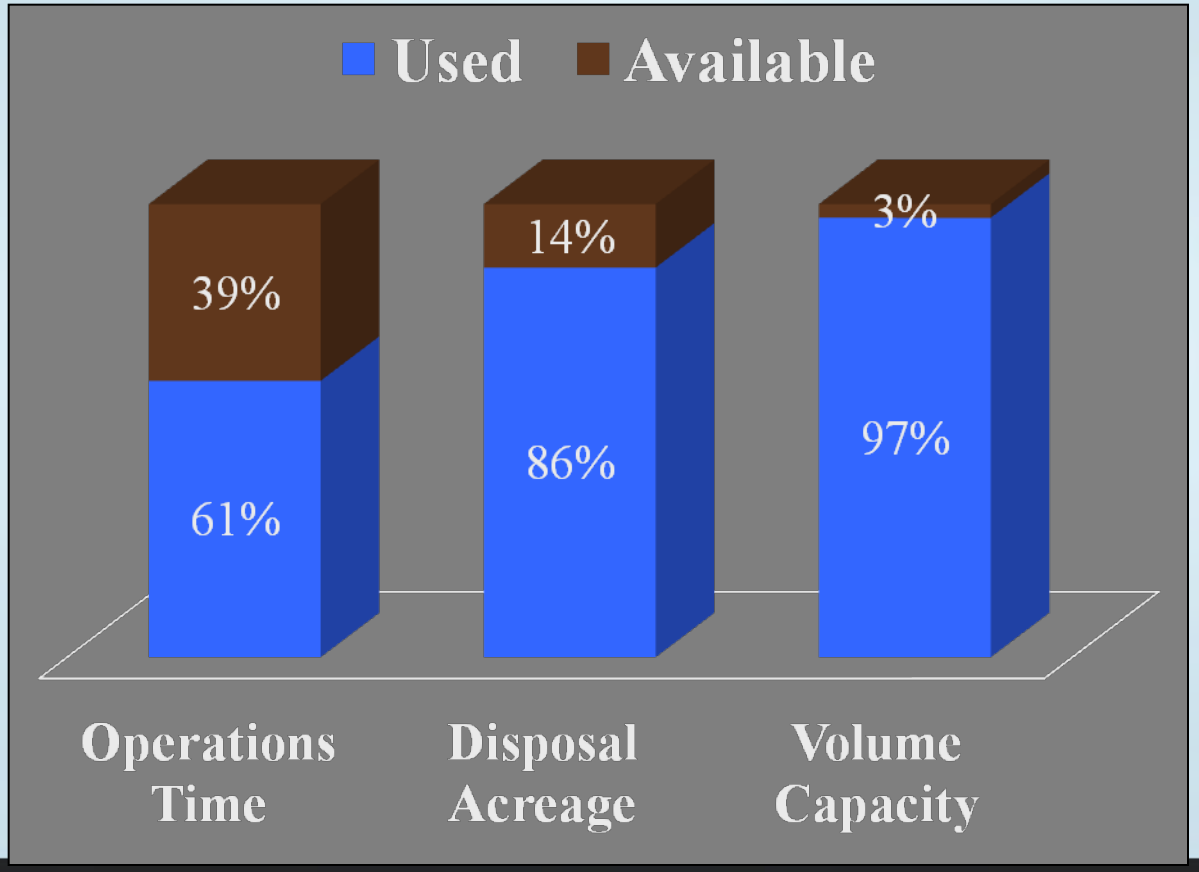


*NC was banned in 1995

Status of Barnwell Site

- Atlantic Compact Operations only
- Phase I closure activities are complete
- 86% of site is in 5-year postclosure observation period
- Extensive documentation showing 16 performance objectives listed in the license have been met

Status of Barnwell Site



Applicability Issues

61.1 Purpose and Scope

"Applicability of the requirements in this part to Commission licenses for waste disposal facilities in effect on the effective date of this rule will be determined on a case-by-case basis and implemented through terms and conditions of the license or by orders issued by the Commission."

Applicability Issues (cont.)

61.13 Technical Analyses (long-term analyses)

"Licensees with licenses for land disposal facilities in effect on the effective date of this subpart must submit these analyses at the next license renewal or within 5 years of the effective date of this Subpart, whichever comes first."

61.58 Waste Acceptance

"Licensees with licenses for land disposal facilities in effect on the effective date of this subpart shall comply with the requirements of paragraphs (b) and (c) of this section at the next license renewal or within 5 years of the effective date of this subpart, whichever comes first."

ACRS Comment

"Previously disposed waste should not be subject to additional compliance evaluations as proposed by staff"

- All disposals at the Barnwell site have been in accordance with the regulatory requirements in place at the time of those disposals
- Site stabilization including installation of caps is complete for 86% of disposal area
- Demonstrated and approved as part of Phase I Closure
- Estimating source term is complex due to recordkeeping
- There are no funds set aside to potentially remediate the site based on new requirements for past disposals

Waste Acceptance Criteria and Operations Evolved

- 1979 - Liquids banned (scintillation liquids and hazardous chemicals)
- 1979 - All waste containerized
- 1983 - Absorbents banned
  - allowed for incidental liquids only
- 1983 – Waste classification table included in license

Waste Acceptance Criteria and Operations Evolved

- 1985 – Cardboard boxes banned as packages
- 1990 - License condition to comply with all of Part 61
- 1991 – Enhanced caps on all trenches
- 1995 - All classes of waste in vaults to promote stability of entire site

61.7 Concepts

- 61.7.c.5
  - "The performance period analyses are used to evaluate the suitability of [long-lived] waste for disposal on a case-by-case basis."
- 61.7.e
  - "For long-lived waste and certain radionuclides prone to migration, a maximum disposal site inventory based on the characteristics of the disposal site may be established."

Period of Compliance

- 10,000 years
  - Concern about uncertainties associated with this timeframe
    - Human behavior and natural processes
    - Design features
- Timeframe on the order of 1,000 years - more reasonable

Inadvertent Intruder Analyses

- All classes of waste (A,B and C) disposed in vaults at Barnwell Site since 1995.
- Vaults improve ability of the site to meet the performance objectives
  - enhance site stability
  - act as intruder barriers

Summary

- Applying new requirements to existing licenses and existing waste should remain case-by-case
- Some concepts and associated requirements of Proposed Part 61 appear contradictory
- Compliance period on the order of 1000 years
- Majority of Barnwell Site is closed, future waste volumes will be low, not candidate for future DU

South Carolina Department of Health and Environmental Control

Promoting and Protecting the Health of the Public and the Environment

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Advisory Committee on Reactor Safeguards Radiation Protection and Nuclear Materials Subcommittee

Rockville, MD

December 3, 2013

Rusty Lundberg

Utah Division of Radiation Control

Considerations

- **1981 NRC DEIS (NUREG–0782):**
  - **Short-Lived Isotopes (e.g., $T_{1/2}$ < 50 yrs, e.g. Cs-137)**
    - **In abundant quantities**
  - **Long-Lived Isotopes (w/ decreased progeny risk)**
    - **$T_{1/2}$ ≥ 50 yrs. (e.g. C-14, Tc-99, etc)**
    - **In limited quantities**
  - **DU – *only in very small quantities***
    - **Weapons / power DU by-product = Federal ownership**
- **NOW: private sector disposal → DU in large quantity**
  - *Increased* progeny risk (significant)

Utah – Performance Assessment Rules

- **Current Utah Rule: UAC R313-25-8**
  - **Promulgated: June 2, 2010**
- **4 Regulatory "Triggers" for new PA Analysis**
  - **1) Waste not considered in 1981 NRC DEIS**
  - **2) Waste that will result in > 10% dose increase @ time of peak dose**
  - **3) Waste > 10% of approved total site inventory**
  - **4) Waste that would result in an unanalyzed condition, not considered in R313-25 (10 CFR 61).**

Utah – Performance Assessments

- 2-Tiered PA Analysis:
  - Tier 1 - "Quantitative" ≥ 10,000 years (required)
    - Computer model predictions
    - Analog to NRC "Compliance Period"
    - Compliance criteria applied - examples include:
      - Points of Compliance
      - Dose limit, all pathways: 25/75/25 mR/yr

Utah – Performance Assessments

- Tier 2: "Qualitative" Analysis – to peak dose
  - Time period beyond "Quantitative"
  - Analog to NRC "Performance Period"
  - Computer model predictions – needed to:
    - Inform regulatory decision
    - Provide ability to evaluate long-term engineering designs / site characteristics

Intruder Performance Objectives

- **Considerations for proposed changes to 10 CFR 61**
  - **Intruder analysis for all LLRW waste classes**
  - **How to address uncertainties for very long time periods for radionuclides with significant progeny in growth**

Other Utah Concerns

Humid vs.

Other Utah Concerns

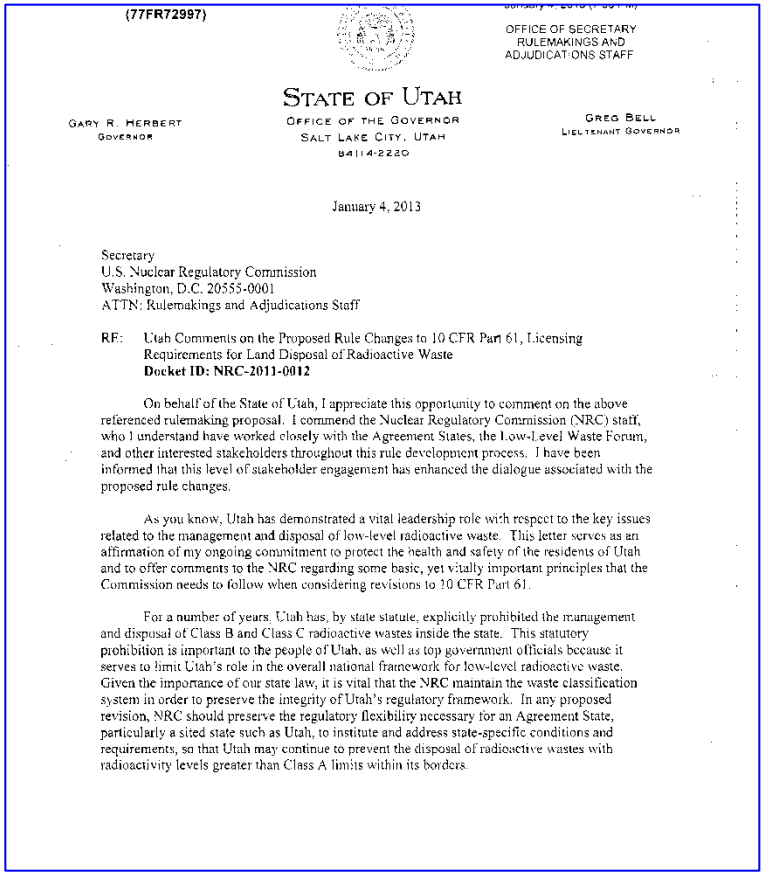
Arid

Other Utah Concerns:
WAC & Waste Classification

"This proposed revision must not either explicitly or by interpretation be a means to by-pass the existing waste classification requirements of Subpart 61.55."

"It is vital to Utah's Class B and Class C prohibition that the existing classification system of low-level radioactive waste remain in place, with the ability of a state, such as Utah, to enforce state prohibitions on wastes with higher radioactive levels."

-- Gov. Gary R. Herbert



{77FR72997}

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

STATE OF UTAH
OFFICE OF THE GOVERNOR
SALT LAKE CITY, UTAH
84114-2220

GARY R. HERBERT
GOVERNOR

GREG BELL
LIEUTENANT GOVERNOR

January 4, 2013

Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
ATTN: Rulemakings and Adjudications Staff

RE: Utah Comments on the Proposed Rule Changes to 10 CFR Part 61, Licensing Requirements for Land Disposal of Radioactive Waste
Docket ID: NRC-2011-0012

On behalf of the State of Utah, I appreciate this opportunity to comment on the above referenced rulemaking proposal. I commend the Nuclear Regulatory Commission (NRC) staff, who I understand have worked closely with the Agreement States, the Low-Level Waste Forum, and other interested stakeholders throughout this rule development process. I have been informed that this level of stakeholder engagement has enhanced the dialogue associated with the proposed rule changes.

As you know, Utah has demonstrated a vital leadership role with respect to the key issues related to the management and disposal of low-level radioactive waste. This letter serves as an affirmation of my ongoing commitment to protect the health and safety of the residents of Utah and to offer comments to the NRC regarding some basic, yet vitally important principles that the Commission needs to follow when considering revisions to 10 CFR Part 61.

For a number of years, Utah has, by state statute, explicitly prohibited the management and disposal of Class B and Class C radioactive wastes inside the state. This statutory prohibition is important to the people of Utah, as well as top government officials because it serves to limit Utah's role in the overall national framework for low-level radioactive waste. Given the importance of our state law, it is vital that the NRC maintain the waste classification system in order to preserve the integrity of Utah's regulatory framework. In any proposed revision, NRC should preserve the regulatory flexibility necessary for an Agreement State, particularly a sited state such as Utah, to institute and address state-specific conditions and requirements, so that Utah may continue to prevent the disposal of radioactive wastes with radioactivity levels greater than Class A limits within its borders.

Other Utah Concerns:
Waste Acceptance Criteria (WAC)

- **Site-specific WACs**
  - **Preserve LLRW Classification System**
  - **Adds confirmation burden to Host States**
  - **Coordination with Class A waste limits**

Other Utah Concerns: Compatibility

"NRC should preserve the regulatory flexibility necessary for an Agreement State, particularly a sited state such as Utah, to institute and address state-specific conditions and requirements, so that Utah may continue to prevent the disposal of radioactive wastes with radioactivity levels greater than Class A limits within its borders."

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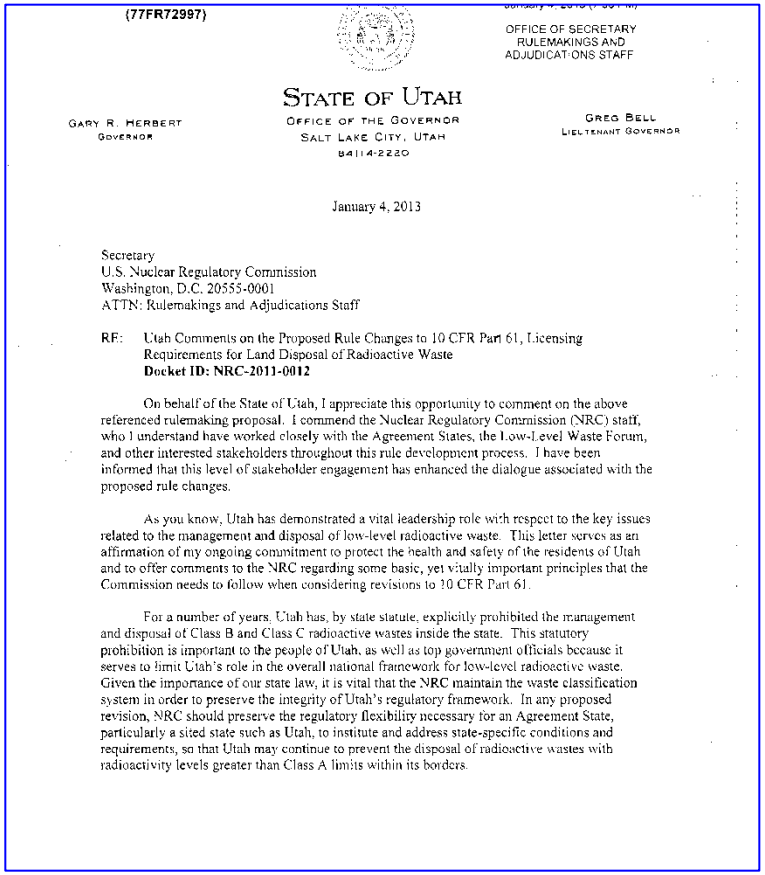

(77FR72997)

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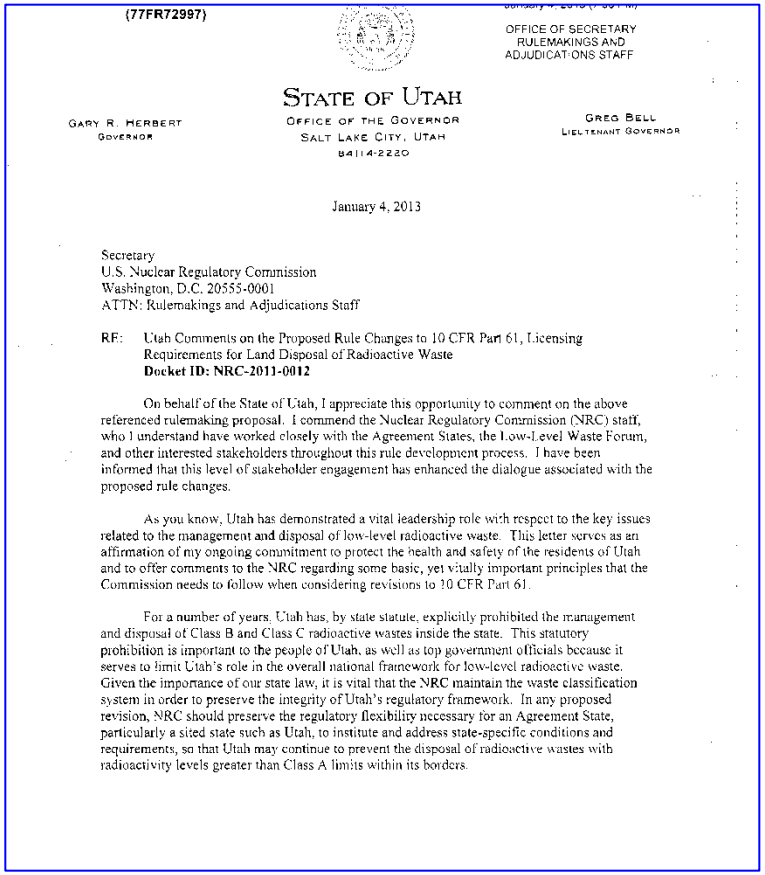
Other Utah Concerns: Compatibility

- **Flexibility for Host States**
  - **State waste classification requirements**
  - **Performance assessments (DU)**
    - In progress



(77FR72997)

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January 4, 2013

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ATTN: Rulemakings and Adjudications Staff

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Contact Information

Rusty Lundberg
Director
Utah Division of Radiation Control
Utah Department of Environmental Quality

(801) 536-4257
rlundberg@utah.gov

PR 10 CFR Part 61
(77FR72997)

DOCKETED
USNRC

January 7, 2013 (5:57 PM)

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

8

Bryan W. Shaw, Ph.D., *Chairman*
Carlos Rubinstein, *Commissioner*
Toby Baker, *Commissioner*
Zak Covar, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 7, 2013

Secretary, U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
Attn: Rulemakings and Adjudications Staff.

Re: Docket ID NRC-2011-0012

Dear Sir or Madam:

The Texas Commission on Environmental Quality (TCEQ) appreciates the opportunity to respond to the United States Nuclear Regulatory Commission's (NRC) proposed revisions to 10 CFR Part 61 published in the December 7, 2012, edition of the *Federal Register* entitled: "Site-Specific Analyses for Demonstrating Compliance With Subpart C Performance Objectives."

Enclosed please find the TCEQ's detailed comments relating to the NRC's proposed revisions referenced above. If you have any questions concerning the enclosed comments, please contact Mr. Brad Broussard, Radioactive Materials Division, Office of Waste, (512) 239-6380, or at brad.broussard@tceq.texas.gov.

Sincerely,

Zak Covar
Executive Director

Enclosure

Template = SECY-067

DS10

Texas Commission on Environmental Quality Comments on Revisions to 10 CFR Part 61: Licensing Requirements for Land Disposal of Radioactive Waste

Waste Acceptance Criteria

Proposed 61.7 Concepts

(d) Waste acceptance. Demonstrating compliance with the performance objectives also requires a determination of criteria for the acceptance of waste. The criteria can be determined from the results of the site-specific analyses that demonstrate compliance with the performance objectives for any land disposal facility or, for a near-surface disposal facility, the waste classification requirements of Subpart D of this part.

Comment: This proposed provision seems to allow waste acceptance criteria to be established from the results of a site-specific analysis for any "land disposal facility." In addition, it appears that in the context of this revision a "near-surface disposal facility" is different than a land disposal facility. This implies that waste acceptance criteria established from a site-specific analysis is the only approach that has to be taken for meeting the performance objectives. However, Section 5.2.7 of the Part 61 Regulatory Basis document states the NRC is proposing Option 3 - *Generic Waste Classification or Site-Specific Waste Acceptance* where a hybrid approach is taken that would allow licensees to use *either* the results of the site-specific technical analyses set forth in 10 CFR 61.13 *or* the waste classification requirements in 10 CFR 61.55.

