

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Radiation Protection and Nuclear Materials

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Wednesday, August 17, 2011

Work Order No.: NRC-1071

Pages 1-154

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
(ACRS)
+ + + + +
SUBCOMMITTEE ON RADIATION PROTECTION
AND NUCLEAR MATERIALS
+ + + + +
WEDNESDAY
AUGUST 17, 2011
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ROCKVILLE, MARYLAND
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The Advisory Committee met at the Nuclear
Regulatory Commission, Two White Flint North, Room
T2B3, 11545 Rockville Pike, at 1:00 p.m., Michael T.
Ryan, Chairman, presiding.

COMMITTEE MEMBERS PRESENT:

MICHAEL T. RYAN, Chairman
J. SAM ARMIJO, Member
DENNIS C. BLEY, Member
DANA A. POWERS, Member
HAROLD B. RAY, Member

1 NRC STAFF PRESENT:

2 DEREK WIDMAYER, Designated Federal Official

3 ANDREW CARRERA, FSME/DILR

4 JIM DANNA, FSME/DILR

5 DAVID ESH, FSME/DWMEP

6 CHRISTOPHER GROSSMAN, FSME/DWMEP

7 DEBORAH JACKSON, Deputy Director, FSME/DILR

8 CHRIS MCKENNEY, FSME/DWMEP

9 GREGORY SUBER, FSME/DWMEP

10 PRIYA YADAV, FSME/DWMEP

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

1:00 p.m.

CHAIRMAN RYAN: The meeting will now come to order please. This is a meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Radiation Protection of Nuclear Materials.

I am Dr. Michael Ryan, Chairman of the Subcommittee. ACRS' members in attendance are Dr. Sam Armijo, Dr. Dana Powers, Dr. Dennis Bley and Mr. Harold Ray. The purpose of this meeting is to continue the Subcommittee's discussion with NRC staff, on proposed rulemaking language to amend 10 CFR 61 to add site-specific analyses for low level waste disposal.

The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate. The Subcommittee plans on proposing a Letter of Report on this matter for consideration by the full Committee at the July --

MR. WIDMAYER: September.

CHAIRMAN RYAN: -- I mean September, thank you, full Committee meeting. I thought we would be behind schedule already.

MR. WIDMAYER: We tried to do it in July.

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1 CHAIRMAN RYAN: Derek Widmayer is the
2 designated federal official for this meeting. A
3 transcript of the meeting is being kept and will be
4 made available on the web. It is requested that
5 speakers first identify themselves, and speak with
6 sufficient clarity and volume so that they can be
7 readily heard.

8 We have not received any requests from
9 members of the public to provide comments, however, I
10 understand that there may be folks on the bridge line
11 who wish to listen in on today's proceedings.

12 Now would folks on the line please
13 introduce yourself, if you're on the bridge line now?
14 Very well, on the bridge line I assume there will be
15 nobody there. Thank you for that. We now proceed to
16 the meeting and I call on Debbie Jackson, Deputy
17 Director of the Division of Intergovernmental Liaison
18 and Rulemaking at FSME to open the proceedings.

19 MS. JACKSON: Thank you Dr. Ryan, and good
20 afternoon. Good afternoon to the Subcommittee members
21 and meeting attendees. I'm going to provide some
22 opening remarks before the staff begins their
23 presentation.

24 So I am going to start off on why we're
25 here today. We're here to provide an update on the

1 Part 61 rulemaking to inform HRS regarding the
2 comments and the staff proposed rule text changes.

3 The staff has modified its approach to
4 enhance some of the flexibility and to address some of
5 the concerns the Subcommittee had during the last
6 meeting, and also to brief you on the draft guidance
7 documents.

8 We've had two previous briefings with
9 ACRS, one with the Subcommittee in June of this year,
10 and one with the full Committee in July. And we've
11 had the Commission direction, which is to proceed with
12 the rulemaking to require site-specific performance
13 assessment prior to the disposal of significant
14 quantities of depleted uranium and blended waste.