The proposed language in 61.7(d) should be clarified in guidance or expanded in rule to indicate that this hybrid approach should incorporate both the waste classification tables and an approved site-specific analysis in determining waste acceptance criteria.

Period of Performance

Proposed 61.2 Definitions

Performance period is the time after the compliance period for disposal facilities during which the performance objectives specified in §§ 61.41(b) and 61.42(b) must be met.

Part 61 Regulatory Basis Document, Section 5.1.7, *Options Considered* states that:

"The analyses for the second tier would use: (a) a screening process to identify if long-term analyses are necessary, and if applicable, (b) long-term, site-specific analyses to peak dose (limited to 1 million years). The performance requirement for the long-term analyses would be to maintain effects to the public ALARA (as low as reasonably

achievable). The analyses that could be used for the second tier would be described in guidance, not in regulations. The regulations would only describe the analyses at a high level. Appropriate technical analyses for each would be described in guidance. The screening analysis would be based on a conservative approach (e.g., peak ingrowth of daughter isotopes, assume no retardation during transport, defined scenarios) to manage long-term uncertainties and ensure that public health and safety is protected. If the screening analysis results show the performance objectives will not be met, then inventory limits could be established based on the screening analysis or long-term, site-specific analyses could be performed to demonstrate that public health and safety will be protected. Using this framework, the analyses can be risk-informed. The standard for considering if the effects from the second tier are acceptable would be to maintain doses to the public ALARA."

Comment: The new proposed definition of performance period indicates that the performance objectives of §§61.41(b) and 61.42(b) must be met. The standard that has to be met for the second tier analysis is still too subjective. Guidance developed that provides instruction on conducting a second tier analysis should state how the ALARA analysis is demonstrated. This may provide better direction for regulators as to how to implement the proposed definition and the proposed §61.41(b) and §61.42(b) revisions.

Compatibility

Section 5.4 of the Part 61 Regulatory Basis document provides limited discussion on compatibility categories for new provisions relating to *performance period, compliance period, intruder assessment, long-lived waste, performance assessment,* and waste acceptance criteria. It only states that compatibility designations be assigned that "... ensure alignment between the States and Federal government on safety fundamentals, while providing the States with the flexibility to determine how to implement these safety requirements. . . ."

Comment: The current compatibility category for §61.41 is category A. If the NRC chooses to maintain this category with the new revisions to §61.41, specifically performance period analyses demonstrating ALARA, the NRC should provide direction in the Part 61 supporting guidance for conducting an ALARA analysis that meets the proposed requirements in §61.41(b).

The current compatibility category for the waste classification tables in §61.55 is category B. If site-specific analysis is used to determine waste acceptance criteria, the NRC should maintain the same compatibility category.

The current compatibility category for §61.2 relating to definitions is category B. However, §61.7 has no compatibility category but the proposed revisions address conducting a performance assessment, an intruder assessment, site-specific analyses for long-lived waste, and in developing waste acceptance criteria. Careful consideration should be given to the compatibility category for §61.7. Stakeholders should be provided

the opportunity to provide input on compatibility categories as they are determined by the NRC Standing Committee on Compatibility.

RulemakingComments Resource

From: Melanie Aldana [melanie.aldana@tceq.texas.gov]
Sent: Monday, January 07, 2013 5:57 PM
To: RulemakingComments Resource
Cc: Carrera, Andrew; Melanie Aldana
Subject: Docket ID NRC-2011-0012
Attachments: signed letter & comments.pdf

Hello -

Attached please find the Texas Commission on Environmental Quality's comments regarding the United States Nuclear Regulatory Commission's (NRC) proposed revisions to 10 CFR Part 61.

These comments were also submitted by mail and via the Federal eRulemaking Portal.

If you require assistance with this electronic transmission or if you have need additional information, please contact me by return e-mail or by phone at (512) 239-1622.

TCEQ appreciates the opportunity to comment on this issue.

Thank you.

Melanie Aldana
Texas Commission on Environmental Quality
Chief Engineer's Office- Executive Assistant
512-239-1622

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND
HEALTHIER WASHINGTON

The state of Washington's View on the Regulatory Path Forward

December 3, 2013

Earl Fordham, Deputy Director, Office of Radiation Protection

Washington State Department of Health

Is the proposed two-tiered approach (compliance and performance periods) appropriate?

Yes

- Large uncertainties associated with these timeframes
- Wide variety of existing timeframes versus predicted earthly events. Beyond 1000 years, impacts are only estimates.

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

Washington State Department of Health

Should a dose limit other than 0.25 mSv (25 mrem) be applied to a performance assessment?

No:

- Future dose is linked to site performance assessment assumptions (e.g., K_d's).
- Uncertainties become too large beyond a few thousand years.
- With large uncertainties, relevant scenario selection is critical. Is rural residential proper everywhere?

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

Washington State Department of Health

Is the compliance period of 10,000 years appropriate for long-lived LLRW?

For the foreseeable events in Washington, we believe the 10,000 year compliance period is sufficient for analysis.

Washington's LLRW disposal site is located within a region of Hanford containing several disposal sites and most likely will never be released for public use.

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

Washington State Department of Health

Should there be a dose limit associated with the performance period analysis, and if so, what should that dose limit be?

No dose limit should be applied if for no other reason that this timeframe will coincide with another glaciation period which could last for thousands of years.

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

Washington State Department of Health

Should there be a dose limit associated with the inadvertent intruder analysis, and if so, what should that dose limit be?

Yes, Washington support the NRC staff's choice of 500 mrem/year for the inadvertent intruder.

With the relative shortness of the intruder exposure, a higher dose rate is appropriate.

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

Washington State Department of Health

Other Issues

- Cost-benefit analysis: brings into play the assumptions about future inhabitants, land use (remember the picture), and scenarios.

  Tread carefully!!

- We agree with the NRC on using the most up-to-date ICRP recommendations.
- We support allowing states to develop their own waste acceptance criteria. No two sites are the same.

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ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

© 2012 Google
Google earth
Imagery Date: 8/7/2011
46°32'15.03" N 119°33'31.85" W elev 726 ft
Eye alt 3909 ft

Questions?

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND
HEALTHIER WASHINGTON

Earl Fordham
509-946-0234
Earl.Fordham@doh.wa.gov
Website: http://www.doh.wa.gov

WCS

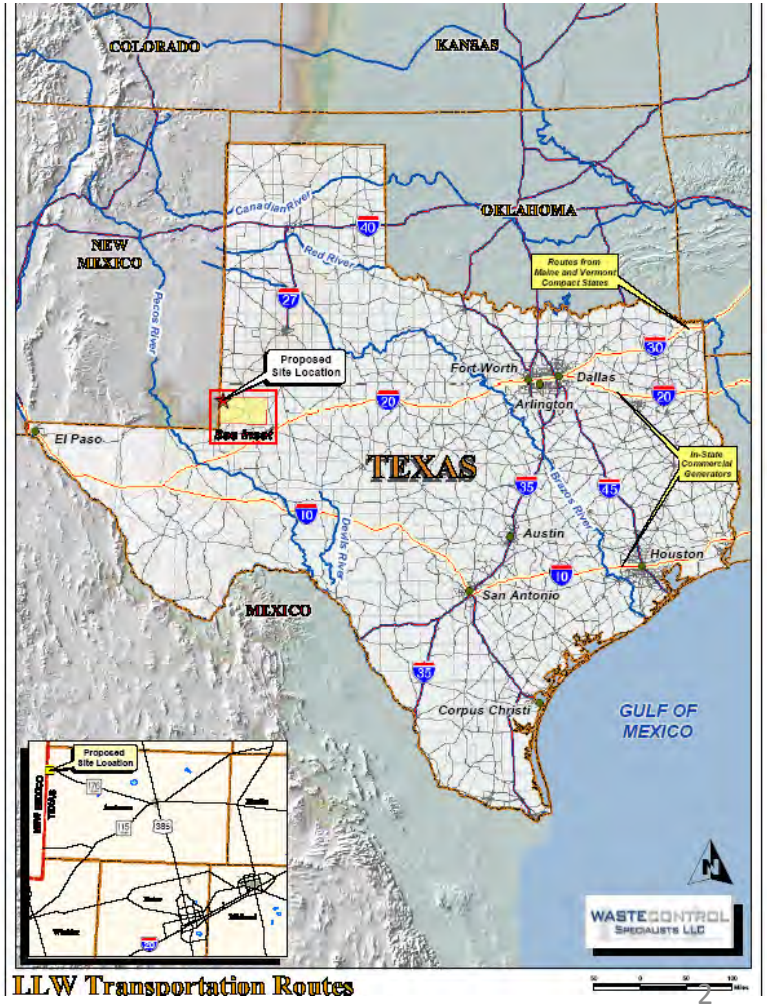
ANDREWS, TEXAS

Advisory Committee on Reactor Safeguards
Technical Basis - 10 CFR Part 61 Low-Level Waste Site-Specific Analysis Rulemaking
December 3, 2013

J. Scott Kirk, CHP

First Operating Facility in Over 40 Years

- WCS is the first operating facility licensed to dispose of Class A, B and C LLW under the LLWPA of 1980 (as amended in 1985).
  - Disposal authorized in the Texas Compact Waste Disposal and Federal Waste Disposal Facilities
  - Importation of LLW by non-regional waste generators authorized by Texas Legislature (275,000 Ci)
- Located in Andrews County, Texas and borders Lea County, New Mexico.



WCS Current Facilities

LLW Facilities

Texas Compact Waste Disposal Facility (CWF)

- Texas Legislature required transfer of land to State of Texas prior to receipt of waste.
- Authorized to dispose of 2,310,000 ft^3 or 3,890,000 Ci (decay corrected).
- Texas takes title of waste prior to disposal.
- Portion of fees collected provided to Texas and Andrews County.

Federal Waste Disposal Facility (FWF)

- Texas Legislature created the framework allowing disposal of federal waste.
- Texas Legislature required a Memorandum of Agreement with the Department of Energy before receipt of waste.
- DOE agreed to assume ownership of the FWF into perpetuity upon closure.
- Authorized to dispose of 26,000,000 ft^3 or 5,600,000 Ci (decay corrected).

WCS' Perspectives Regarding Revisions to 10 CFR Part 61

- WCS supports a 10,000 year Period of Compliance.
  - Allows for an evaluation of the long-term environmental performance of a waste disposal facility.
    - Tests engineered barriers, determines significant exposure pathways, and indicates need for additional site characterization.
  - Well suited for regulating Unique Waste Streams such as DU.
  - Demonstrating compliance with a 10,000 Period of Compliance is not insurmountable for a well-sited disposal facility.
  - Texas regulations requires a Period of Compliance of 1,000 years of peak dose whichever is longer.
    - Effectively required evaluation of over 50,000 years .

WCS' Perspectives Regarding Revisions to 10 CFR Part 61 (Cont.)

- NRC' rulemaking should reflect waste management advancements made over the past several decades as exemplified by the successful licensing of the WCS facilities in Texas.
- Intruder protection as been a long-standing, fundamental design requirement and performance objective for disposal facilities. However, the NRC should consider reasonable/likely intruder scenarios in the decision making process.
- 10,000 year Period of Compliance provides regulatory and public confidence in the long-term performance of the site.
- WCS' success rooted in strong support from the State, region and local communities from the outset.
- Community agreed to host a disposal facility only if backed by good science and technology, as well as regulated by proper regulatory oversight.

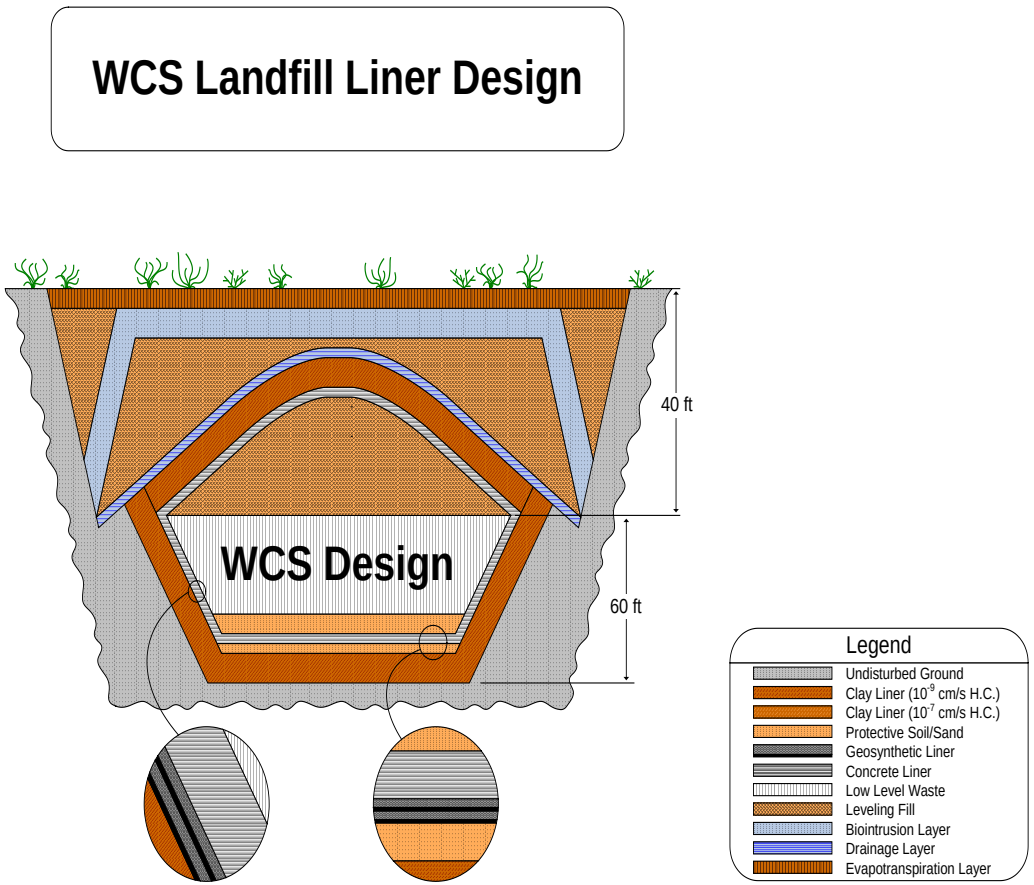
Texas' Vision of a Modern LLW Disposal Facility

- Created framework for licensing a 21st Century waste disposal facilities recognizing that:
  - More stringent standards may be needed to protect public health and the environment.
    - Use of Modular Concrete Canisters (MCCs) to remove radioactive materials from the biosphere.
  - Concept based on assured isolation and monitored, retrievable storage.
  - Located in an arid and remote region of western Texas with less than an average annual rainfall of less than 16 inches.
  - Located in an area far removed from any water table.

Texas' Vision of a Modern LLW Disposal Facility (Cont.)

- A Period of Compliance of 1,000 years or peak dose, which ever is longer is stipulated in Texas regulations .
  - Includes a quantitative public health standard to a reasonably maximum exposed individual of 25 mrem/y.
- Rulemaking considered a 10,000 Period of Compliance consistent with NRC guidance, but chose a more restrictive standard to:
  - Capture the peak dose from the more mobile long-lived radionuclides, and
  - Demonstrate the relationship of site suitability to the performance objectives specified in the rule.

WCS Site Design



- Multi-layered cover system that is 25 – 45 feet thick
- Depth to waste is at least 25 feet below surface
- Natural red bed clay is less permeable to water than concrete
- Hydraulic conductivity of clays are ~1E-9 cm/sec
- Red bed clays more than ~600 ft thick below landfill.
- Confined water 125 ft below landfill age dated at ~16,000 years.
- Extensive hydrogeological investigation – over 600 boreholes.

Compact Waste Facility (New Industry Standard)

Federal Waste Facility
(New Industry Standard)

Clive Facility
(Previous Industry Standard for Class A)

Barnwell Facility
(Previous Industry Standard for Class B/C)

WCS' Updated Performance Assessment

- WCS submitted a major license amendment to accept all Class C LLW and 400,000 m^3 of Depleted Uranium (DU) in August 2013.
- The maximum doses to an intruder or "reasonably maximum exposed individual" well below the regulatory limits.
- Model estimated peak doses for DU at ~1 million years in to the future.
- Analysis included the effects of future climate changes (i.e., wetter climates) by doubling average rainfall.

WCS' Updated Performance Assessment (Cont.)

- Use of large volumes of concrete very effective at impeding the mobility of certain radionuclides (i.e., ^{14}C, ^{99}Tc and ^{129}I) for long period into the future.
- Disposal at depth with a robust cover system is a fundamental necessity for ensuring the safe disposal of DU.
- Disposal at depth, coupled with intrusion barriers, are reasonable design features needed to demonstrate compliance with performance objectives.
- Analysis clearly demonstrated the suitability of the site to isolate radioactive materials from the biosphere well past at 10,000 year Period of Compliance, especially for Unique Waste Streams.
- Technical review of the major amendment is nearing completion.

Conclusions

- Much has changed in the manner in which radioactive materials have been managed since 10 CFR 61 was promulgated over 40 years ago.
- Only one site has successfully been licensed and currently in operations since Congress passed the LLWPA in 1980.
- Texas has assumed a leadership role in establishing requirements needed site and develop a 21st century, state-of-the art disposal facility.
- NRC guidance developed with the support of Agreement States hosting a disposal facility have recognized the need for a Period of Compliance of 10,000 years.

Conclusions (Cont.)

- A 1,000 year period of compliance is not sufficient to evaluate the long-term environmental performance of a disposal facility, especially for long-lived radionuclides.
- Building community support is essential to the development of new sites.
- Communities willing to host a disposal facility should expect use of modern, state-of-the art science and technologies in the siting and design of a facility to ensure long-term protection of public health and the environment.
- The length of time selected for Period of Compliance is more of a policy decision rather than a technical decision.
- Demonstrating compliance for a well-sited and designed facility for 10,000 years is not insurmountable as evidenced by the successful licensing of WCS.

ENERGYSOLUTIONS

ACRS – 10 CFR Part 61 Technical Basis Site Specific Analysis Rulemaking

Daniel B. Shrum

December 3, 2013

10 CFR Part 61

ENERGYSOLUTIONS

Objective as stated from NRC RIN 3150-A192 July 2013 Proposed Rule for Part 20 and 61, Page 13

"The NRC is proposing to modify the current regulations to ensure that LLRW streams that are significantly different than those considered in the development of the existing 10 CFR Part 61 are adequately considered during the licensing of LLRW disposal facilities and to ensure that the 10 CFR Part 61 performance objectives will be met for disposal of those LLRW streams"

10 CFR Part 61

ENERGYSOLUTIONS

Proposed Rule will require Part 61 facilities to:

Prepare New and Revised Site-Specific technical analyses

"Proposed rule would affect existing and future LLRW disposal facilities that are regulated by NRC or an Agreement State"

Set exposure limits for intruders

Current rule has no long term exposure standards for inadvertent intruder

Develop criteria for the acceptability of LLRW for disposal

Allows facilities to "account for facility design, disposal practices, and site characteristics to determine criteria for the acceptability of LLRW for disposal"

Part 20

NRC will Amend Part 20 to "conform to the proposed requirements of LLRW acceptance"

10 CFR Part 61

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January 2012 COMWDM-11-0002/COMGEA-11-0002

ICRP Standards

Allow flexibility to use current ICRP dose methodologies in SSPA

Two-tiered approach

Compliance Period that covers the reasonably foreseeable future

Period of Performance that is not a priori

Waste Acceptance Criteria (WAC)

Flexibility for disposal sites to establish site-specific waste acceptance criteria based on PA results

Compatibility

Establish requirements for SSPA

Develop site-specific waste acceptance criteria
Ensure alignment between States and Federal government

Site Specific Technical Analyses

ENERGYSOLUTIONS

Fundamental Requirement of new rule

Four Current Commercial Part 61 disposal facilities:

US Ecology – Hanford Complex, Washington

WCS – Andrews County, Texas

Barnwell Facility – Barnwell, South Carolina

Clive Facility – Clive Utah

All four facilities have current PAs – with different exposure limits

Two-tier approach

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"A two tiered approach that establishes a compliance period that covers the reasonably foreseeable future and a longer period of performance that is not a priori and is established to evaluate the performance of the site over longer timeframes. The period of performance is developed based on the candidate site characteristics (waste package, waste form, disposal technology, cover technology and geo-hydrology) and the peak dose to a designated receptor."

Reasonably Foreseeable

ENERGYSOLUTIONS

- Reasonably Foreseeable ≠ You can run the model
- More to a model than plugging in numbers – analyses and evaluations have been conducted on components for LLRW facilities, but for more reasonable time frames. For example:

  Durability of cover components

  Durability of waste forms

  HIC durability

  Drainage durability/fouling

  Rebar strength and durability
- Many components of engineered systems have not been evaluated for timeframes much longer than 300 years therefore 10,000 year timeframes are less meaningful

Reasonably Foreseeable

ENERGYSOLUTIONS

- Reasonably Foreseeable = 1,000 years
- Captures most of LLW disposed of in US
- Doesn't capture DU, but neither does 10,000 or 20,000
- 10,000 year same value used for high level waste
- Consistent with other regulated LLW facilities
- Component performance can be reasonably extrapolated
- Still a really long time
- Manages uncertainty without undue speculation
- A number that would provide confidence to the general public and practicality for regulated community
- Won't cause unintended consequences for existing facilities

Performance Period

ENERGYSOLUTIONS

- Will capture longer lived isotopes to evaluate catastrophic effects
- Allows for flexibility as the error terms grow larger
- Should allow for a higher threshold – 1 to 10 rem as contemplated by the IAEA
- Moves focus to site location as opposed to engineering features
- Captures DU – which was the original purpose of the rule

Inadvertent Intruder

ENERGYSOLUTIONS

- Proposed: 10 CFR 61.42 would require an intruder assessment
- Proposed: 500 mrem/year standard
- "Given the uncertainty in predicting human behavior into the distant future and to limit associated speculation, the NRC is proposing to change the definition of the inadvertent intruder to limit scenarios to reasonably forseeable activities." (NRC RIN 3150-A192 July 2013 Proposed Rule for Part 20 and 61, page 26)

Inadvertent Intruder

ENERGYSOLUTIONS

Clive specific example

- Site inhospitable to human habitation
- Inherently protective against intruder scenarios
- Utah DRC conclusion
  - "…unrealistic to assume residential or agricultural intruders.[1]"
- From the Nuclear Regulatory Commission's Order
  - "…significant intruder exposures at a site like [Envirocare] are unrealistic.[1]"
  - "…could be licensed under 10 CFR 61 regardless of the time frame you looked at.[1]"

[1]Memorandum and Order in the Matter of Louisiana Energy Services, L.P., CLI-06-15, June 2, 2006

Inadvertent Intruder

ENERGYSOLUTIONS

Clive specific example

Also From the Nuclear Regulatory Commission's Order

> "If, as here, extensive speculation is required to find significant long-term adverse impacts at [Envirocare], by the same token one could assume – perhaps even more readily – that technological improvements over upcoming centuries (or millennia) will provide more erosion-resistant disposal unit covers, or will otherwise alleviate concerns about the impact of depleted uranium disposal."

Inadvertent Intruder

From DRC June 7, 2013 responses to Energy*Solutions* PA for SEMPRASAFE waste:

- Resident lives, farms, and mines on the Clive facility (page 134)
- Pumps water from high TDS (65,000 mg/l)/low yield (gallons per day) aquifer (Page 132)
- Treats water for consumption and irrigation (page 136)
- Ability to grow crops in high saline soils (page 137)
- Receive dose from filter cake (page 136)

Inadvertent Intruder

- Require a different analysis for blended vs bulk waste (page 127)
- Lack of historical habitation doesn't preclude future residence patterns (Page 143)
- Grows algae for food source in high saline waters (page 137)

"Currently, it is anticipated that commercial biofuel production from algae is several decades away; however, the expectation is that algae will provide much in the way of biofood and fuel in the future"

Waste Acceptance Criteria

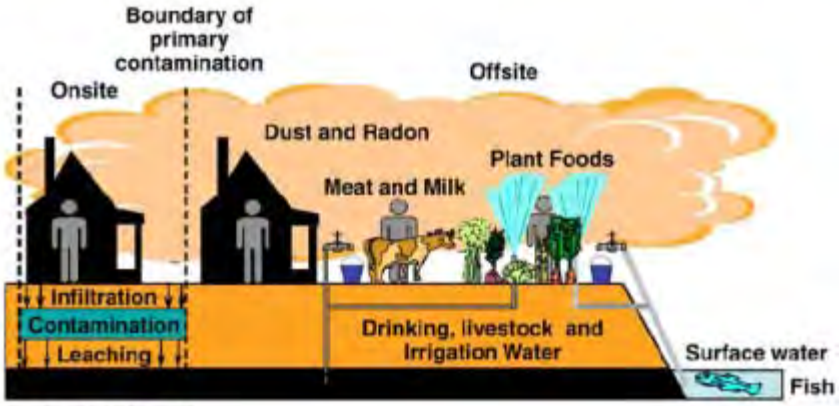
ENERGYSOLUTIONS

- All four commercial disposal facilities currently use WAC to enforce critical and limiting assumptions of an approved site-specific performance assessment
- Effectively applied throughout DOE complex
- PA-derived WAC would end need for further rulemaking
  - Establishes risk-informed performance-based standard
  - Consistent with NRC Principles of Good Regulation
  - Continued rulemaking will result in status quo until end of second rulemaking

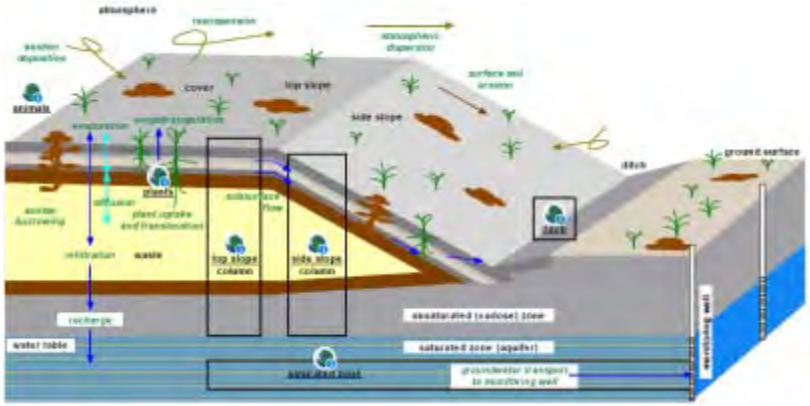
Depleted Uranium Status

ENERGYSOLUTIONS

- Moratorium effective June 1, 2010
- May not receive or dispose of significant quantities of concentrated DU until PA approved
- PA submitted June 1, 2011
- Utah DRC began the review September 2013
- Further Part 61 rulemaking is a significant policy issue to be resolved



From NUREG/CR-6937, Fig. 1.1



Compatibility

ENERGYSOLUTIONS

- Definitions are ambiguous and overlap
- Confusion of various categories
- H&S basis of Performance Objectives
- Consistent implementation of Part 61 across the Agreement States is critical
- Transboundary implications for waste generators as well as disposal facilities
- Consistent standards nationwide

ENERGYSOLUTIONS

ENERGYSOLUTIONS

December 3, 2013

Barnwell Disposal Facility Comments on the Proposed Rulemaking to revise 10 CFR Part 61

We agree with the Conclusions and Recommendations of the ACRS to the NRC Chair, Allison Macfarlane dated July 22, 2013, "REVISIONS TO LOW-LEVEL RADIOACTIVE WASTE DISPOSAL REQUIREMENTS (10 CFR PART 61)".

The Barnwell Disposal Facility (BDF) has disposed of low-level radioactive waste for longer than 40 years in compliance with the regulations. The radiological performance of the BDF is addressed by the acceptance of waste according to the Waste Acceptance Criteria of the BDF, regulations, and by direct measurements and modeling.

As an operating facility, we believe the additional proposed requirements are a risk because we would have to demonstrate compliance for an operating facility for 10,000 years as well as the protection of an inadvertent intruder for that period. We do not believe there is justification for the selection of this time period. We believe forecasting human activities and natural processes over 10,000 years have not progressed to be a reliable science.

The proposal to change the regulations to also be applicable to previously disposed waste will cause unnecessary burden on the BDF. The proposed changes will not affect the performance of the BDF for waste already disposed.

Respectfully submitted,

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General Manager, Disposal Operations

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LLRW Time of Compliance in 10 CFR Part 61

Lisa Edwards
Sr. Program Manager

USNRC ACRS

Radiation Protection and Nuclear Materials Sub-Committee
December 3, 2013

Together…Shaping the Future of Electricity

EPRI's Mission

To conduct research, development and demonstration on key issues facing the electricity sector on behalf of our members, energy stakeholders, and society

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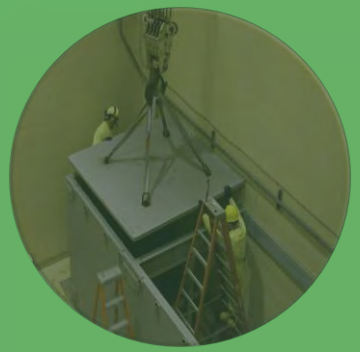
EPRI LLRW Focus Areas

Waste Minimization

- Reducing Generation Reduces Need for Disposal or Storage



Safe Storage

- If Storage is the Only Option – Store Waste Safely
- No Events

Disposal Flexibility

- Technical Bases to Risk Inform the Regulatory Process

EPRI LLRW Research Portfolio

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Part 61 Discussion Topics

- LLRW near surface versus geologic disposal
- What is the reasonably foreseeable future in terms of a shallow land disposal site?
- Calculations for compliance with a limit should have reasonable accuracy in the results
- A need for depleted uranium (DU) disposal
- Potential impacts on existing disposal options
- What is the risk from LLRW absent DU

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Quantitative Time of Compliance for LLRW
International Guidance

- ICRP 81 (1998): "…*doses and risks, as measures of health detriment, cannot be forecast with any certainty for periods beyond around several hundreds of years into the future*."
- IAEA SSG-23 (2012): "…*engineered near surface disposal facilities, which are subject to processes that may affect their integrity (e.g. erosion, human intrusion) … modeling periods of a few thousand years may still be reasonable.*

  For deeper facilities, such as geological disposal facilities for high level waste, modeling for periods of tens of thousands of years and beyond may still result in meaningful estimates of upper bounds of possible radiation doses."

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Balancing Risks Fairly Across Generations
National Academy of Public Administration (NAPA)

- In a 1997 report titled "*Deciding for the Future: Balancing Risks, Costs, and Benefits Fairly Across Generations*"[6] , for DOE, the NAPA acknowledged:
  - The "near future" to be 2 to 4 generations, and
  - The "distant future" to be 500 to 1,000 years.
- The present generation carries forward an "trustee responsibility" for maintaining an awareness of longer term hazards to future generations.
- Proposed a philosophical concept of a "chain of obligation" between generations, and recognizes that there may be circumstances where near-term hazards have priority over long-term hazards that are less certain.

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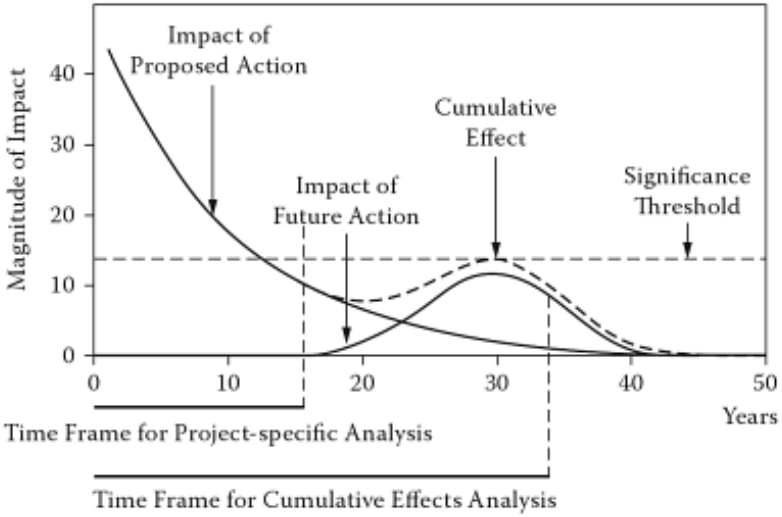
Time Frames for Environmental Assessments

Council on Environmental Quality Guidance

- The Council on Environmental Quality in their 1997 Handbook "Considering Cumulative Effects Under the National Environmental Quality Act"[8] provides a chart for evaluating time scales used in environmental assessments (EA).



- To determine the time frame used in an EA, a "proximate cause test" is often used to "...determine if a reasonably close relationship exists, as opposed to some remote or speculative causation. …the test determines [if an] action would reasonably and foreseeably cause a measureable or important impact on a resource of concern and limits an agency's analysis to those resources thus affected."[9]
- In this chart from CEQ, the significance threshold represents some level of acceptable risk. Likening this peak to a point where postulated LLRW intruder dose is known to be highest, near year 100, in effect the LLRW significance threshold, then the diminishing hazard from Cs-137 and Ni-63 decay should dictate the duration of the LLRW x-axis.

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What is the Reasonably Foreseeable Future?
Varying Concepts and Guidance

- ICRP 81, Several hundred years with any level of certainty[4]
- IAEA SSG-23:
  - Surface disposal (mining wastes), several hundred years with any certainty
  - Engineered near surface disposal, a few thousand years may still be reasonable
  - Deeper geologic disposal facilities for HLW, tens of thousands of years and beyond may still result in meaningful estimates[5]
- NAPA 500-1,000
- RCRA: Hazardous waste disposal sites, 30 years
- Council on Environmental Quality: When considering cumulative effects of large field oil and gas development 35 – 55++ years[10]
- NRC High Level Waste 10,000 or 1,000,000 years quantitative time of compliance

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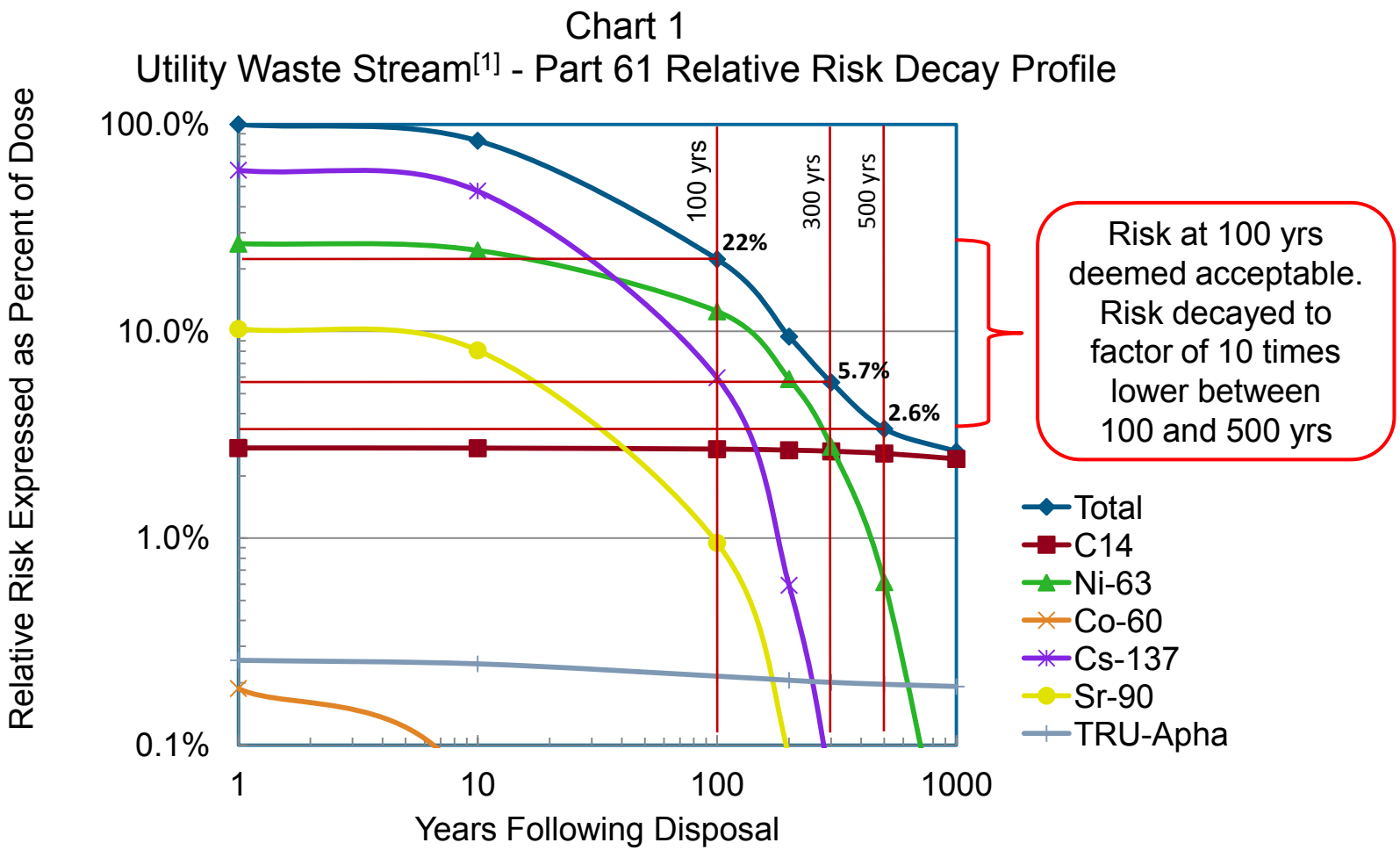
Risk Vs. Decay - Actual LLRW Radionuclide Mix

Using Current Part 61 Class A Concentration Limits



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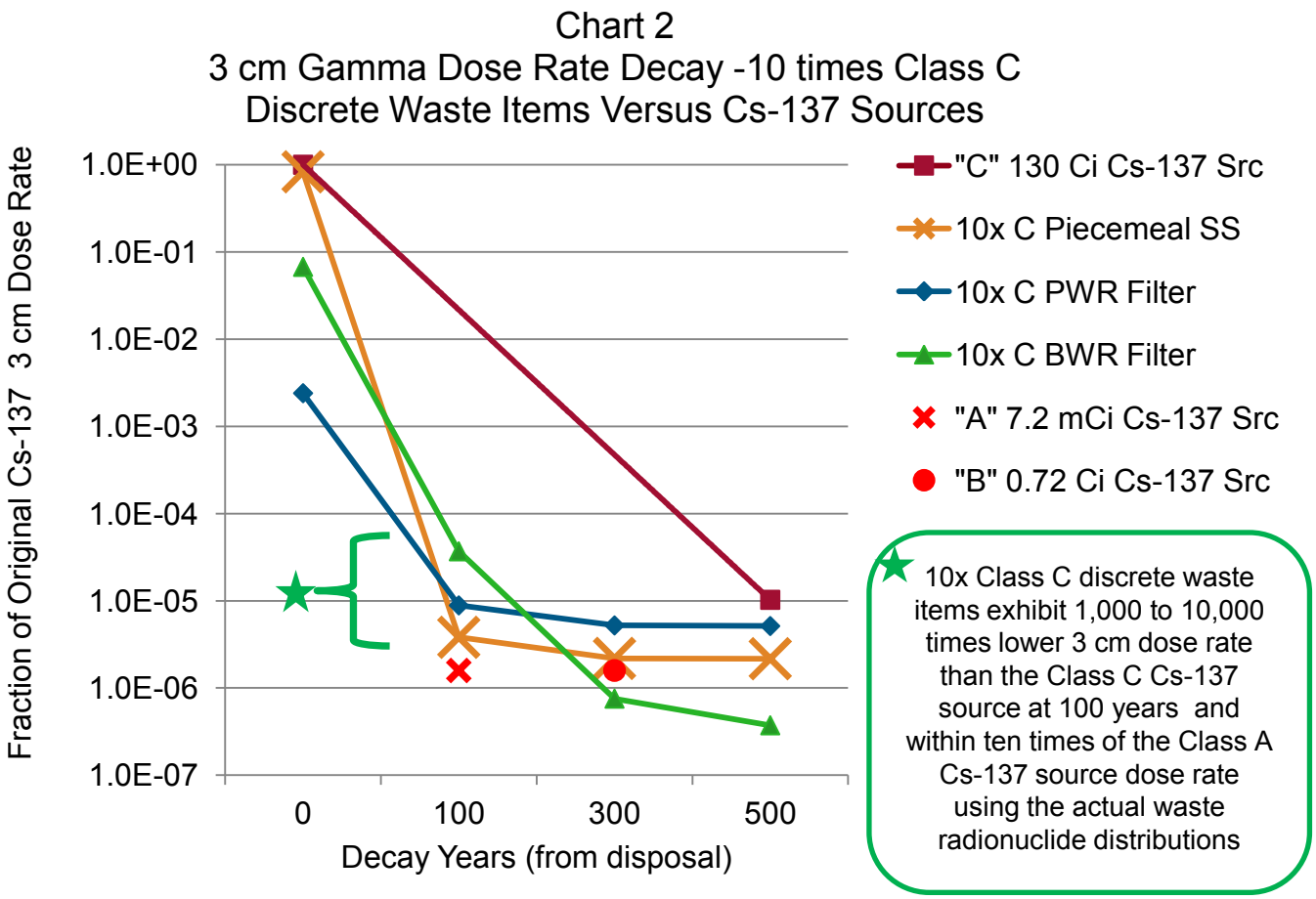
Risk Vs. Decay - Actual LLRW Radionuclide Mix