15 CHAIRMAN RYAN: And we, just for the
16 record, somewhere again today we'll define what
17 blended waste is, coming in the Commission's direction
18 may have mentioned that.

19 MS. JACKSON: I believe that, is that --

20 MR. ESH: We can, yes.

21 CHAIRMAN RYAN: That would be helpful, I
22 think.

23 MS. JACKSON: Okay.

24 CHAIRMAN RYAN: Just so that we are all
25 clear that, you know, what we're talking about today,

1 if it's evolved or changed or, clear, you know. Thank
2 you.

3 MS. JACKSON: Okay. So today's topics and
4 the presenters, Andy Carrera will follow me with the
5 draft proposed rule and analysis of the comments
6 received on the preliminary rule language, and he's
7 also going to talk about some of the rule changes to
8 address the flexibility.

9 And then Priya, Dave, and Chris will
10 follow with a discussion on the guidance for
11 conducting the site-specific analysis of Part 61, and
12 then I'll close with Path Forward. So with that,
13 Andy, we're going to change seats a little.

14 MR. CARRERA: Thank you Debbie, good
15 afternoon everyone. My name is Andrew Carrera, I'm
16 the project manager for the Part 61 rulemaking. Next
17 slide please.

18 And the last time that staff briefed the
19 Committee on the Part 61 rulemaking was while the
20 working group was in the process of reviewing the
21 public comments that we received on the proposed rule
22 language, I'm sorry, preliminary proposed rule
23 language for the Part 61 site-specific analysis
24 rulemaking.

25 And for this rulemaking, this fact follows

1 Commission's direction in Staff Requirement Memorandum
2 SECY-08-0147 and SRM-SECY-10-0043, which is to specify
3 site-specific analysis requirements for the disposal
4 of large quantities of depleted uranium, and develop
5 a guidance document for such analysis. And also to
6 included blended waste into existing rulemaking for
7 depleted uranium. And Dave, do you want to talk about
8 what's your definition of blended waste, yes?

9 MR. ESH: Yes, sure. I'll just describe
10 it. The blended waste that you asked about is when
11 you take waste of one classification, say some amount
12 of Class C waste, and you blend it with lower class
13 waste to lower the overall classification of the
14 mixture. So blended waste would be taking a higher
15 class waste, mixing it with a lower class waste to get
16 the combination at the value of the lower class waste.

17 CHAIRMAN RYAN: Okay. And that's allowed,
18 or the perception now is that it would be allowed over
19 all classes, A, B, C and Greater-than-C.

20 MR. ESH: A, B, C, a Commission gave
21 explicit direction to not allow it for Greater-than-
22 Class-C.

23 CHAIRMAN RYAN: Not allow it for Greater-
24 than-Class-C, okay, just so that everybody's clear on
25 what we talked about.

1 MEMBER ARMIJO: What's the cutoff between
2 Class C and Greater-than-C, you know, specifically
3 what is Greater-than-Class-C and, I know high-level
4 waste, but --

5 MR. ESH: Yes.

6 MEMBER ARMIJO: -- is there something in
7 between?

8 MR. ESH: The Greater-than-Class-C is
9 defined by the weight of the Class C waste
10 concentration values that are provided in 61.55,
11 Tables 1 and 2 in Part 61, so it's concentrations that
12 were derived, where if you're above those
13 concentrations then it's considered Greater-than-
14 Class-C waste.

15 If it's not determined by language or
16 derivation to be high-level waste, because high-level
17 waste is based on where it came from, basically.

18 CHAIRMAN RYAN: It's interesting that
19 that's a classification that's based on the potential
20 for, basically, worker exposure during handling,
21 because it does involve both long- and short-lived
22 radionuclides.

23 MR. ESH: Yes.

24 CHAIRMAN RYAN: And some Class C waste
25 will become lower than Class C fairly quickly, 50

1 years for example, it's driven by cobalt. So it's not
2 only risk-driven classification for disposal alone, it
3 does take into account the questions of operational
4 management while they're being handled, and some of
5 which go away quickly after disposal.

6 And then the risks become those for
7 longer-lived radionuclides, and if it was classified
8 at that time it would be a much lower class of waste.