Intruder Acute Direct Dose Hazards[11, 12]



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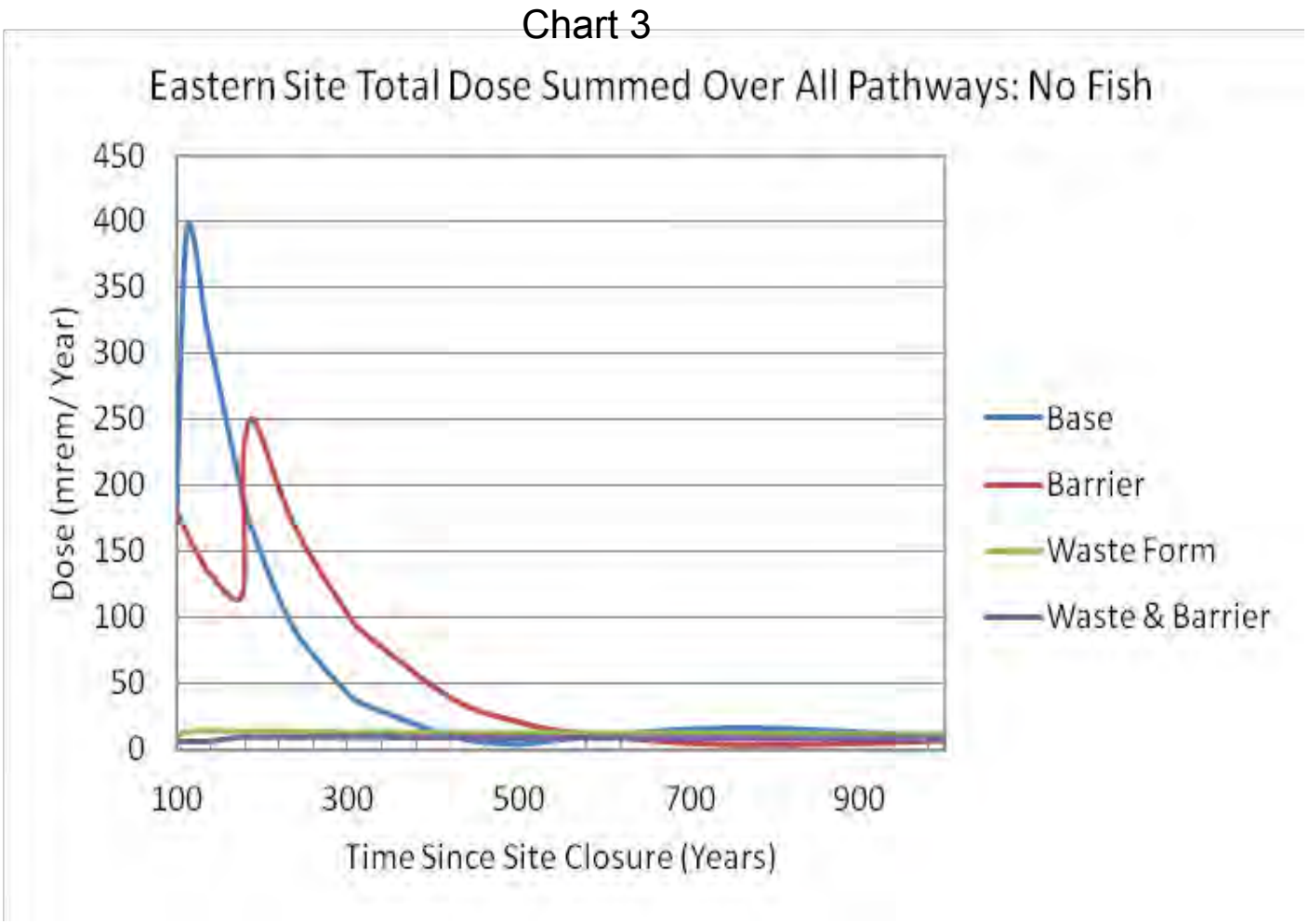
Actual LLRW Radionuclide Mix in One Site[3]

Utility and Non-Utility Waste 2009-2057 (9 mil m³)



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Shallow Land Disposal of LLRW
Acknowledging Uncertainties in PA

- NEA-OECD 4435 (2004): *"In order to maintain credibility within the scientific community…[and]… other stakeholders, it is important to acknowledge the limits of predictability of the repository and its environment in both regulations and in safety cases. …At times when the stability…can no longer be assured, a more qualitative assessment of radiological consequences is likely to be adequate,.."*[5]

- IAEA SSG-23 (2012): "*…if misused, results from overly conservative…representations of the disposal system may lead to poor decision making that is based on…results that bear little resemblance to the actual performance of the facility. …the use of an overly conservative approach can raise concerns…about manipulation of results, if later assessments adopt a more realistic…approach to demonstrate compliance with regulatory requirements*."[7]

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Quantitative Time of Compliance for LLRW
Summary and Conclusions

- Surface disposal of LLRW is safe within the current Part 61 framework and a TOC of 500-1,000 years is adequate
- It is not reasonable to believe that a shallow land disposal site can be accurately modeled over geologic durations
- The unique hazard from land disposal of DU should not dictate a generic TOC for LLRW sites not accepting DU
- There are other areas where Part 61 could be improved such as international alignment with the:
  - Duration of institutional controls
  - Application of updated dosimetry to the tables
  - Acknowledging very low level waste

but that is not a topic for this limited rulemaking.

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Assumptions, Bases, and References

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Risk Vs. Decay

Assumptions and methods in Chart 1

- The existing Part 61 concentration limits were based on the best waste stream information available at the time and an assumed volume (50,000 m^3/yr for 20 years into each of four regional disposal sites) thus representing a total disposal site activity[1, 2]. Today we know the representative waste stream and the combined utility and non-utility waste generation rates far better . The waste stream is comprised of different radionuclide fractions than those used to develop Part 61 and the generation rate is about 50% of what was used[1, 2, 3].
- The radionuclide inventory used in this assessment is derived from four years of utility waste manifests between 2003 and 2006 (~7,000 records) less activated hardware[1]. This entire inventory when averaged over its volume is class A waste[1].
- The Part 61 concentration limits are taken to represent a level of risk (or dose) relative to each other. In this example the Table 1 and Table 2 values are simplified and evaluated together when the hazard would really occur at different times but this doesn't impact the overall conclusion.
- The total utility waste inventory expressed as concentrations for the dominant class driving radionuclides is divided by the existing class A concentration limit for each and the results are normalized with the total set to 100% of the risk (or dose). The individual radionuclides each depict their individual contribution to the risk with the time set to zero.
- The relative risk is decayed by individual radionuclides for multiple time increments between 0 and 1,000 years and plotted in Chart 1.
- Observation; Intrusion scenarios drive the concentration limits and at 100 years, the concentration limits in the Part 61 volume basis are taken to represent an acceptable risk. Then the delta of risk between 100 years and 500 years is 10 times lower and there is little change after that out to 1,000 years. If at 500 to 1,000 years the dose rate is 1/10th of what was deemed acceptable at 100 years, why look further?

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Risk Vs. Decay

Assumptions and methods in Chart 2

- The radionuclide mix used to develop the three individual (or discrete) waste items depicted in Chart 2 are derived from the same database as Chart 1 except that the individual waste streams for BWR filters, PWR filters and activated hardware are used. The BWR and PWR filter geometries are based on a standard industry configuration (6” D x 30” H) and the piece of activated metal is a cube sized to the 0.01 ft^3 individual item criteria from the draft concentration averaging BTP[11]. The total activity in the three waste items are proportionally scaled up until they reached 10 times class C which is the bounding averaging criteria from the draft BTP[11].
- Models were developed using MicroShield™ for each discrete waste item to calculate the dose rate at 3 cm from each with the time set to zero The same models were used to calculate dose rates from the decayed items at 100, 300 and 500 years[12]. All dose rates were normalized to the highest dose rate at time equals zero, or that of the Cs-137 source.
- These fractions of initial dose rates are plotted against the decaying dose rate exhibited by a 130 Ci Cs-137 source, all calculated at 3 cm.
- Also depicted is the decayed Class A and Class B Cs-137 source[11] at their respective time frames of 100 and 300 years.
- Observation; Using very conservative 10 times Class C concentration from the actual radionuclide distributions in individual (or discrete) waste items, the gamma dose rates from waste items are far lower than a permissible decayed Class C Cs-137 source and actually approximate the dose rates that would be exhibited by a permissible decayed Class A Cs-137 source 100 years even though the individual waste items were 10 times Class C when disposed. This analysis shows that direct dose hazards from individual waste items using a more accurate depiction of the LLW stream than used to develop Part 61 can be significantly lower than those of mono-isotopic sources used in more recent well drilling scenarios[11].

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Actual LLRW Radionuclide Mix In One Site[3]

Assumptions and methods in Chart 3

- The radionuclide inventory used in this assessment is derived from our modern and accurate understanding of radionuclide mix from operational and decommissioning nuclear power plants and the non-power plant waste inventory from MIMS (2002-2006) [3].
- The entire volume from the remaining operating life and decommissioning of the current fleet of reactors including all eligible wastes (i.e., eligible activated metal) and non-utility waste is projected over 48 years (2009-2057)[3].
- This results in an aggregated volume of 9 million m^3 which is modeled in one disposal site using RESRAD. ICRP 72 dose factors were used and the fish pathway was turned off because it was assumed that one would not place a disposal site adjacent to a fresh water body, four models were run:
  - The base scenario uses just the minimum required 2 m cover and no barriers to prevent water infiltration.
  - The barrier case adds an impermeable layer over the disposal site to minimize water infiltration. We can see that even with this unrealistically large inventory placed in one site and in the absence of normal waste form practices that would reduce the rate at which water penetrates the waste the intruder dose rate is <500 mrem/year.
  - In the waste form case, we reduce the permeability of the waste by altering the kd in only the waste zone which is considered the most representative of current disposal practices (e.g.; HICs, concrete over packs, etc)..
  - Combining the barrier, to minimize water infiltration into the site, and waste form results in little change from the waste form case alone.
- The dry site dose model, not depicted here, begins to increase in the waste form model at 700 years up to 1,000 years because of the breakdown of the waste form and water infiltration from no cap but even at 1,000 years the dose rate is <1 mrem/year.
- Observation; Using a far larger volume than was used to develop Part 61, a more accurate depiction of the radionuclide mix and modern dosimetry, even in the absence of modern disposal practices and a cap (barrier), the resident farmer (intruder agriculture) dose would be less than 500 mrem/yr. Using modern disposal practices we end up with intruder agriculture dose rates of <25 mrem/year out to 1,000 years[3].

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1. *An Evaluation of Alternative Classification Methods for Routine Low Level Waste From the Nuclear Power Industry*. EPRI, Palo Alto, CA: 2007. 1016120

2. *Investigation of Low Level Radioactive Waste Disposal Regulations and Practice: Recent Experience and Current Practices*. EPRI, Palo Alto, CA: 2009. 1019222

3. *Options for Improved Low Level Waste Disposal Using 10 CFR 61.58*. EPRI, Palo Alto, CA: 2010. 1021098

4. *Radiation Protection Recommendations as Applied to the Disposal of Long-Lived Solid Radioactive Waste.* ICRP Publication 81. Annals of the ICRP 28:13-22,1998

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10. *Interagency Reference Guide, Reasonably Foreseeable Development Scenarios and Cumulative Effects Analysis , For Oil and Gas Activities on Federal Lands in the Greater Rocky Mountain Region*, USDI Bureau of Land Management, USEPA, USDI Fish & Wildlife Service, USDI National Park Service, USDA Forest Service, 2003

11. *Draft Branch Technical Position on Concentration Averaging and Encapsulation, Revision 1*, ML121170418, May 2012

12. Letter, EPRI to NRC, RE: *Docket ID NRC 2011-0022 Revised Branch Technical Position on Concentration Averaging and Encapsulation of Low-Level Radioactive Waste*, ML12284A264, October 2012

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U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

DOE Activities for Management of Depleted Uranium

ACRS Part 61 Stakeholder Meeting

Christine Gelles, Office of Environmental Management
Roger Seitz, Savannah River National Laboratory

December 3, 2013

Savannah River National Laboratory™
OPERATED BY SAVANNAH RIVER NUCLEAR SOLUTIONS

Discussion Topics

- Overview of DOE's DUF6 Inventory and Conversion Facilities
- History of DOE Studies and NEPA analyses
- Basis for Selection of Conversion Product Form (DU3O8)
- Future Disposal Considerations

CC2 Row

DUF6 Conversion Project History

- DOE's inventory of DUF6 is legacy of DOE (and USEC) enrichment activities.
- DOE looked exhaustively at options for disposition of its DUF6 inventory.
- In 1999, DOE issued its *Final Programmatic Environmental Impact Statement [PEIS] for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride, DOE-EIS-0269.*
- In its August 10, 1999, programmatic Record of Decision (ROD) (64 FR 43358), DOE decided to convert the DUF6 inventory to depleted uranium oxide, depleted uranium metal, or a combination of both.
- Following the ROD, DOE initiated a competitive acquisition for construction of conversion facilities at the Portsmouth (OH) and Paducah (KY) gaseous diffusion plant sites.
- On August 29, 2002, DOE awarded a contract to Uranium Disposition Services, LLC (UDS) for such services and facility development began.
- Between 2002 and 2004, DOE reviewed the environmental consequences of building and operating the conversion facilities.

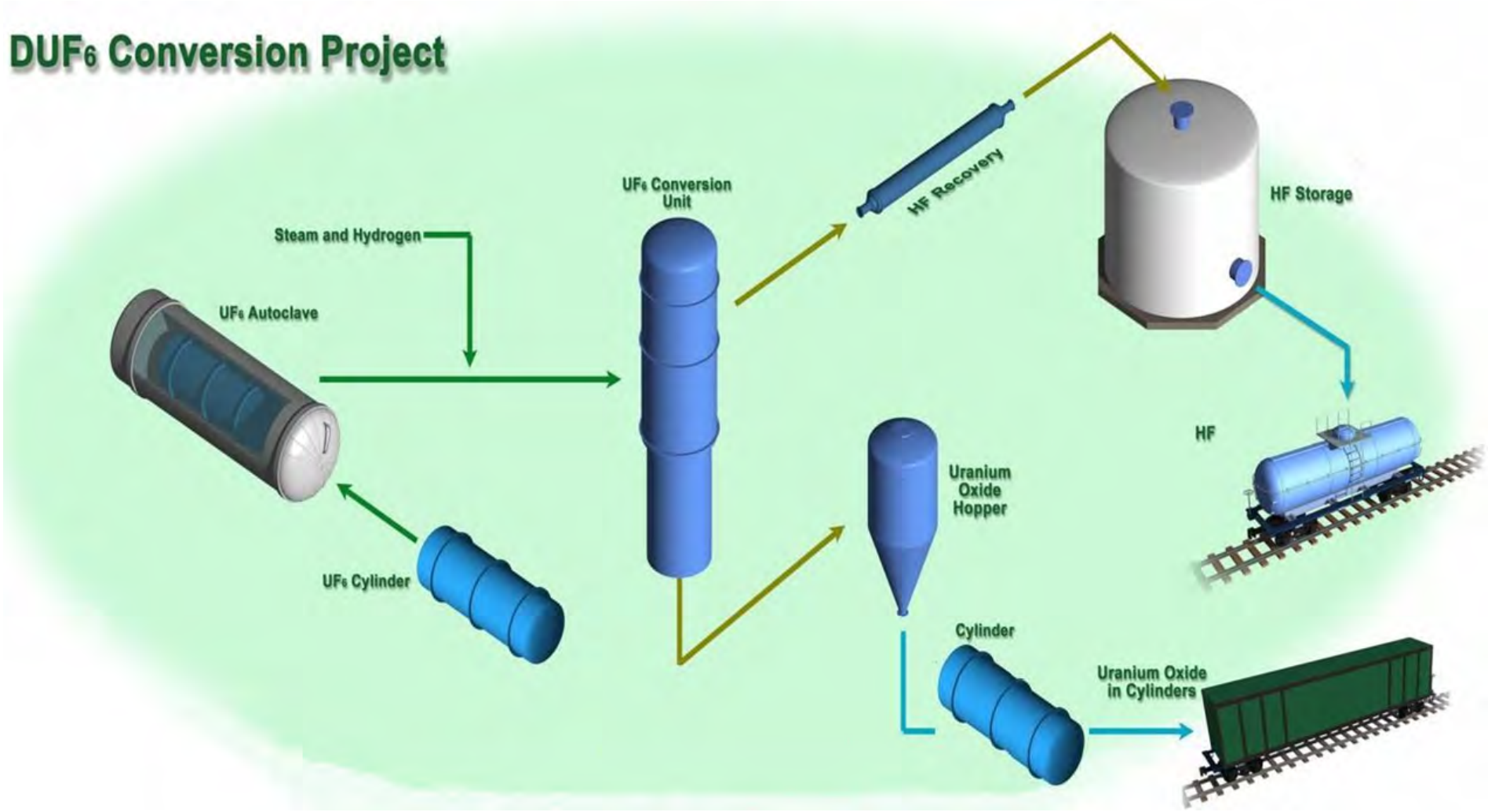
DUF6 Conversion Project History (continued)

- On June 18, 2004, DOE issued two site-specific EISs for the construction and operation of the Portsmouth and Paducah DUF6 conversion facilities (DOE 004a, b).
- In the RODs for these facilities, DOE decided that it would convert DOE's inventory of DUF6 to depleted uranium oxide (primarily depleted U3O8) and aqueous hydrogen fluoride (HF).
  - The aqueous HF produced during conversion is projected to be sold for use in commercial applications in accordance with approved authorized release limits.
  - The depleted uranium oxide conversion product will be reused to the extent possible or be disposed of as low-level waste (LLW) concurrently with emptied cylinders and the small amount of CaF2 produced during normal conversion operations.
- Although the site-specific EISs considered the NTS (NNSS) and Envirocare (Energy*Solutions*) as destinations for transportation and disposal of the these materials, DOE did not decide specific disposal location(s) in the 2004 RODs.

Piketon/Portsmouth OH
Three lines
Construction 2002 – 2008
HFT June 2010
240,000 MT DUF6
18 years operations projected

Paducah KY
Four lines
Construction 2002 – 2008
HFT Oct. 2010
550,000 MT DUF6
30 years operations projected

DOE's DUF6 Conversion Process



Status of DUF6 Project Operations

- Following construction of the facilities, DOE conducted competitive acquisition for the commissioning and operations of both facilities.
- In 2010, operations contract awarded to Babcock & Willcox Conversion Services, LLC.
- Hot functional testing began in 2010, and operations in 2011.
- Due to the first-of-kind nature of these facilities, a major focus on the path to stable, sustainable conversion operations has been determining the maximum possible throughput, based on actual experience and empirical data.
- DOE has focused on ramping up to full conversion operations, including continue to upgrade systems to achieve higher throughput in stages.
- Through FY 2013, 1600 cylinders have been processed and the conversion product is stored in re-used cylinders in the yards adjacent to the facilities.

DOE's responsibilities for commercial DU

(a) Responsibility of DOE

(1) The Secretary, at the request of the generator, shall accept for disposal low-level radioactive waste, including depleted uranium if it were ultimately determined to be low-level radioactive waste, generated by—

(A) the Corporation as a result of the operations of the gaseous diffusion plants or as a result of the treatment of such wastes at a location other than the gaseous diffusion plants, or

(B) any person licensed by the Nuclear Regulatory Commission to operate a uranium enrichment facility under sections 2073, 2093, and 2243 of this title.

(b) Agreements with other persons

The generator may also enter into agreements for the disposal of low-level radioactive waste subject to subsection (a) of this section with any person other than the Secretary that is authorized by applicable laws and regulations to dispose of such wastes.

(c) State or interstate compacts

Notwithstanding any other provision of law, no State or interstate compact shall be liable for the treatment, storage, or disposal of any low-level radioactive waste (including mixed waste) attributable to the operation, decontamination, and decommissioning of any uranium enrichment facility.

Excerpts from USEC Privatization Act (P.L. 104-134 §3113)

Assessment of Preferred Depleted Uranium Disposal Forms

- ORNL/TM-2000/161, June 2000
- Each DU form has a degree of uncertainty regarding acceptability, with the uncertainty decreasing in the following order: DU metal, DUF_4, DUO_2, and DU_3O_8.

Assessment of Preferred Depleted Uranium Disposal Forms (cont'd)

Chemical Properties of Uranium and its compounds under ambient conditions

DU product form	Solubility in water	
DU Metal	Insoluble	Reacts slowly with moisture to form oxides in the presence of oxygen; condensed moisture promotes generation of H2 Reactions may form pyrophoric surface in absence of O2

Assessment of Preferred Depleted Uranium Disposal Forms (cont'd)

DU product form	Solubility in water	
DUF4	Very Slightly soluble	Reacts slowly with moisture to form DUO2 and hydrogen fluoride (HF) and eventually other oxides and minerals
DUO2	Insoluble	Powder only can be pyrophoric in air Reacts very slowly with oxygenated groundwater to yield more stable oxides and minerals

Assessment of Preferred Depleted Uranium Disposal Forms (cont'd)

DU product form	Solubility in water	
DU3O8	Insoluble	Reacts very slowly with oxygenated water to yield more stable uranium minerals Product tends to be a fine particulate or powder

NRC Comments on DU Waste Form

NRC Comment September 22, 1992

Letter from NRC (J. W. N. Hickey) to LES (W. H. Arnold)

- NRC staff expressed a preference for U3O8 as the chemical form for final disposition. Conversion of the DUF6 to DUF4, for final disposition is not acceptable because its physiochemical, long-term stability is incompatible with final disposal under 10 CFR Part 61.

NRC Comment January 3, 1995

Letter from NRC (R. Bernero) to DOE (C. Bradley)

- Disposal of the DUF6 will likely require conversion of the material to a more stable physiochemical form, such as U3O8. NRC staff has recommended in the past that U3O8, which is thermodynamically stable and relatively insoluble, is a likely form for disposal.

NRC Comment May 1, 1998

Letter from NRC (C. Paperiello) to DOE (C. Borgstrom)

- In 1998 regarding disposal of DU, NRC expressed preference for uranium oxides over metal in comments on DOE PEIS.

Future Considerations Related to Potential Disposal

- DOE has committed to conduct additional NEPA analyses on the transportation and disposal of the conversion product.
- In March 2007, DOE published *Draft Supplement Analysis for Location(s) to Dispose of Depleted Uranium Oxide Conversion Product Generated from DOE's Inventory of Depleted Uranium Hexafluoride*

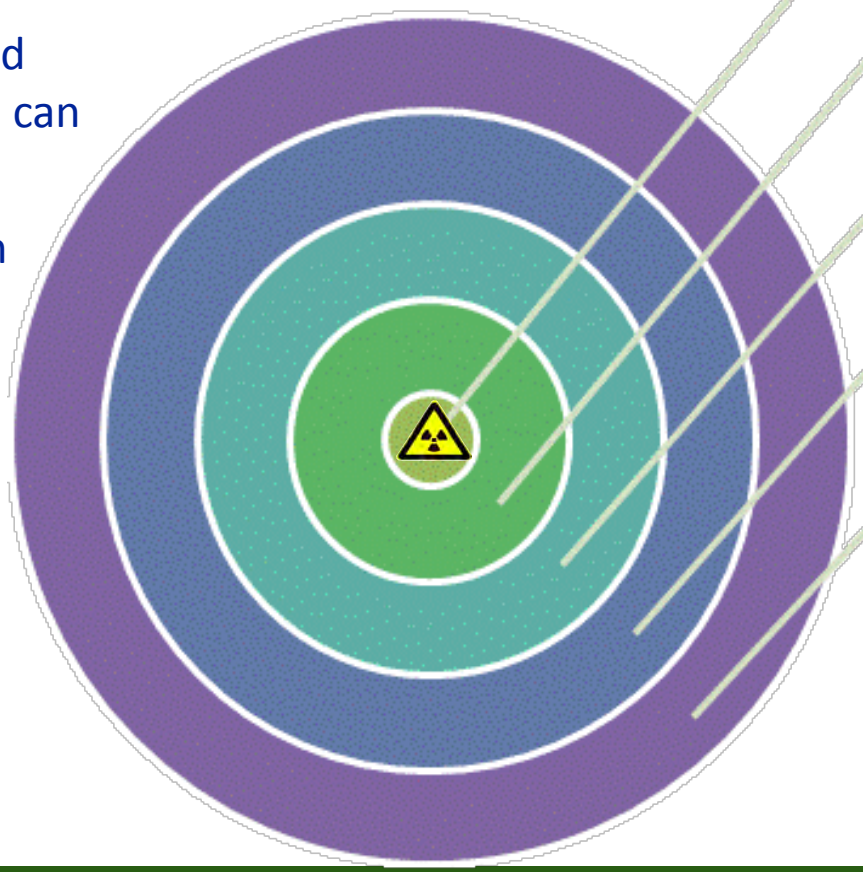
  (EIS-0359-SA-01 _EIS-0360-SA-01-2007).
- DOE has opted to defer finalization of this analyses or select disposal location(s), in light of the pending regulatory changes.
- DOE has closely monitored and participated in (i.e., provided comments) the NRC rulemaking efforts related to Part 61.
- DOE's schedule to complete the additional NEPA analysis and issue a Record of Decision remains uncertain.
- DOE is also pursuing potential sale of a portion of the DUF6 inventory for reuse.

Future Disposal Considerations

- Although near-surface disposal of DU poses challenges, it is considered to be a potentially viable option at a few sites with favorable conditions.
- Performance assessment and NEPA analyses to date support near surface disposal in favorable locations that provide for long-term protectiveness.
- Three locations currently considered as potential options
  - Nevada National Security Site, Energy*Solutions* (UT), and Waste Control Specialists (TX)
  - DOE oversees disposal at Nevada National Security Site (NNSS). DOE has safely disposed of DU waste forms in past, and the NNSS site specific performance assessment demonstrates that the uranium oxide waste form can safely be disposed at NNSS.
  - Energy*Solutions* and Waste Control Specialists are pursuing needed regulatory approvals from their regulators.

Basis for Near Surface Disposal
- Defense in Depth

- Integrated, total systems approach to safety
  - Site characteristics which provide geologic and hydrologic barriers
  - Facility design – Engineered barriers
  - Administrative & technical controls
- Federal ownership and buffer zones until site can be released
- Site-specific approach
- Conservative bias
- Commitment to maintenance and monitoring



Site Characteristics

Facility Siting, Design and Construction
- Engineered Barriers

Site Performance
- PA/CA
- Independent Reviews
- DAS

WAC
- Waste Characterization
- Generator Certification

Annual Operational Reviews
- Federal Ownership
- Institutional Controls
- Site Monitoring and Maintenance
- Record Management

Questions?

Updating 10 CFR Part 61

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INTERNATIONAL, LLC.

Regulatory Standards

- **Adequate protection**
- **Simple**
- **Clear**
- **Implementable**

Background

- **Commercial LLW disposal was stabilized under 10 CFR Part 61 (1982)**
  - **Performance Objectives were <u>primary</u> (Site Releases, Intrusion, Operations, Stability)**
  - **Technical Requirements were very prescriptive**
  - **NRC Agreement States have successfully implemented these requirements**
  - **Technical Analysis advancements and emerging Unique Waste Steams require updated standards**

Background

- **Part 61 is a combination of deterministic and Performance Based approaches**
  - **Deterministic aspects are waste classifications (A,B, C, and greater than Class C)**
  - **Performance Objectives can be risk informed**
- **There are gaps in Part 61 that have been brought to forefront by current DU and blending issues**

Preliminary Thoughts

- **Updated Part 61 Should**
  - **Clearly Require SS-PA for <u>all</u> waste streams**
  - **Provide an intruder dose standard (500 mr/y)**
  - **Use modern ICRP methods**
  - **Set two tier standard**
    - **Address short lived waste for 1,000 years**
    - **Evaluate long lived waste out to peak dose or impact**

Preliminary Thoughts

- **Performance Objectives should continue to be <u>primary</u> standard**
  - **Proposed reference to 61.13 should be reconsidered**
- **Need quantitative metric for second tier performance period analysis**
  - **Minimize releases to the public would be difficult to implement**
  - **1 R should be considered**
- **Long-Term analysis proposed under 61.7 and 61.13 is too complicated**
  - **Site specific waste acceptance criteria (WAC) is sufficient**

Preliminary Thoughts

- **Performance Objectives should have highest level Agreement State compatibility requirement**
- **Existing sites should be grandfathered for any new provisions**
- **Point of Compliance (beyond buffer zone) is a key concept**
- **Site specific performance assessment WAC should resolve outdated classification tables gaps**

Comments on the Proposed Revisions to 10 CFR 61

Presented to the
Advisory Committee on Reactor Safeguards
Radiation Protection and Nuclear Materials Subcommittee

John Tauxe, PhD, PE

Paul Black, PhD

Neptune and Company, Inc.

Presentation Outline

- Site-Specific Performance Assessment
- Intruder Assessment
- Federal *vs.* Commercial Facilities
- Other Issues

Site-Specific PA

There is recognition (e.g. in the NRC revisions to 10 CFR 61) that site-specific PA is important in characterizing site performance.

NNSS Area 5 RWMS in Frenchman Flat

≠

ORNL SWSA 6 at White Oak Creek

Start by examining Features, Events, and Processes (FEPs).

Site-Specific FEPs

The foundation for defensible PAs

transpiration wind adsorption

weathering

groundwater

radioactivity

corrosion

earthquake bioturbation

tsunami

erosion

inundation

diffusion cliff retreat

Only some of these apply to a given site.

Site-Specific FEPSs

Exposure Scenarios should be included

farming

water well drilling

resident

basement construction

hunting

mining

drainfield construction

recreation

fishing

intrusion

oil/gas exploration

Again, only some of these apply to a given site.

Site-Specific Exposure Scenarios
help to discriminate site performance

site	on-site resident	well water supply and drilling	surface water supply	oil/gas well drilling	mining	farming	hunting	ranching	fishing	recreation
V	●	●	●			●	●		●	●
W		●					●			●
X							●	●		●
Y	●			●		●	●	●		●
Z	●	●				●	●	●		●

Presentation Outline

- Site-Specific Performance Assessment
- Intruder Assessment
- Federal *vs.* Commercial Facilities
- Other Issues

Intruder Assessment

We do not see the value in separating "inadvertent human intruders" (IHI) from other "members of the public" (MOPs) into a distinct Intruder Assessment.

The site-specific PA should evaluate all plausible receptors and exposure scenarios (and *not* implausible ones), whether they intrude into the waste or not.

Intruder scenarios must be site-specific, at any rate.

Intruder Issues

What makes an intruder?

This is not so clear.

Consider the situation where one person causes an event that later releases waste, but is not himself exposed.

A future person, while not occupying the site, is exposed to this waste.

Neither is the classic intruder.

This scenario falls through the cracks.

Presentation Outline

- Site-Specific Performance Assessment
- Intruder Assessment
- Federal *vs.* Commercial Facilities
- Other Issues

Federal *vs.* Commercial Facilities

There is no fundamental difference between radioactive waste facilities that are intended to be for commercial wastes from those for Federal wastes.

All such facilities should follow the same Performance Assessment methodology.

At Neptune, we have done our best to follow the same basic principles of PA for decision making at both DOE and commercial sites.

Presentation Outline

- Site-Specific Performance Assessment
- Intruder Assessment
- Federal *vs.* Commercial Facilities
- Other Issues

Other Issues in Proposed 10 CFR 61

- 10 CFR 61 suffers from vague and inconsistent language (e.g. protecting the "general population" and "any member of the public").
- Inadequate definitions of "person", "occupy", "radiation from the waste", "stability", etc.
- It seems that an assessment must be done in order to determine if an assessment must be done.
- Much language belongs in guidance.
- According to § 61.7(e)(3), Depleted Uranium is now a Class C waste. (That must be pointed out.)
- Environmental impacts are mentioned but not an ecological risk assessment. Why not do eco risk?
- Dose is still used as a proxy for risk.

How Long is Dose Relevant?

The uncertainty in human behaviors becomes exceedingly large in just a few hundred years. This limits the utility of “dose” as a performance metric to relatively short time frames.

The same goes for risk to humans.

What About Longer Time?

There may still be utility in longer period assessments, even if dose (or risk) is too uncertain to be useful.

Site stability could be a useful discriminator.

- Some sites are inherently unstable.
- Others are inherently stable.

The Problem of Deep Time

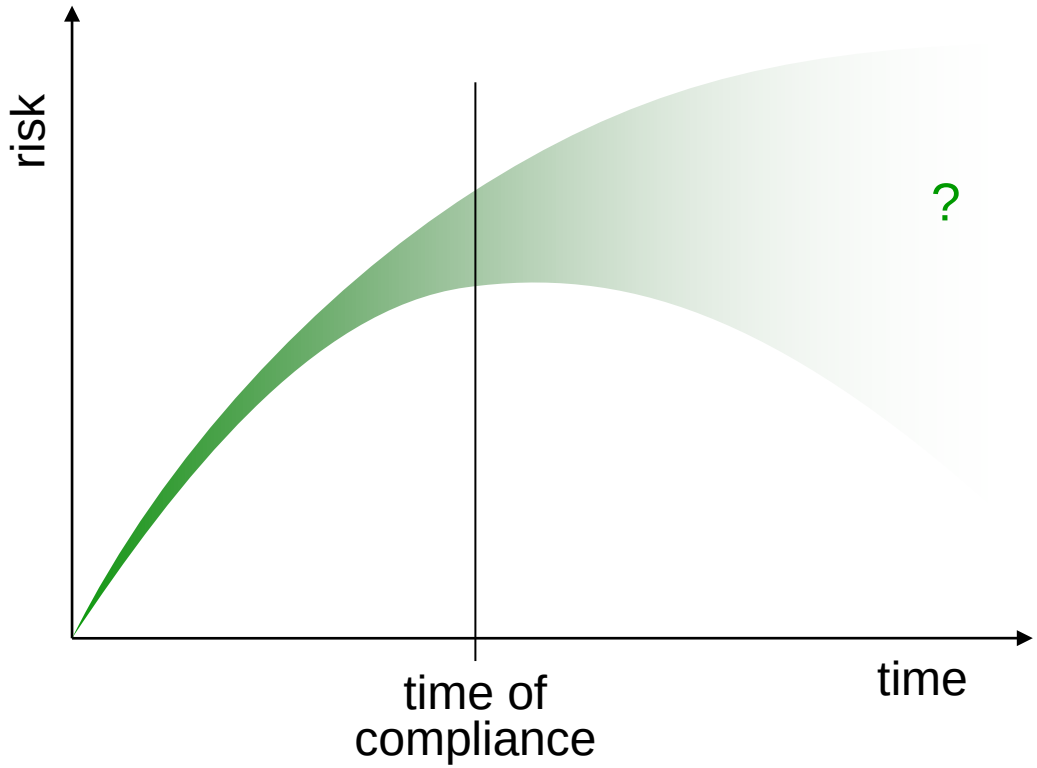
PAs are challenged to provide estimates of dose out into exceedingly long time frames.

(DU example: Secular equilibrium is not reached for over 2 million yr, and after that, the increased risk remains effectively forever.)

After 100,000 years...

- Los Alamos mesas will have collapsed
- Lake Bonneville will have returned to Utah
- West Valley will be under an ice sheet
- Oak Ridge valleys will have been further eroded
- Savannah River may have incised the SRS
- Hanford may have experienced another mega flood
- Southern Nevada may have seen volcanoes again

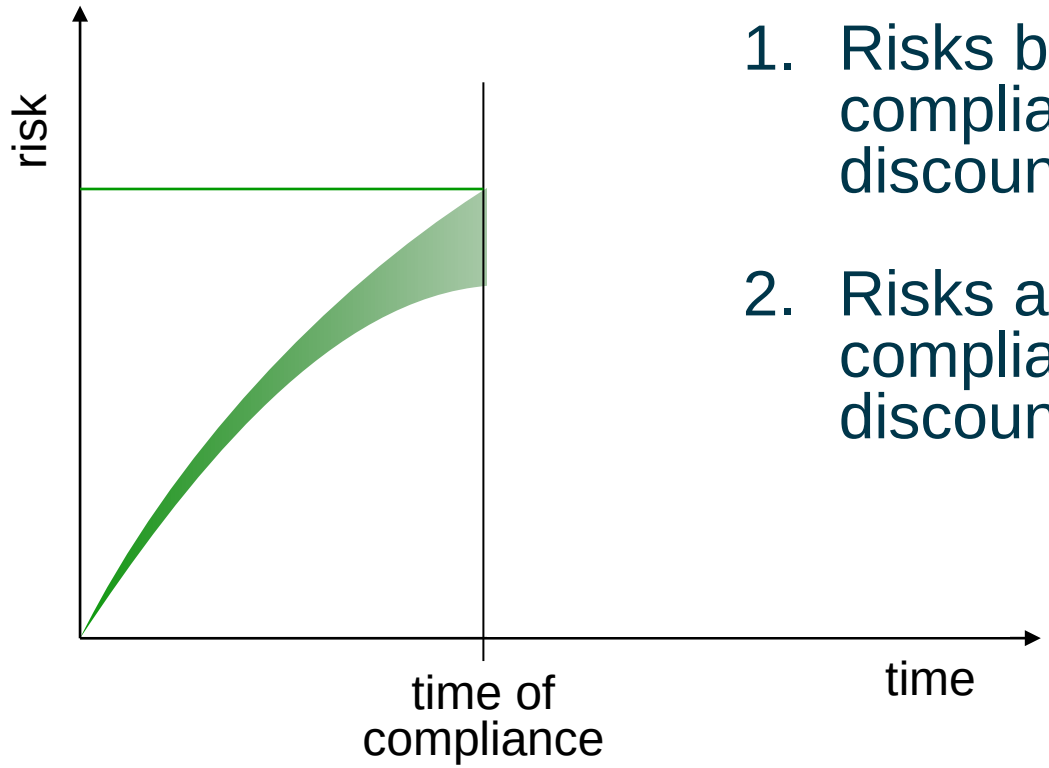
Consideration of Future Risk



uncertainties increase with time

How does a decision maker choose when higher risks in the future have high uncertainty?

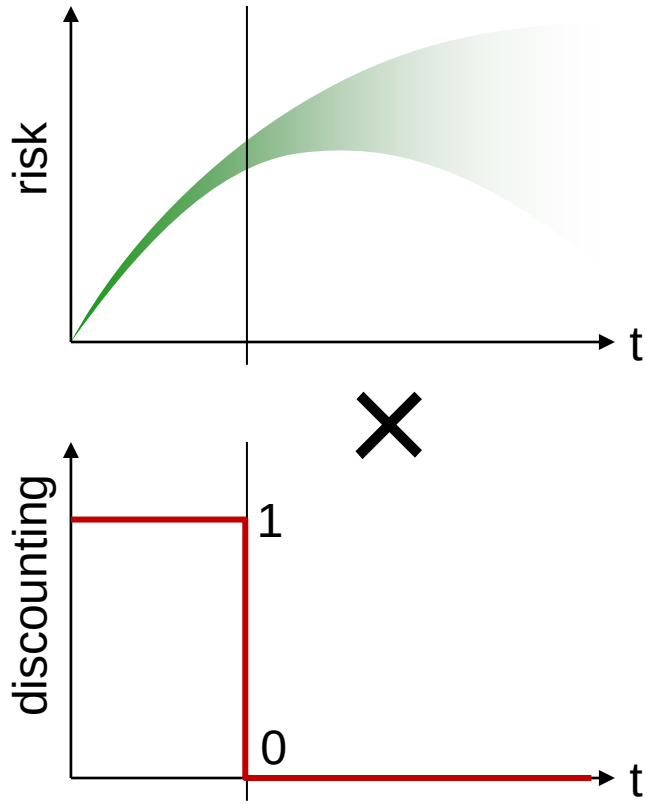
Imposing a Time of Compliance



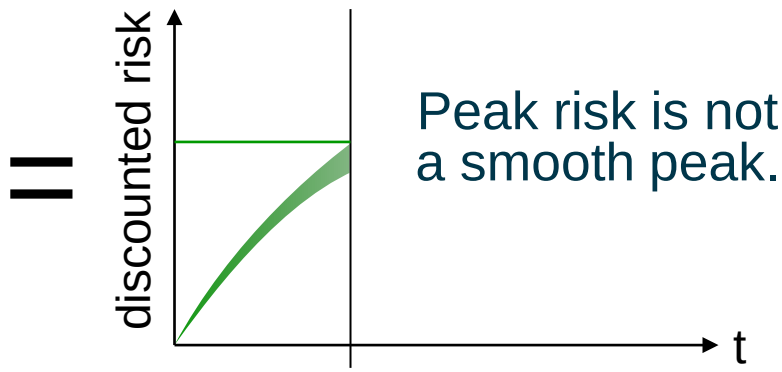
1. Risks before the time of compliance are not discounted at all.
2. Risks after the time of compliance are completely discounted.