9 MR. ESH: Yes, there are two isotopes in
10 practice that drive it a lot, and those are cesium and
11 strontium.

12 CHAIRMAN RYAN: Right.

13 MR. ESH: So and Class A waste, the
14 concentrations are derived that they're quite a bit
15 lower than the concentrations of Class C waste.
16 Because Class C waste you basically have 500 years of
17 decay that you can take advantage of.

18 So you can dispose of much higher
19 concentrations. And the table for long-lived
20 radionuclides, the way it basically works is the Class
21 C waste is, the concentrations that are at the values
22 in the table, Class A waste is at 1/10th of the values
23 in the table for, to determine whether it's Class A or
24 Class C waste for the long-lived isotopes.

25 CHAIRMAN RYAN: Thank you.

1 MR. SUBER: Excuse me Dr. Ryan, this is
2 Gregory Suber. I do have just one clarification.

3 CHAIRMAN RYAN: Yes, sir.

4 MR. SUBER: What something the doctors
5 said. The SRM said that greater than Class C should
6 remain a federal responsibility. As you know, waste
7 that is Greater-than-Class-C, the Department of Energy
8 is responsible for disposing of that waste, and the
9 Classes A, B and C are NRC or agreement state
10 responsibility. So what the SRM did is issue a mind
11 set that we want Greater-than-Class-C waste to remain
12 a federal responsibility?

13 CHAIRMAN RYAN: Absolutely. No, that's a
14 great classification, I appreciate that.

15 MEMBER ARMIJO: So for the purposes of
16 this rule, everything that, let's say the civil
17 nuclear programs deal with, A, B and C, they all can
18 be blended, right? And Greater-than-Class-C is a
19 federal thing, and we don't have to worry about it?

20 CHAIRMAN RYAN: One important aspect of
21 waste is, it's not waste until you declare it waste.
22 So if you create a package of waste, you can create it
23 in such a way so that it will be classified as A, B or
24 C, based on how you prepare those materials in the
25 commercial sector.

1 But by definition I think, Dave has
2 pointed out correctly that those things that are
3 clearly large quantities of Greater-than-Class-C waste
4 are in fact a DOE obligation at this point. Thank
5 you.

6 MEMBER BLEY: I'm sorry, I just, I was
7 mixing other places I know with this. So if you have
8 a process estimate and you've accumulated something in
9 a tank that will end up as waste, it's not waste until
10 you package it and declare it as waste.

11 CHAIRMAN RYAN: And perhaps even treat it.
12 For example, a liquid waste you may solidify in
13 concrete, and that concreted waste is what you assess
14 for its classification as a waste.

15 MEMBER BLEY: But before it leaves the
16 process plant it's not waste.

17 CHAIRMAN RYAN: Correct. It's material on
18 process and --

19 MEMBER BLEY: Materials.

20 CHAIRMAN RYAN: -- you know, if you
21 solidify it, obviously that'll have an impact on the
22 ultimate concentration, you know, those kinds of
23 things. Sorry David, but thank you for the
24 clarification. Andrew?

25 MR. CARRERA: Now, the staff is here again

1 today to pick up where we left off, and inform the
2 ACRS of stakeholders' comments on the preliminary
3 proposed rule language, and revisions being considered
4 for the proposed rule language. Slide Number 3,
5 please.

6 Just to recapture the essence of the
7 processes on rulemaking, the Commission directed staff
8 to keep this rulemaking to a limited scope and that is
9 where the Staff's focus remained. And in this limited
10 scope rulemaking, the staff inserted several
11 approaches.

12 And one of the approach is to specify
13 site-specific analysis requirements for a
14 demonstration of compliance for the performance
15 objectives in Subpart C of 10 CFR Part 61. And these
16 site-specific analysis include performance assessment,
17 intruder assessment, long-term analysis as far as
18 update analysis at facility closure.

19 And these analysis will enhance the safe
20 disposal of low-level waste and would also identify
21 any additional measures that will be prudent to
22 implement. Next slide, please.