The full burden is on the current generation. This ignores uncertainty in future decision alternatives (e.g. technology).

Traditional Implied Discounting



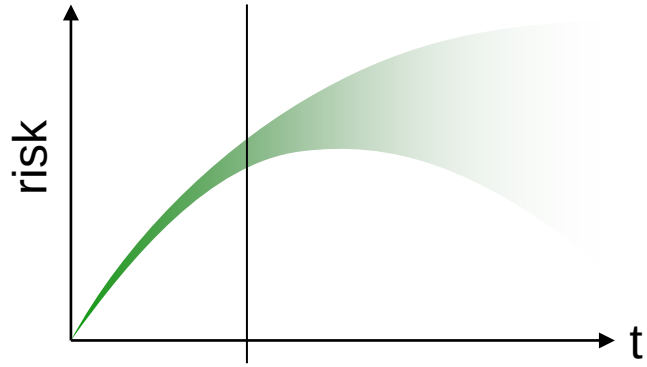
This discounted risk is implied.



Peak risk is not a smooth peak.

The traditional approach implies no discounting (0) up to $t_{compliance}$ and complete (1) thereafter.

A Proposal for Future Discounting



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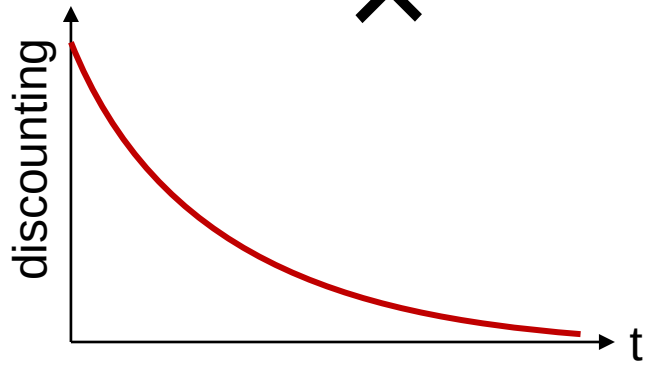

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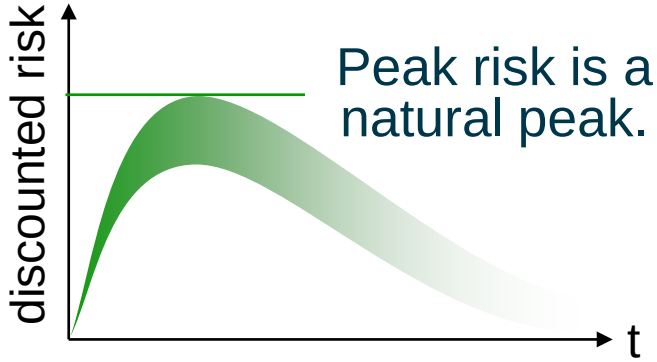

Discounted risk is a function of the discount function.

Peak risk is a natural peak.

Another approach is to discount according to a site-specific, stakeholder-determined discount function.

More 10 CFR 61 Comments

For Neptune and Company's more thorough examination of issues in revisions to 10 CFR 61, please refer to our formal submittal of comments to the NRC, dated 7 January 2013.

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7 January 2013

minor edits, 1 December 2013

Annette Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
Rulemakings and Adjudications Staff

Subject: Comments on November 2012 Preliminary Rule Language for Proposed Revisions to Low-Level Waste Disposal Requirements (10 CFR Part 61)

Reference: Docket ID NRC–2011–0012

Dear Ms. Vietti-Cook:

Neptune and Company, Inc. (Neptune) is submitting the attached comments in response to the notice published in the 7 Dec 2012 Federal Register Vol. 77, No. 236, pp. 72997 *et seq*. We appreciate the opportunity to comment on the proposed language for 10 CFR 61.

We believe that the revision to 10 CFR 61 is a worthwhile endeavor that will lead to radioactive waste disposal decisions that are more beneficial for and protective of current and future generations.

Thank you again for this opportunity to comment. Questions regarding these comments may be directed to Dr. Paul Black at (866) 245-5040 ext 1 (pblack@neptuneinc.org), or Dr. John Tauxe at (505) 662-0707 ext 15 (jtauxe@neptuneinc.org).

Sincerely,

John Tauxe, P.E., Ph.D. and Paul Black, Ph.D.
Neptune and Company, Inc.

Comments on November 2012 Preliminary Rule Language for Proposed Revisions to Low-Level Waste Disposal Requirements (10 CFR Part 61)

Neptune and Company, Inc. (Neptune) appreciates the opportunity to provide comments on the U.S. Nuclear Regulatory Commission (NRC) proposed language for Code of Federal Regulations Title 10 Part 61. We believe the NRC efforts are timely, and that revisions to 10 CFR 61 are sorely needed.

The document entitled *November 2012 Preliminary Rule Language for Proposed Revisions to Low-Level Waste Disposal Requirements (10 CFR Part 61)* was provided for comment, and it contains sections of proposed revisions to the text of Part 61. Revisions are indicated in the document by the use of underlined text, and changed or omitted text is not identified. Also not identified are sections of the rule that are not proposed for revision, but are nevertheless proposed for the rule, by implication. The proposed revisions have implications for most of the rule, and so we consider the entire rule to be "proposed". Some of the following comments therefore are oriented toward parts of 10 CFR 61 that are not discussed in the document provided, but are nevertheless in need of revision.

The comments below are organized into a General Comments section, with application to the overall rule, and a Specific Comments section, with comments following the same order as they appear in the proposed revisions document.

General Comments

Much of the existing language in 10 CFR 61 suffers from being overly vague, and in many cases the proposed language does little to remedy this shortcoming.

Neptune had hoped for greater changes to the regulation. We were hoping that the revised regulation would open the door to performing a proper risk assessment, bringing in site-specific factors, and not tying the performance assessment to conservative unlikely MOP or IHI scenarios. Perhaps the proposed revisions accomplish part of this by providing options for site-specific analyses, but it is not clear that the concepts of MOP and IHI may be abandoned in favor of site-specific exposure scenarios.

The language of Part 61 could still use tightening up. A significant example of this is in the definition of the performance objectives, which apply in the title of § 61.41 to the "general population", but in the text of the same subsection refer to "any member of the public". These terms are quite different from each other, but are sprinkled throughout Part 61 as if they were equivalent. Protection of the "general population" implies that a population risk assessment should be developed, and protection of "any member of the public" implies protection of anyone, including the most vulnerable members of the public. This is different from protecting an "average" member of the public, such as the "reference man" that is commonly used. It is good that the regulation strives to protect both the general population and any member of the public,

and this can be done in a site-specific performance assessment, but the language needs to be cleaned up so that the two concepts are made to be clear and distinct. While the dose to any member of the public can be assessed against the performance objective of an annual maximum of 0.25 mSv, the population dose must be expressed differently. A new section is needed to do this, describing how a population dose is to be evaluated as a summed dose to a large number of individuals—all those receptors that will be exposed to radioactivity from the waste over the entire period of performance. The population dose thus calculated would be expressed in terms of total Sieverts (or rem), and this is to be kept as low as reasonably achievable (ALARA). There is no predetermined value that is acceptable for a total population dose—there is no equivalent to the 0.25 mSv maximum annual dose for individuals. Note also that the term "general population" needs to be better defined in terms of the potentially affected population. The "general population" is too vague. This is another place where changing focus to a risk assessment based on reasonable site-specific exposure/receptor scenarios would be beneficial.

The specific references to a scoping analysis (such as a features, events, and processes, or FEPs analysis) is encouraging. This should be a starting point for a site-specific performance assessment, and mentioning this in the regulation is appropriate. It could benefit from a scoping of human exposure scenarios as well, however, since these are also potentially significant in evaluating compliance with performance objectives. The regulation should not get into specifics, however, as these will vary so much from site to site. Examples of specific features, events, processes, and exposure scenarios (FEPSs) to include should be left to guidance.

If regulations are sufficiently vague or obfuscating, then they can open the door to wider interpretation, so compliance (and optimization) can be demonstrated as long as the performance assessment can be shown to fit the regulation in some reasonable form, and so long as it is demonstrated to be defensible. However, this could be achieved with a simpler regulation that requires a proper risk assessment and provides performance objectives for evaluation of compliance.

As is stands, the current regulation is very difficult to communicate, and consequently, current performance assessments are very difficult to communicate. They have very little basis in perceived reality. What is needed is to replace the concepts of a "member of the public" (MOP) and "inadvertent human intruder" (IHI) with site-specific receptor exposure scenarios and risk assessment. The proposed changes in language still include inconsistencies in the promotion of site-specific analyses.

The current form of CFR 61 was developed over 40 years ago, before the advent of modern computer technology. Because of the rapid change in technology and consequent modeling capabilities, there is a need to move beyond the methods and approaches that underlie the current regulation. The proposed revisions do not accomplish this. They are a small step that, in some ways, seems to allow site-specific analyses to be performed, but is otherwise still tied to and adversely affected by methods and approaches that are out of date. The opportunity to revise regulations does not come along very often. It is important, therefore, not to miss this opportunity, but the current revision does largely miss this opportunity.

Other items relevant to radioactive waste disposal under the purview of the NRC include the effects of the disposals on the environment. Since NRC is tasked with "protecting people and the environment", one might expect that the analyses required in 10 CFR 61 would include ecological risk assessment as well as for human health. Also, in the analyses of long term effects, after the period of performance (currently suggested to be 10,000 years) there loom the inescapable effects of climate change. While prescribing methodologies for taking climate change into account is beyond the scope of regulation (more appropriately falling into the realm of guidance), the fact that climate change must be accounted for in these "deep time" assessments should be touched on somewhere in Part 61.

The proposed changes to Part 61 are marginal, with the primary issues being to accommodate disposal of depleted uranium (DU), to allow site-specific analyses to be performed, and to update the dose conversion factors (DCFs) to current methodology. The door is opened, but there could have been much more done to advance protection of people and the environment.

Specific Comments

§ 61.2 Definitions.

Several terms are used in the existing and the proposed rule language that require definition in this section. These are

- member of the public
- general population
- reasonable assurance
- unacceptable risk
- disposal facility
- disposal site
- disposal unit
- low-activity waste
- high-activity waste
- radiation from the waste

The following existing definitions are proposed for revision, with specific comments following each. We note, again, that if a proper risk assessment is applied, then some of these terms are unnecessary, and the regulation could be simplified and brought in line with modern risk assessment practices. We regard this as a serious flaw in the proposed revision.

Proposed definition:

Inadvertent Intruder means a person who might occupy the disposal site after closure and engage in normal activities, such as agriculture, dwelling construction, resource exploration or exploitation (e.g., well drilling) or other reasonably foreseeable pursuits that might unknowingly expose the person to radiation from the waste.

Comments:

We think the distinction between an inadvertent intruder and any other member of the public should be dissolved. It is a completely unhelpful distinction that obfuscates a proper risk assessment. It is difficult to understand how, on the one hand, the revised regulation is meant to convey the need for a "risk informed" analysis, and at the same time require an evaluation of a default or stylized inadvertent human intruder. We think the concept of an inadvertent human intruder should be removed from the regulation, and the risk informed process should, instead, be supported by proper risk assessment to the general population on the basis of the development of reasonable site-specific exposure scenarios. We presume that such a change has not been made because of the tables that exist for intruder analysis. It is unfortunate that this was considered a constraint too powerful to overcome.

Further, use of the word "person" (twice) becomes immediately problematic when the definition of "person" is considered:

> *Person* means (1) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency other than the Commission or the Department of Energy (except that the Department of Energy is considered a person within the meaning of the regulations in this part to the extent that its facilities and activities are subject to the licensing and related regulatory authority of the Commission pursuant to law), any State or any political subdivision of or any political entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing.

Given this definition of "person", it is hard to imagine that this is all to be considered in the definition of inadvertent intruder, or anyone receiving a dose. A clarification is in order, perhaps by substituting another word for "person".

What is the meaning of the word "occupy" in this context? Does it mean that someone must set up residence on the site, or is a temporary visitation of the site considered an occupation? If a recreational hunter, for example, crosses the site and is unknowingly exposed to waste, or radionuclides that migrated from the waste, is that considered an occupation? Is such a visitor considered an inadvertent intruder? The definition of "inadvertent intruder" remains vague. This also requires clarification. This confusion would disappear if a risk-based approach were to be taken.

Use of the terms "reasonably foreseeable" and "might" makes this definition quite vague in practice. Is it left up to the applicant to determine what constitutes "reasonable foreseeable pursuits", and what "might" means in this context? Is an inadvertent intruder one who "might occupy the disposal site", or one who actually "occupies the disposal site"? Our recommendation is that the "foreseeable future" should be defined site-specifically by the local (potentially affected) population and by considering economic arguments. This is how society operates in practice in our everyday lives.

Finally, the phrase "radiation from the waste" is problematic in the context of inadvertent intrusion. Does this mean radiation only from the waste that is still in place as it was disposed?

What if the waste has migrated, or what if the radionuclides that originated in the waste have migrated to a location where the intruder might come into contact with it, or at least be irradiated by it? Consider that radionuclides from the waste may have migrated to the ground surface, or to surface waters, and that such radionuclides would irradiate anyone who might traverse the area. Is such an individual to be considered an inadvertent intruder?

Ultimately, the distinction between an inadvertent intruder and other members of the public, or the general population, becomes blurred. We recommend that the concept of the inadvertent intruder be abandoned, replaced by a performance assessment that assesses risks to populations of individuals that are expected to occur at any given site. Such an approach would be far easier to communicate to the stakeholders, which is very important to gain approval and hence be able to open a disposal facility.

Proposed definition:

Intruder assessment is an analysis that (1) assumes an inadvertent intruder occupies the site or contacts the waste and engages in normal activities or other reasonably foreseeable pursuits that might unknowingly expose the person to radiation from the waste; (2) examines the capabilities of intruder barriers to inhibit an inadvertent intruder's contact with the waste or to limit the inadvertent intruder's exposure to radiation; and (3) estimates an inadvertent intruder's potential annual dose, considering associated uncertainties.

Comments:

Given our views on the concept of the inadvertent intruder (above) it will be no surprise that we feel that the definition of an "intruder assessment" as distinct from a "performance assessment" is not needed. If a performance assessment examines all site-specific exposure scenarios, then it will naturally account for all receptors as part of the general population, be they "intruders" or "members of the public". This is overcomplicating what should be a straightforward problem.

Proposed definition:

Long-lived waste means (1) waste where more than ten percent of the initial radioactivity remains after 10,000 years (e.g. long-lived parent), ...

Comments:

If applied to a single radionuclide with no progeny, this would correspond to a half-life of just over 3000 yr. That calculation is useful just to get an idea of what is considered long-lived by this definition. However, perhaps the intent is to account for a "waste" that may contain quite a lot of various radionuclides in various concentrations, in any combination. It is difficult to assess the reasonableness of this definition without examining sample recipes of waste. We trust that this has been done, and that NRC is comfortable with the implications of this definition.

Proposed definition:

Performance period is the time after the compliance period for disposal facilities during which the performance objectives specified in §§ 61.41(b) and 61.42(b) must be met.

Comments:

A performance period is not necessary if a proper risk analysis, including an economic analysis, is performed. However, if such a concept is to be included, then it needs greater definition. There is also an implication in this definition that dose will be tied to performance objectives even within this period. This is completely unnecessary. This begs the question of how "foreseeable future" is defined and for what purpose. It might be an interesting exercise to evaluate concentrations beyond the Compliance Period, but a dose comparison should not be performed. Given the rapid changes that are likely to continue in society and technology, the assumptions concerning characteristic of humans that far into the future cannot be defended.

Proposed definition:

Compliance period is the time during which compliance with the performance objectives specified in § 61.41, § 61.42 and § 61.44 must be demonstrated. This period ends 10,000 years after closure of the disposal facility

Note that the same is the case for the Compliance Period. A proper economic or decision analysis performed under ALARA would not require specification of a Compliance Period. However, if a Compliance Period is to be used as an anchor in this way, then a shorter time frame than 10000 yr, for example, 1000 yr, likely corresponds better to the idea of a "foreseeable future".

Proposed definition:

Site closure and stabilization means those actions that are taken upon completion of operations that prepare the disposal site for custodial care and that assure that the disposal site will remain stable and will not need ongoing active maintenance.

Comments:

It is not clear how such assurance can be provided. The language should be softened to explain the true intent. It is not possible to guarantee (assure) that stability will be maintained and that ongoing active maintenance will not be needed. Inserting the word "reasonably" in front of "assure" would at least make this consistent with other language in the rule.

Proposed definition:

Stability means structural stability.

Comments:

This definition is self-referential, and not particularly useful, even though we realize that the proposed revision is simply to correct a spelling error. The definition begs for discussion. What is the issue, actually? Is it exposure of the waste that is of concern? What about structural changes that do not release waste? What if waste is exposed to the environment through a structural failure but no one is exposed, and there is no dose or risk? Is the concern about stability simply for stability's sake?

This issue is raised again in 61.7(e) below, which further defines stability as minimizing contact with water (not really a structural stability issue), and also states that stability "isn't necessary from a health and safety standpoint for most waste..." Well, if it is not necessary, what is the need for stability?

Since the regulation is supposed to support risk-informed decision making, it seems that the subject of site stability should also be framed in terms of risk. The basic definition in §§ 61.44 indicates that the intent is to "eliminate to the extent practicable the need for ongoing maintenance of the disposal site following closure, so that only surveillance, monitoring, or minor custodial care are needed". This, by itself, is a far better definition of site stability. Although it would be better again to regulate such that measures of site stability correspond to risk (dose).

§ 61.7 Concepts.

Proposed language:

§ 61.7(a) The disposal facility. [The contents of (1) and (2) are not reproduced here.]

Comments:

Sections 61.7(a)(1) and (2) clearly define the terms "disposal facility", "disposal site", and "disposal unit", but the use of these terms in the entire Part 61 seems to be inconsistent at times. Inconsistencies are identified in the comments below as they are identified. The entire text should be carefully reviewed to assure consistency in the use of these terms.

Proposed text:

§ 61.7(a)(2) ... In choosing a disposal site, site characteristics should be considered in terms of the indefinite future, take into account the radiological characteristics of the waste, and be evaluated for at least a 500-year timeframe.

Comments:

It is not clear what this means. How does this relate to the concept of a Compliance Period or a Performance Period? If a performance assessment is to estimate doses or risks for 10,000 years into the future, why would site characteristics be evaluated for only a 500-yr time frame?

§ 61.7(b) Performance objectives. Disposal of radioactive waste in land disposal facilities has the following safety objectives: protection of the general population from releases of radioactivity, protection of inadvertent intruders, protection of individuals during operations, and ensuring stability of the site after closure. Achieving these objectives depends upon many factors including the design of the land disposal facility, operational procedures, characteristics of the environment surrounding the land disposal facility, and the radioactive waste acceptable for disposal.

Comments:

We think that the concept of an inadvertent intruder should be removed, and the performance assessments should be aimed at doing a reasonable risk assessment. Protection of individuals during operations is handled through worker safety, and site stability can be folded into the risk assessment. Presumably a site is would be judged sufficiently stable if the risks are low enough, or is there another reasonable approach to evaluating site stability?

Protection of the "general population" is called for, but, as pointed out above, this is different from protection of "any member of the public", which is required in § 61.41. Again, a clarification of terms is needed. This seems to imply that the performance assessment should perform a population risk assessment, as opposed to (or perhaps in addition to) an assessment of dose to an individual. This is in concordance with the title of § 61.41: Protection of the general population from releases of radioactivity. That title also seems to suggest that a population dose assessment is in order. As discussed in the comments below for that section, however, this is in conflict with the text within that section, which mentions dose to "any member of the public". The point of this comment is that the "general population" is in practice quite different from "any member of the public". Since § 61.7 discusses concepts, it would be good to clarify the intent of the rule here as well as in § 61.41.

Note that we support the need to perform a population risk (dose) assessment to support decision making, whether performed using the principles of ALARA or otherwise. Ultimately, siting of disposal sites was done by considering population risks.

The proposed text also neglects to identify the significance of human behavior and demographics in the assessment of risk to the general population and inadvertent intruders. These are among the "many factors" that should be mentioned specifically.

Proposed text:

§ 61.7(c)(1) Demonstrating compliance with the performance objectives requires assessments of the site-specific factors including engineering design, operational practices, site characteristics, and radioactive waste acceptable for disposal. ...

Comments:

Demonstrating compliance requires assessment of site-specific factors. How is that reconciled with the evaluation of an inadvertent intruder who represents an exposure scenario that is not reasonable at a particular site? This clause is a step in the right direction, but other parts of the regulation need to catch up. An alternative is to leave it sufficiently vague that the applicant will address sufficiency of the analysis, so long as the analysis can be shown to fit the regulation in some reasonable form (i.e., demonstrate that the analysis is defensible).

Proposed text:

§ 61.7(c)(2) A performance assessment is an analysis that is required to demonstrate protection of the general population from releases of radioactivity.

Comments:

In the following sentences of this section, the term “site” is used twice, as is the term “facility”. Now that these terms have been carefully defined, care should be taken that they are used intentionally in this section. All occurrences in this section should probably use “site”.

Again, the term “general population” is used when it may not be what is actually intended.

The phrase “...that is required to demonstrate...” could be shortened to simply “...that demonstrates...”

Proposed text:

§ 61.7(c)(3) It is possible, but unlikely, that persons might occupy the site and engage in normal pursuits without knowing that they were receiving radiation exposure.

Comments:

This sentence has several problems. First, why is this considered “unlikely”? The likelihood of someone occupying the site (again, “person” is probably misused here, and “occupying” still requires definition) is quite site-specific. The word “unlikely”, used here with no quantification, is rather meaningless. Some waste disposal sites are much more likely to be encountered by humans than others, and some less likely. What is “unlikely” is completely a relative term. The words “but unlikely” should simply be removed, since for all sites future visitation by humans is certainly possible. That said, the idea that receptors have a likelihood of visiting (or occupying) the site is important, and should in fact become part of the site-specific performance assessment. The fact that remote or harsh sites are less likely to be occupied is an important factor. The likelihood of occurrence of a visitation or occupation scenario is less than unity, and this should be taken into account. This occurs naturally if a performance assessment considers the comings and goings of various types of receptors with various attributes and behaviors (the “normal pursuits”. The risk to each individual can thereby be assessed, as can the risk to the entire population of individuals. Of course, these individuals are projected into the future based on current societal conditions, and it would be good to clarify that is how a PA must be conducted – that is, project current conditions/knowledge into the foreseeable future.

In this sentence, persons (labeled “inadvertent intruders”) would not know “that they were receiving radiation exposure”. But at the end of the paragraph for (3), mention is made of “some form of intruder barrier that is intended to prevent contact with the waste.” The problem here is that “receiving radiation exposure” is different from “contact with the waste”. A future human could be some distance from the waste, at least from where it was originally placed, and still be exposed to radiation, while being exposed to radionuclides that have migrated away from the waste, or the progeny of those radionuclides. This begs the question of what is meant by “waste”. Is it the waste form itself as disposed, or is it the radionuclides that were at one time part of the waste? This lack of firm definition plagues the bulk of Part 61. These details may seem trivial to the casual reader, but they are critical to the analyst who must develop assessments that address the performance objectives in detail.

And, we again suggest removing inadvertent intrusion as a concept, and replacing with the need for a site-specific risk assessment, which should include human intrusion into the waste if that is

part of reasonable site-specific exposure scenarios. This would simply mean removing §§ 61.42 and revising §§ 61.41 towards a risk assessment.

Proposed text:

§ 61.7(c)(4) Demonstrating protection of inadvertent intruders requires an assessment of potential radiological exposures should an inadvertent intruder occupy the disposal facility following a loss of institutional controls after closure.

Comments:

This sentence is essentially tautological, since an inadvertent intruder, by definition, occupies the disposal site (not "the disposal facility", mind you) after the loss of institutional control, which also by definition occurs after closure. Note that institutional control applies to the site, but not to the facility.

Proposed text:

§ 61.7(c)(4) [continued] An intruder assessment can employ a similar methodology to that used for a performance assessment, but the intruder assessment must assume that an inadvertent intruder occupies the disposal site following a loss of institutional controls after closure, and engages in activities that unknowingly expose the intruder to radiation from the waste.

Comments:

This introduces yet another spin on the concept of future humans encountering radiation. Here, the intruder might unknowingly be exposed to "radiation from the waste". This continues to beg the question of what the waste is, where the radiation might be. Do radionuclides that have migrated away from the waste into the environment constitute "radiation from the waste"?

This also suggests that an intruder assessment is a different analysis from a performance assessment. This is indeed a new concept, as intruder analysis has always been part of performance assessments in the past. Is the applicant expected to develop separate analyses, and even separate documents, for an intruder assessment and a performance assessment?

This language also appears to require that an intruder assessment be performed at a site as if the scenario will happen. That is, a probability of 1. Is this the intent? If so, how is this reconcilable with the requirement to evaluate site-specific factors in § 61.7(c)(1), and the implication that there is a likelihood to occupation hinted at in § 61.7(c)(3)?

We recommend that this proposed text be removed.

Proposed text:

§ 61.7(c)(5) Waste with significant concentrations and quantities of long-lived radionuclides may require special processing, design, or site conditions for disposal. Demonstrating protection of the general population from releases of radioactivity and inadvertent intruders for [?] the disposal of this waste requires an assessment of long-term impacts.

Comments:

This is an example of vague language that is not helpful in a regulation. What does “significant concentration and quantities” mean? How is the significance evaluated except by performing an assessment of long-term impacts? It seems that the assessment must be done in order to determine if the assessment must be done. “Concentration” could mean concentration in the waste form, or in environmental media such as water, air, soil, or rock. “Quantities” could refer to activities, masses, or volumes. Perhaps what is really meant is that for any disposed waste, an assessment should be done in order to determine the long-term (and indeed short-term) impacts, and special processing, design, or site conditions should be modified in order to mitigate unacceptable impacts. If the assessment is to be performed anyway, then just say that the assessment must be performed.

The rest of § 61.7(c)(5) continues in this vein, discussing “limited quantities of long-lived waste”. It says that “...conditions should be evaluated on a case-by-case basis to determine whether analyses beyond the compliance period would be required.” It seems to say than an evaluation should be done in order to determine if an analysis should be done. Again, just rely on the performance assessment for the analysis and be done with it, and require that the performance assessment actually conduct a risk assessment.

And, again we have yet another variation in wording regarding what we are protecting against. In this case, we are to protect the general population from “releases of radioactivity.” Is the general population to be protected only from radioactivity that is released from the waste? What happens in cases where the general population comes into direct contact with the waste (which can happen in certain scenarios)? And further, the distinction between the “general population” and an “inadvertent intruder” becomes blurred.

Proposed text:

§ 61.7(d) Waste acceptance. Demonstrating compliance with the performance objectives also requires a determination of criteria for the acceptance of waste. The criteria can be determined from the results of the site-specific analyses that demonstrate compliance with the performance objectives for any land disposal facility or, for a near-surface disposal facility, the waste classification requirements of Subpart D of this part.

Comments:

The need for a site-specific assessment is indicated for specification of waste acceptance criteria (WAC). This continues the confusion in the document that sometimes default (intruder) scenarios are required, and sometimes site-specific analyses are required. This can all be cleaned up by simply requiring that a risk assessment be performed with associated Performance Objectives. (We presume the difficulty with such an approach is the waste classification tables and associated derivation that exist in the current regulation, and that apparently need to be maintained at this time. If that is the case, then the clean up that is needed can refer to intruders, for example, for specific evaluation but on a site-specific basis.)

Proposed text:

§ 61.7(e)(1) A cornerstone of the waste classification system is stability—stability of the waste and the disposal site—which minimizes the access of water to waste that has been emplaced and covered. Limiting the access of water to the waste minimizes the migration of radionuclides, which may avoid the need for long-term active maintenance and reduces the potential for release of radioactivity into the environment. While stability is desirable, it isn't necessary from a health and safety standpoint for most waste because the waste doesn't contain sufficient radionuclides to be of concern.

Comments:

This seems contradictory, in saying that stability is both a cornerstone of the waste classification system and that stability is not necessary. It also extends the original definition of "stability" (in 61.2, which says that stability means "structural stability") to claim that stability minimizes the access of water to waste. This seems to be confusing different concepts. Structural stability means that the site will not collapse, as in subside or erode—that it will retain its shape and strength. That really has little to do with keeping water out. Further, this focus on water belies a humid site bias—that water is universally the most significant process for contaminant transport in radioactive waste disposal. There are sites where water has a minor or even insignificant role to play—where, for example, biotically-induced transport or gas phase diffusion is of far greater significance than waterborne transport.

Structural stability has another unspoken but much more significant role: It keeps the waste from being exposed to the environment and especially from being directly exposed to human receptors. That function of stability is not even mentioned in this section.

It is somewhat jarring to read that "most waste ... doesn't contain sufficient radionuclides to be of concern." If that is the case, when what is all the fuss about in creating regulations for it in the first place? Perhaps this is just a confusion generated by poor presentation of context, however, as this section eventually seems to identify the waste under discussion as Class A waste, in the next part.

Why is site stability an issue? If it's tied to potential risk (dose), then that could make sense. But requiring stability with no metrics does not make sense, and the metrics should be dose or perhaps long term costs. The language in §§ 61.44 already provides the necessary impetus for framing site stability in the context of risk (dose): "The disposal facility must be sited, designed, used, operated, and closed to achieve long-term stability of the disposal site and to eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure so that only surveillance, monitoring, or minor custodial care are required."

Proposed text:

§ 61.7(e)(1) [continued] This low-activity waste (e.g. ordinary trash-type waste) tends to be unstable, which can become a problem with high activity waste of long-lived low-activity waste. If lower activity waste is mixed with the higher activity waste, the deterioration of unstable waste could lead to the failure of the system. The failure of the system could permit water to penetrate the disposal unit, which may cause problems with higher activity waste..

Comments:

This further confuses concepts. The real concern seems to be stability, which again is couched in terms of water even though it should not be assumed that water is the principal mode of contaminant transport at any given site. But, water aside, stability of the system (meaning the site, one presumes) may be compromised by unstable waste. Fair enough—so the operator should not mix structurally unstable waste with structurally stable waste. Activity has nothing to do with it, except that apparently we are not to be overly concerned with unstable low-activity waste, since it is not "of concern". If the classification of waste is driven by stability, which this section seems to imply, then let it be defined by stability, and not by concentration of specific radionuclides. Having classification tables based on radionuclide concentrations does not make sense if the real driving factor is structural stability of the wastes. Also, a properly formed risk assessment would take care of all of this, since it should factor in stability of waste.

Isn't "ordinary trash-type waste" what goes in a municipal landfill? This term is undefined and potentially misleading.

The language in this section goes on to discuss unstable Class A waste as opposed to stable Class A waste, but makes no formal definitions of what "stability" means. § 61.2 defines stability only as "structural stability", which is a pretty useless definition. Here, at least somewhat more of a definition is provided ""to maintain gross physical properties and identity [for] over 300 years." And, is this "stability" meant to apply to the waste form itself, or to the disposal unit (or perhaps even disposal site) as a whole?

In general, waste classification is an anachronism that needs to be abandoned at some point. The classification scheme is no longer necessary, now that site-specific risk assessments can be performed fairly routinely.

Proposed text:

§ 61.7(e)(1) [continued] The stability of long-lived waste may be more uncertain and require more robust technical evaluation of the processes that are unlikely to affect the ability of the disposal system to isolate short-lived waste.

Comments:

Again, are we concerned with the stability of the waste itself, or that of the disposal system (disposal unit or site)? What does stability of the waste imply here? Is this relative to migration potential? Again, lots of concepts not clearly separated in here.

Proposed text:

§ 61.7(e)(1) [continued] For long-lived waste and certain radionuclides prone to migration, a maximum disposal site inventory based on the characteristics of the disposal site may be established to limit potential exposure.

Comments:

This seems to imply the need for site-specific assessment again, but that is not made clear. It also ties site stability with risk for the first time (limit potential exposure). This idea should be expanded upon, and site stability as a concept should be tied to risk (dose).

Proposed text:

§ 61.7(e)(2) Institutional control of access to the site is required for up to 100 years. This permits the disposal of Class A and Class B waste without special provisions for intrusion protection, since these classes of waste contain types and quantities of radioisotopes that will decay during the 100-year period and will present an acceptable hazard to an intruder.

Comments:

If Class A and Class B wastes are so benign, one might ask rhetorically, then why is a performance assessment needed? It seems that this clause needs to be revised, especially since depleted uranium (DU) is currently (and apparently will continue to be, following these proposed revisions) considered a Class A waste. If Class A waste disposal is basically no more than a landfill, then why are all of these protections implied in this regulation being taken at great cost to the taxpayer? The regulation should be grossly simplified if this is the case.

Since DU is still defined as a Class A waste after all these revisions, it is not accurate to state that "these classes of waste contain types and quantities of radioisotopes [*sic*] that will decay during the 100-year period and will present an acceptable hazard to an intruder".

On an editorial note, the word "radioisotopes" should be replaced with "radionuclides" to maintain consistency with the rest of the rule and to be correct. Usage of "radioisotopes" should be restricted to discussions of actual isotopes (which by definition are all the same chemical element).

Proposed text:

§ 61.7(e)(3) Waste that will not decay to levels that present an acceptable hazard to an intruder within 100 years is designated as Class C waste. Class C waste must be stable and be disposed of at a greater depth than the other classes of waste so that subsequent surface activities by an intruder will not disturb the waste. Where site conditions prevent deeper disposal, intruder barriers such as concrete covers may be used. The effective life of these intruder barriers should be 500 years.

Comments:

The choice of 500 years for the effective life of a concrete barrier seems arbitrary. Concrete materials will often last much longer than this, but at any rate will last longer in some environments than others. As part of a site-specific performance assessment, it seems that a given site should take into consideration whatever local conditions dictate the effective life would be. In general, arid sites will enjoy longer effective life for cementitious materials than will humid sites, and this difference, like so many other site-specific differences, should be take into account in the performance assessment. Specifying that they should be effective for 500 years is just another example of subverting the goal of using site-specific information to support

a performance assessment. Perhaps this could be rephrased to “at least 500 years”.

If it is true that “waste that will not decay to levels that present an acceptable hazard to an intruder within 100 years is designated as Class C waste”, how is DU not a Class C waste? It decays to levels that are increasingly hazardous for over 2 million years. “Decay” does not imply a reduction in hazard.

It is also not clear why Class C waste must be disposed at greater depth. This statement is too general. A performance assessment should be performed, no matter the waste stream, to determine if a waste stream can be disposed in a given disposal configuration or engineered system. This also seems to presume that the pathway of interest is unvaryingly upwards. This might not be the case—for example, it is not clear that disposing deeper in a system that has potable groundwater at, say 5 meters below ground surface, would make sense.

Proposed text:

§ 61.7(e)(3) [continued]... Disposal of this waste will be evaluated on a case-by-case basis with the long-term analyses required in § 61.13(e).

Comments:

The language in this clause also implies that a performance assessment with a Compliance Period of 10,000 years is totally unnecessary for anything other than waste that is greater than Class C. How does this address the issue of DU, or large quantities of Tc-99 or I-129 for example (which are classified only by concentration, not quantity)? Why are the many details of this regulation necessary for anything other than greater than Class C waste given this clause? Again, all of this would be simplified if the regulation simply required a site-specific risk assessment. And, that would be easier to communicate.

Proposed text:

§ 61.7(e)(4) Regardless of the classification, some waste may require enhanced controls or limitations at a particular land disposal facility to provide reasonable assurance that the waste will not present an unacceptable risk over the compliance period. A performance assessment and an intruder assessment are used to identify these enhanced controls and limitations, which are site-and waste-specific. Enhanced controls or limitations could include additional limits on waste concentration or total activity, more robust intruder barriers (such as burial below 30 meters), and waste-specific stability requirements. These enhanced controls or limitations could mitigate the uncertainty associated with the evolutionary effects of the natural environment and the disposal facility performance over the compliance period.

Comments:

This newly introduced clause appears to have been written to accommodate DU. The same general concepts should be applied to all waste, however, since this clause is essentially requiring that a site-specific performance assessment be performed. The intruder assessment is also site-specific according to this language. Again, simplification of the regulation to require a properly formed probabilistic risk assessment would avoid the need for so many clauses, and

would facilitate better communication.

Proposed text:

§ 61.7(f)(3) During the period when the final site closure and stabilization activities are being carried out, the licensee is in a disposal site closure phase. Following that, for a period of five years, the licensee must remain at the disposal site for a period of post-closure observation and maintenance to assure that the disposal site is stable and ready for institutional control. The Commission may approve shorter or require longer periods if conditions warrant. At the end of this period, the licensee applies for a license transfer to the disposal site owner.

Comments:

In the context of a 10,000-year Compliance Period, it is not clear how it is helpful to have a five-year post-closure period. In general, the language in § 61.7(f) is very vague. Time frame is not well defined, and the nature and intent of the monitoring program is not well defined. It might be better to use some of the concepts from the DOE and from NUREG/CR-6948 on long-term PA maintenance, reduction in uncertainty, etc. to provide a technical framework and basis for long term monitoring and maintenance.

Proposed text:

§ 61.7(f)(4) After a finding of satisfactory disposal site closure, the Commission will transfer the license to the State or Federal government that owns the disposal site. If the Department of Energy is the Federal agency administering the land on behalf of the Federal government the license will be terminated because the Commission lacks regulatory authority over the Department for this activity. Under the conditions of the transferred license, the owner will carry out a program of monitoring to assure continued satisfactory disposal site performance, physical surveillance to restrict access to the site, and carry out minor custodial activities. During this period, productive uses of the land might be permitted if those uses do not affect the stability of the site and its ability to meet the performance objectives. At the end of the prescribed period of institutional control, the license will be terminated by the Commission.

Comments:

In this section, a “program of monitoring to assure continued satisfactory disposal site performance” is specifically mentioned. NRC would do well to broaden the concept of monitoring to encompass more than simply sampling for radionuclides that are headed for the fence line. As pointed out in NUREG/CR-6948, monitoring can and should include key elements of those processes that are known to be sensitive in the performance assessment in contributing to migration of radionuclides, and ultimately to receptor exposures. This could include, for example, monitoring for excessive water content in unsaturated materials, or a particularly dense population of deeply-rooted plants, if these are known to contribute to human exposures. This is addressed further in § 61.12(l).

If a decision analysis structure based on a properly formed risk assessment were required, then all decisions concerning disposal of radioactive waste could be optimized (disposal, closure) and long term monitoring programs could be designed with stopping rules. Otherwise, long-term

monitoring could continue indefinitely. As such, the performance assessment would become the decision document that it should be.

What happens to the site after the license has been "terminated by the Commission"? Is it assumed that the site poses no further risk to the public? How can the license ever be terminated in a case where risks continually grow in time, such as for the disposal of DU?

Proposed text:

§ 61.7(g) Implementation of dose methodology. The dose methodology used to demonstrate compliance with the performance objectives of this part shall be consistent with the dose methodology specified in the standards for radiation protection set forth in Part 20 of this chapter. After the effective date of these regulations, applicants and licenses may use updated factors, which have been issued by consensus scientific organizations and incorporated by the U.S. Environmental Protection Agency into Federal radiation guidance. Additionally, applicants and licensees may use the most current scientific models and methodologies (e.g., those accepted by the International Commission on Radiological Protection) appropriate for site-specific circumstances to calculate the dose. The weighting factors used in the calculation of the dose must be consistent with the methodology used to perform the calculation.

Comments:

Exactly how does the dose methodology relate to "reasonable assurance that the waste will not present an unacceptable risk"? Again, the terms "dose" and "risk" are assumed to be equivalent, and yet they are not. Risk, which we agree should be the proper metric for assessment and compliance, includes more than just dose. For example, many radioactive wastes contain uranium, or decay to lead, both of which present toxicity risks to exposed humans. Since they are part of the waste, either as disposed or through decay, the risk presented by the waste should include this toxicity. If NRC wishes to ignore toxicity risks presented by substances that are integral to the waste (e.g. uranium and lead) then it should restrict its language in Part 61 (and perhaps indeed in Title 10) to the language of dose, not risk. These are conceptually different.