23 Staff also proposed additional amendment
24 to Part 61 regulations, such as adopting new
25 definitions and concepts as part of the program to

1 facilitate the implementation of the site-specific
2 analysis requirement.

3 And during the proposal development
4 process, the staff made the decision to make no
5 explicit reference to depleted uranium or blended
6 waste. The proposed requirement would apply to total
7 waste inventories.

8 MEMBER ARMIJO: Is there any reason why
9 you wouldn't just make it very clear, where you have
10 issues related to DU or blended waste, you know, it
11 seems like the objective was to bring that into the
12 regulations and you don't, you say you're not going to
13 talk about it in the language?

14 MR. CARRERA: Well we may have special
15 reference to it, but while the working group was
16 formulating the approach to this rulemaking, we were
17 talking about looking at DU by itself, and then we
18 will see as uranium for, include blended waste in
19 there, and then we proceed to look forward to the
20 future where we're contemplating future waste streams
21 that were not part of the original Part 61 analysis.

22 And looking at those, we figure it would
23 be more prudent or more efficient if we were to make
24 this rulemaking apply to all waste streams, all waste
25 types.

1 CHAIRMAN RYAN: And I hear what you're
2 saying, but I guess I would add to Dr. Armijo's
3 comment that if you say something, that this
4 regulation now also applies to DU and blended waste
5 as long as you meet the performance objectives or
6 whatever it is, that's helpful.

7 And then if you want to deal with how to
8 do that and guidance, fine. But being silent on it
9 leaves the impression that it's not covered.

10 MEMBER ARMIJO: Or that everything is the
11 same. You see where I'm a little worried is that DU
12 may have special properties, special issues that
13 require different treatment. And if it's just kind of
14 buried in with all the other stuff, then we have to
15 apply the same treatment to all the other stuff when
16 it's not really justified.

17 CHAIRMAN RYAN: And in fact the Commission
18 directed that that be considered, so why wouldn't you
19 add it to the things that are covered in the
20 regulation? I just think you shouldn't be silent on
21 it because it creates the wrong impression.

22 MR. ESH: Yes, I think the documentation
23 that will be produced with the draft rule, such as the
24 FRN and the Statement of Considerations will be clear
25 of what the rule applies to. And generally, I think

1 if we don't explicitly state in say, the regulation,
2 that if you carve out special exceptions or criteria
3 for a certain material, then it's going to apply to
4 all low-level waste regardless of the type,
5 characteristics, or consideration.

6 CHAIRMAN RYAN: Right. I don't know, I
7 guess I'd just like to see what the regulation covers
8 in the regulation. I know the lawyers will tell you
9 it's how things apply and don't apply, but I think it
10 ought to be explicit.

11 MR. ESH: The two things that we struggled
12 with, or we discussed when we got to this point was,
13 one, the reason why we're at this juncture today is
14 because when Part 61 was developed they didn't
15 envision disposing of waste streams such as the two
16 that we're talking about here today.

17 And because they didn't envision them,
18 then the criteria, in particular the Waste
19 Classification Tables weren't designed to deal with
20 the situations that you may establish when disposing
21 of these waste streams.

22 CHAIRMAN RYAN: So they should be changed
23 to accomplish that.

24 MR. ESH: Well, that was an option that
25 was presented to the Commission in the SECY paper 08-

1 147, and the Commission didn't tell us to follow that
2 option. They said to develop requirements for site-
3 specific analysis instead of changing the Waste
4 Classification Tables, because that's more risk-
5 informed.

6 You can develop then the actual
7 concentrations that a site may take of these types of
8 materials, instead of one number, that you would have
9 to build some conservatisms into and apply to all of
10 the sites. So that's one of the things we thought of
11 is, are we smart enough today to know all the waste
12 streams that are going to be generated in the future?

13 Well we weren't when we got to this point,
14 so what is there to say that we're that smart now
15 again, and that we're not going to be back in this
16 box again when the fuel cycle changes, and some new
17 stream comes online that wasn't envisioned in the
18 previous two steps.

19 And the other thing is what I just
20 mentioned, is that if we develop say table values, it
21 starts becoming very difficult to be risk-informed
22 when you do that, because there's a lot of variance
23 from site to site in particular, and conditions to
24 conditions, the risk that may be derived from the
25 material that's disposed of there.

1 CHAIRMAN RYAN: Well now you're on the
2 right track with me, because a site-specific risk-
3 informed assessment is exactly the right way to go,
4 all radionuclides, forget about what's in the table
5 and what's not.

6 MR. ESH: Now the question that Dr. Armijo
7 mentioned of whether there are specific requirements
8 that you need for maybe these waste streams that are
9 special and different than other waste streams, that's
10 a different issue.

11 We didn't necessarily envision, hopefully
12 you'll see by the rule text that we discuss, and the
13 guidance document that there were things that stood
14 out that deserved regulatory requirements, but that's
15 a thing to discuss. Maybe there are something,
16 especially if you have some views that there are
17 special requirements that should be applied to those
18 waste streams.

19 MEMBER ARMIJO: And only to those waste
20 streams.

21 MR. ESH: And only to those waste streams.

22 MEMBER ARMIJO: Yes, that's concern I have
23 that--

24 MR. ESH: Yes, that's something we should
25 talk about.

1 MEMBER ARMIJO: -- the DU is a particular
2 problem with long life issues like that.

3 CHAIRMAN RYAN: Okay, well let's --

4 MEMBER ARMIJO: We'll get to that.

5 MR. CARRERA: Slide 5, please. The
6 Stakeholder Involvement, the NRC published Part 61
7 preliminary proposed rule language in this regulatory
8 basis document, including the period of performance
9 paper that they developed on regulation.gov on May
10 3rd.

11 We also held a public meeting on May 18th
12 to present the documents and solicit early public
13 comments on these documents. The public commentary
14 ended on June 18th. The staff also received
15 stakeholders' comments from the previous ACRS meeting
16 of Part 61 as well. Slide number 7, please.

17 The comment that the staff received came
18 from a diverse group of stakeholders such as public
19 interest group, the industry, and other government
20 organizations, and their view were just as diverse as
21 the organization that they represent.

22 All comments were fully considered.
23 However, because we are not technically in a proposed
24 rule comment period, the NRC will not provide response
25 to these comments. In all we received 15 comment

1 letters at the end of the comment period.

2 The staff reviewed all the comments,
3 including verbal comments provided at the public
4 meetings, and grouped them into nine separate issues.
5 And these issue are listed in the lasted bullet of
6 this slide, and I will briefly touch over each of
7 those issues and some of the flavors that you get from
8 these comments.

9 CHAIRMAN RYAN: Okay, thank you.

10 MR. CARRERA: Slide number 8, please. The
11 issue on performance assessment requirement, we
12 received comments in support and against the use of
13 Total Effective Dose Equivalent methodology, or TEDE.

14 Some thought that it's not an appropriate
15 dose methodology to use, and others thought it was a
16 good idea to be consistent with Part 20 of the
17 regulation which used TEDE dose methodology.

18 We also see comments related to
19 uncertainty involved in the performance assessment,
20 conducting a performance assessment. Some say the
21 performance assessment result would not be meaningful,
22 taking into consideration of the large uncertainty
23 that you get from the 20,000 years period of
24 performance.

25 Others suggest that in addition to

1 evaluating the uncertainties in the assessment, we
2 should also apply a dose limit for the timed period
3 beyond the 20,000 years.

4 Intruder assessment requirement, some
5 comments support intruder assessment language, while
6 others suggest that the intruder dose scenarios is
7 burdensome. While some agrees with the 500 millirems
8 that the staff proposed as a dose limit for intruder
9 dose assessment. Others believe that we should lower
10 it to 100 millirem, and even lower it to 25 millirem
11 to be consistent with other regulations.

12 And some take issues with the requirement
13 to demonstrate that intruder barrier must be affective
14 for the duration of the period of compliance.