This section also seems out of place here after the discussion on closure and monitoring under institutional control. It should be moved up, and everything else moved down.

§ 61.12 Specific Technical Information

Proposed text:

§ 61.12(a) A description of the natural and demographic disposal site characteristics as determined by disposal site selection and characterization activities. The description must include geologic, geotechnical, geochemical, geomorphological, hydrologic, meteorologic, climatologic, and biotic features of the disposal site and vicinity.

Comments:

The second sentence should also include the word "demographic". We also suggest adding this sentence: "These features, events, processes, and exposure scenarios must be related to their

respective roles in both migration of and human exposure to radionuclides originating in the disposed waste."

Proposed (existing) text:

§ 61.12(b) ... For near-surface disposal, the description must include those design features related to infiltration of water; integrity of covers for disposal units; structural stability of backfill, wastes, and covers; contact of wastes with standing water; disposal site drainage; ...

Comments:

Somewhere in there should also be added "occurrence and activity of biota;".

Proposed (existing) text:

§ 61.12(e) A description of codes and standards which the applicant has applied to the design and which will apply to construction of the land disposal facilities..

Comments:

Change first occurrence of "which" to "that". This particular grammatical error seems to have been proposed for revision on other parts of Part 61. This one should be changed, too.

Proposed (existing) text:

§ 61.12(g) A description of the disposal site closure plan, including those design features which are intended to facilitate disposal site closure and to eliminate the need for ongoing active maintenance.

Comments:

Is should be acknowledged that in some cases it is not possible to "eliminate the need for ongoing active maintenance" (e.g. for wastes that pose ever-increasing risks). NRC should acknowledge that there will be cases when sites require perpetual maintenance.

Also, change "which" to "that".

Proposed (existing) text:

§ 61.12(j) A description of the quality assurance program, tailored to LLW disposal, developed and applied by the applicant for the determination of natural disposal site characteristics and for quality assurance during the design, construction, operation, and closure of the land disposal facility and the receipt, handling, and emplacement of waste.

Comments:

Of equal importance is the quality assurance applied to the performance assessment (and intruder assessment, if this is to exist). Language should be added to this effect.

Proposed (existing) text:

§ 61.12(l) A description of the environmental monitoring program to provide data to evaluate potential health and environmental impacts and the plan for taking corrective measures if migration of radionuclides is indicated.

Comments:

As mentioned above in the discussion of § 61.7(f)(4), NUREG/CR-6948 demonstrates that monitoring can and should include key elements of those processes that are known to be sensitive in the performance assessment in contributing to migration of radionuclides, or more to the point, risks to future humans.

The change to § 61.12(l) that we would recommend, then, is to include more than simply monitoring for the migration of radionuclides. Once a sensitivity analysis of a probabilistic performance assessment is completed, the most significant features, events, processes, (FEPs) and exposure scenarios (FEPSs) in contaminant transport and human exposure can be identified, and it is these FEPSs that can be monitored (perhaps indirectly) to flag conditions that would lead to migration of radionuclides. It is best to mitigate migration pathways before migration has occurred. Language to this effect could be added to this section.

§ 61.13 Technical Analyses

Proposed text:

§ 61.13(a)(1) Consider only features, events, and processes that might affect demonstrating compliance with § 61.41(a).

Comments:

This language implies a scoping analysis, commonly known as a FEPs analysis. We would modify the language to include phenomena related to human exposures, as in “features, events, processes, and exposure scenarios”.

Proposed text:

§ 61.13(a)(2) Consider the likelihood of disruptive or other unlikely features, events, or processes for comparison with the limits set forth in § 61.41(a).

Comments:

We agree that consideration of likelihood of specific FEPS in scoping, as well as in site-specific performance assessment, is critical. The question is, how to evaluate the likelihood, and how to use it to screen out FEPs. For Yucca Mountain, for example, the likelihood was quantified to justify omission of some FEPs. The question remains here of what exactly is being required.

Again, we would suggest modifying the language to include “features, events, processes, and exposure scenarios”.

Consequence should also be considered. If the consequence is very small, then a high likelihood

(probability) will not matter to the overall performance. However, it also raises the issue of how to measure and evaluate consequence. This can only be done formally in the context of using performance assessment as a decision analysis.

Proposed text:

§ 61.13(a)(3) Provide a technical basis for either inclusion or exclusion of degradation, deterioration, or alteration processes (e.g., of the engineered barriers, waste form, site characteristics) and interactions between the disposal facility and site characteristics that might affect the facility's ability to meet the performance objective in § 61.41(a).

Comments:

It's not clear why this is being separated out, as this is a natural part of the FEPs scoping process. It could be eliminated because it is already covered by the FEPs process additions, and because Part 61 is meant to be regulation, not guidance. This entire section has become guidance it seems. The regulation would be better served by requiring a reasonable risk assessment (which should naturally include a scoping analysis) and providing performance objectives for comparison. This type of technical guidance should be removed.

If it is to remain, the word "naturalization" should be added after "degradation", since it does not have a negative connotation. As discussed extensively during the NRC Workshop on Engineered Barriers in August 2010, the change of engineered barriers (and other parts of the system) to move toward natural conditions is not always detrimental to performance, and in any case must be recognized.

Proposed text:

§ 61.13(a)(4) Provide a technical basis for models used in the performance assessment such as comparisons made with outputs of detailed process-level models or empirical observations (e.g., laboratory testing, field investigations, and natural analogs).

Comments:

This is a surprise as well. Why is this in the regulation? It is worthwhile, but not as part of the regulation. This is technical guidance.

It also would be good to specify what sorts of models are meant, here. It seems that it would mean computational models, but it could apply to conceptual models or mathematical models as well. Perhaps it should.

Proposed text:

§ 61.13(a)(5) Evaluate pathways including air, soil, groundwater, surface water, plant uptake, and exhumation by burrowing animals.

Comments:

There is a mix of categories, here. Some of these are contaminant transport processes (plant

uptake and exhumation by burrowing animals) but the others (air, soil, ground water, and surface water) are environmental media, rather than pathways or processes. Contaminant transport processes within these media might be diffusion, advection, chemical partitioning, etc. This distinction could be made. One drawback to include these, and only these, is that the list may become dated. As we learn more about the world of radionuclide contaminant transport, we find previously unknown or at least underappreciated mechanisms. For example, the only biotic pathways mentioned here are for plants and animals, but the potentially significant roles of mycological and microbiological entities are only now beginning to be appreciated.

Again, this is technical guidance and not regulation (it opens the door to dealing with biota, which is a good thing, but should be in guidance rather than regulation). As such, its presence in the regulation may not be appropriate. If it is retained, it should use more general language, rather than calling out specific mechanisms or materials.

Change “groundwater” to “ground water” in keeping with established NRC style.

Proposed text:

§ 61.13(a)(6) Account for uncertainties and variabilities in the projected behavior of the disposal system (e.g., disposal facility, natural system, and environment).

Comments:

This appears to be requiring a probabilistic performance assessment. However, nothing else in the regulation explicitly requires this. Obviously, we think this is needed, but some other adjustments to the regulation are really needed to go along with this.

As a companion section, we would also propose the following (to follow § 61.13(a)(6):

§ 61.13(a)(6½) Account for uncertainties and variabilities in the projected demographics and behavior of human receptors.

Since the principal performance objectives for future humans is one of dose (or risk) to any member of the public (and/or to the general population), uncertainties and variabilities in the human element must be considered. These have the potential to be of greater significance than disposal system behavior in determining the risk and its uncertainty.

Proposed text:

§ 61.13(a)(7) Consider alternative conceptual models of features and processes that are consistent with available data and current scientific understanding, and evaluate the effects that alternative conceptual models have on the understanding of the performance of the disposal facility.)

Comments:

In addition to alternative conceptual models, alternative implementations as mathematical models could be considered (e.g. various representations of porous medium tortuosity). This

could further be extended to alternative computational modeling implementations. The same system could be modeled as a system model, or as a process model using finite-difference, finite-element, or some other discretization paradigm. Solutions could be implicit, explicit, or hybrid. All of these variations could produce somewhat different results, and all will no doubt evolve as better technologies are developed. The question is how far do we want to take this evaluation of alternative approaches? Perhaps the proposed language is sufficient.

At any rate, this is guidance, not regulation. It is not useful for the regulation to instruct analysts to merely "consider" an approach, but it would also be inappropriate to here require that specific approaches be tried.

If this section is to remain, then we would further suggest that "features and processes" be expanded to "features, processes, and exposure scenarios" so that alternative conceptualizations of the human element would be considered.

Proposed text:

§ 61.13(a)(8) Identify and differentiate between the roles performed by the natural disposal site characteristics and design features of the disposal facility in limiting releases of radioactivity to the general population.

Comments:

While this is an important activity to be performed as part of performance assessment, this is again guidance, not regulation.

Proposed text:

§ 61.13(b) Analyses of the protection of inadvertent intruders that demonstrate there is reasonable assurance the waste acceptance criteria developed in accordance with § 61.58 will be met, adequate barriers to inadvertent intrusion will be provided, and any inadvertent intruder will not be exposed to doses that exceed the limits set forth in § 61.42(a) as demonstrated in an intruder assessment. An intruder assessment shall:

(1) Assume that an inadvertent intruder occupies the disposal site at any time during the compliance period after the period of institutional controls ends, and engages in normal activities including agriculture, dwelling construction, resource exploration or exploitation (e.g., well drilling), or other reasonably foreseeable pursuits that unknowingly expose the intruder to radiation from the waste.

(2) Identify adequate barriers to inadvertent intrusion that inhibit contact with the waste or limit exposure to radiation from the waste, and provide a basis for the time period over which barriers are effective.

(3) Account for uncertainties and variabilities.

Comments:

NRC is moving in the wrong direction with respect to assessing inadvertent intrusion. It's not

that inadvertent intrusion should not be evaluated—it must be—but rather that it be considered fundamentally different from other types of site occupation. Rather than develop or suggest particular scenarios as done in (1) above, and rather than develop a separate "intruder assessment," a site-specific performance assessment can cover all of this by evaluating likely future scenarios of who might occupy the site and what they might be doing. It must be recognized that agriculture, dwelling construction, and resource development are not universally normal activities. There could be disposal sites where none of these would be considered likely enough to survive a scoping analysis, let alone become part of a model. On the other hand, there are sites where all of these could happen, although with some likelihood that is probably less than 1 every year for in 10,000 years. There are still other activities that could lead to future waste releases or exposures, but would not of themselves be considered intrusive. The variation in likely activities between sites is part of what makes them different, and is important information for a site-specific performance assessment to incorporate.

Future humans who would intrude inadvertently into the waste should be considered just as any future member of the public would be considered, and with the same dose or risk metrics. However, the likelihood of any activity should also be considered, as the risk to future individuals is consolidated into a composite risk for the general population. There will be some individuals who experience greater exposures through their behavior or the activities of others, and there will be differences in how each individual responds to a given exposure. The language of risk to the general population and to any member of the public has been in Part 61 all along, but it has never been adequately spelled out. More of this discussion follows in comments to § 61.41 below.

Under our recommendation it would still be possible to distinguish between receptors that are deemed MOP or IHI, but only for the purpose of comparison to the appropriate performance objective. This would, however, assume that an inadvertent intruder should not be as protected as a MOP, which might not make sense when performing a proper risk (dose) assessment.

Proposed text:

§ 61.13(e) Analyses that assess how the disposal facility and site characteristics limit the potential long-term radiological impacts, consistent with available data and current scientific understanding. The analyses shall only be required for land disposal facilities with long-lived waste that contains alpha-emitting radionuclides with average concentrations exceeding 10 nCi/g or radionuclides with average concentrations exceeding one tenth of the values listed in Table 1 of § 61.55, or if necessitated by site-specific factors including engineering design, operational practices, and site characteristics. The analyses must identify and describe the features of the design and site characteristics that will demonstrate that the performance objectives set forth in §§ 61.41(b) and 61.42(b) will be met.

Comments:

This appears to be asking for a "deep-time" analysis, meaning one that evaluates the fate of long-lived radionuclides and their progeny long after the compliance and performance periods have passed. That can be done, though as time progresses the uncertainties in performance-related processes should overwhelm the analysis (the only reason they do not is that all models project

out current societal conditions/knowledge into the indefinite future—it is not clear that this should be required beyond what might be termed the "foreseeable future"). But the fate of radionuclides and their progeny is not a "performance objective", which would imply a peak risk or dose to humans. If uncertainty in the future of physical processes is uncertain, uncertainties in demographics, behaviors, and even physiology of humans in the distant future are even greater. Long-term radiological impacts of the sort implied by the performance objectives presented in this part are difficult to estimate with any certainty, and are more difficult to defend.

§ 61.41 Protection of the general population from releases of radioactivity

Proposed text:

§ 61.41(a) Concentrations of radioactive material that may be released to the general environment in ground water, surface water, air, soil, plants, or animals must not result in an annual dose exceeding an equivalent of 0.25 milliSievert (25 millirems) to any member of the public within the compliance period. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable during the compliance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(a).

(b) Reasonable effort should be made to maintain releases of radioactivity from a disposal facility to the general environment as low as reasonably achievable at any time during the performance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(e).

Comments:

This is a welcome direct invocation of ALARA, which is appropriately applied to assessments of dose (or risk) to the general population. But while the term "general population" is used in the title, the text of this section uses the phrase "any member of the public". These are conceptually different. If we are to accept the phrase "any member of the public" at face value, then this implicitly means that the most vulnerable members of the public should be protected. This would include children, for example, who generally incur higher risks from exposure to radionuclides in the environment than do adults, due to both behavioral and physiological differences.

In performing a risk assessment of the general population, such members of the public should be considered, as should anyone else deemed to be exposed to radionuclides disposed at the site. This is where the so-called "inadvertent intruder" can be included as well, as a member of the public (i.e., as a potential receptor), rather than couched in some distinct assessment. The proper way to go about doing a population risk assessment is to consider who the receptors would be, what activities they would be pursuing, and what exposures they would encounter. Each receptor has its own likelihood of encountering radioactivity, for different amounts of time, in different exposure media, and with different physiological responses based on age, for example, as outlined in ICRP documents. This approach evaluates risks to each individual member of the public as well as the general population, and is required to satisfy the language of the title and text of this section.

Note this section also acknowledges a role for the compliance period. This means that zero discounting of risk or dose is allowed up to the compliance period, followed by complete discounting thereafter. We might suggest a smoother discounting function than this 0/1 step function. In general, a discounting function should be developed site-specifically to take into account the desires of the local potentially affected population. Discounting should not be construed negatively—it is simply a mechanism for deciding when to use available resources for further evaluation.

The same comments (see response to § 61.13(a)(5)) about using language that considers only part of the biotic spectrum applies here as well.

An additional problem is presented with the use of the term "effluents" in § 61.41(a). It seems to be assumed that the only mechanisms for the migration of radionuclides from the waste into the larger environment involves effluents, but this is not the case. Plants translocate chemicals (including radionuclides) within their tissues, though the fluids in plant tissues might be considered effluents. Burrowing animals move bulk soils, which are not effluents. Erosion can cause bulk movement of solid materials as well—again, not effluents. Atmospheric dispersion transports radionuclides from the ground surface that are not "effluents". Perhaps this language can be remedied by substituting something like "...effluents and other mechanisms of contaminant transport...". Alternatively, a sentence structure could be used that does not use the word "effluents" at all, as in § 61.41(b).

§ 61.42 Protection of inadvertent intruders

Proposed text:

§ 61.41(a) Design, operation, and closure of the land disposal facility must ensure protection of any inadvertent intruder into the disposal site who occupies the site or contacts the waste at any time after active institutional controls over the disposal site are removed. The annual dose must not exceed 5 milliSieverts (500 millirems) to any inadvertent intruder within the compliance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b).

(b) Reasonable effort should be made to maintain exposures to any inadvertent intruder as low as reasonably achievable at any time during the performance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(e).

Comments:

This language clarifies the allowable dose to an inadvertent intruder, but still we have members of the public who might be considered intruders who "fall through the cracks". Consider the case where an initial visitor to the site causes a disturbance to the engineered or natural barriers, and a later visitor is exposed to radioactivity. The initial visitor is not considered an intruder by the definition in this part, since s/he does not actually come into contact with the waste. Assume that this initial disturbance, however, compromises the integrity of the site in such a way that it causes radioactivity to be released after some time. A later visitor to the site, who would be a

member of the public because s/he would cause no disturbance of the site, could be exposed to that released radioactivity, or conceivably to the waste itself. How is this case to be considered given the definitions of “inadvertent intruder” and “member of the public” in this part? Here we have what seems to be an inadvertent intruder who is not exposed and a member of the public who could come into direct contact with the waste.

It would be far more straightforward to dispense with these definitions, and consider this receptor as someone who should be protected to the standard presented in § 61.41: with an annual dose not to exceed 0.25 mSv.

§ 61.58 Waste Acceptance

Proposed text:

§ 61.58(a)(1) Allowable activities and concentrations of specific radionuclides. Allowable activities and concentrations shall be developed from the technical analyses required by either § 61.13 for any land disposal facility or the waste classification requirements set forth in § 61.55 for a near-surface disposal facility.

Comments:

The only way to determine “allowable activities and concentrations of specific radionuclides” is to develop a site-specific performance assessment. Even with that support, a classic problem in developing waste acceptance criteria (WAC) is the non-unique solution of the sum-of-fractions. Further, with the incremental disposal of wastes, the remaining capacity for future wastes changes, thence changing the universe of wastes that can be accepted. Ideally, the criteria for the acceptance of waste would change with each disposal, reflecting the amount of remaining radiological capacity. This is not practical, however, as it is problematic for generators and operators both to have to contend with a “moving target” of WAC.

A more practical approach, then, is to have a sub-optimal working WAC that serves to ensure that the site does not accept more waste than its performance assessment would allow. In addition to meeting a standard WAC, candidate wastes that might not meet the WAC could also be considered on a case-by-case basis. Further, allowance should be made that a WAC be updated periodically, so that a site may be fully utilized. It would be better, then, to have as part of a license application, a defined methodology for developing a WAC, rather than the specific allowable activities and concentrations of radionuclides. The method may not change, but the allowable amounts will, and it would be beneficial to be able to make those changes without requiring license amendments. As long as the performance objectives for dose or risk are met, that should be sufficient.

Proposed text:

§ 61.58(b) Waste characterization. Each applicant shall provide, for Commission approval, acceptable methods for characterizing the waste for acceptance. The methods shall identify the characterization parameters and acceptable uncertainty in the characterization data. The following information, at a minimum, shall be required to characterize waste:

(1) Physical and chemical characteristics;
(2) Volume, including the waste and any stabilization or absorbent media;
(3) Weight of the container and contents;
(4) Identities, activities, and concentrations;
(5) Characterization date;
(6) Generating source; and
(7) Any other information needed to support the technical analyses set forth in § 61.13.

Comments:

This gets to the practical approach of defining a methodology. It is good to require "acceptable methods for characterizing waste for acceptance", and the data required are reasonable for supporting development of a WAC, in addition to a site-specific performance assessment. Since these data will change as disposal operations proceed, however, it is not sensible to require the data itself as part of a license application. It is reasonable to indicate that these data could be made available, and it is reasonable to indicate how the data would be used in developing a WAC.

Section 61.58 (b)(7) asks for "any other information", leading to two issues that we think need to be addressed in waste manifesting. Those are lower limits of detection (LLDs) and general reporting of concentrations that are greater than necessary, because they are often reported at a disposal site's waste concentration limit (part of a site's WAC). This over-estimation of inventory limits disposal capability. Perhaps some clarification is needed of the intent of (7).

Proposed text:

§ 61.58(c)(1-4) Waste certification. Each applicant shall provide, for Commission approval, a program to certify that waste meets the acceptance criteria prior to receipt at the disposal facility. [...]

Comments:

We interpret this as asking for a program that will need to be statistically based in order to justify that the waste that is accepted is properly characterized for disposal. We are pleased that NRC encourages better characterization and specification of waste concentrations so that disposal can be more effectively managed. With improved characterization and manifesting, including appropriate reporting of LLDs, radioactive waste disposal resources can be better utilized.

This concludes comments from Neptune and Company, Inc. on the proposed revisions to 10 CFR 61.