15 MEMBER ARMIJO: You know, this intruder
16 assessment issue, the question I think I raised at the
17 last Subcommittee meeting was whether it was even
18 justified. The number of people who might be exposed
19 far into the future is tiny. And their exposure would
20 not be catastrophic.

21 And yet so much of this rulemaking and
22 regulations are based on the need to protect, or
23 belief that someone has to protect some very small
24 population of intruders far in to the future, who are
25 unable to protect themselves.

1 And so that I looked for, what's the legal
2 justification and it goes back to this concept of
3 intergenerational equity. So I'd like to ask when, is
4 there an NRC policy statement that uses
5 intergenerational equity as a basis for regulation?

6 MR. CARRERA: Dave?

7 MEMBER ARMIJO: Is there such a thing?

8 MR. ESH: Not that I'm aware of.

9 MEMBER ARMIJO: So it hasn't been really
10 been decided by some sort of a discussion among the
11 commissioners to decide, yes, we've really got to
12 regulate according to that concept. So we're doing it
13 sort of because we want to do it, it's our preference.

14 And I just don't see how that's justified
15 at all and particularly for 20,000 years. So at some
16 point we're going to have to get into that, but I'm
17 just looking for some sort of a rational justification
18 of why such an assessment is justified, either by law
19 or by real safety, or just by preference.

20 MR. ESH: No we have, I mean it is an
21 individual protection standard that's applied in Part
22 61, it's not a population-based standard. And the
23 intruder performance objective is not something that
24 we're adding here.

25 It's something in the regulation, we're

1 just specifying that the intruder dose assessment
2 component of it, which is what was done to derive the
3 classification tables, we'll add it in since the
4 Commission told us not to change the Waste
5 Classification Tables, and that handles the intruder
6 protection for material that's not in the tables.

7 So I don't necessarily disagree with you
8 about the issue of the intruder protection but this is
9 a limited scope rulemaking, and I think we're
10 comfortable and we feel we're on firm ground with the
11 intent of the Commission to put this requirement for
12 the intruder dose assessment under 61.42 because it is
13 a limited scope rulemaking.

14 MEMBER ARMIJO: If it's just a simple
15 assessment, I could understand. Just do it just to
16 see what things are like. But if it brings all sorts
17 of other requirements into play, time scales, and
18 these reassessments, and barriers that'll last out
19 into the future, and assessment of the reliability of
20 those barriers, and it goes into all of that sort of
21 stuff, it starts looking more and more like Yucca
22 Mountain, high-level waste.

23 And I keep reminding myself we're dealing
24 with low-level waste and, you know, we've got to keep
25 that, we can't let the Yucca Mountain approach become

1 the model for low-level waste.

2 MR. ESH: Yes, and I would agree with
3 that. I would say that for some of these materials
4 though, you have to look carefully at them, especially
5 over the longer time frames. So there's a big
6 divergence in the characteristics of the material and
7 the hazard that they have at today, when the materials
8 are generated.

9 So you put depleted uranium next to
10 commercial spent nuclear fuel, there's no comparison.
11 The radiation fields and how you need to handle them,
12 et cetera, they're way different.

13 But I would say, think of it this way. In
14 the high-level waste repository, if it had gone
15 forward it was going to take about 70,000 metric tons
16 equivalent of uranium. The amount of depleted uranium
17 that has been generated and needs a home for disposal
18 can be ten times that and more.

19 So it is a lot of uranium and whenever you
20 run those calculations out to long time, I saw an
21 interesting figure from a U.K. report that they had
22 looked at all different types of waste that are
23 generated over there, and did a comparison of
24 disposing of each type of waste in the same facility.

25 And at longer time, say after 10,000

1 years, especially out at 100,000 years, the depleted
2 uranium was actually the highest risk. It was higher
3 than their spent nuclear fuel, and their defense high-
4 level waste, and all the other materials.

5 So the problem is, is how these things
6 change over time and to get thinking about it the
7 right way and in the appropriate context.

8 CHAIRMAN RYAN: You know, in addition to
9 those comments which I appreciate David, I think we've
10 also got to think about the notion that, you know, as
11 a system of regulation in the U.S. we take other
12 uranium wastes, put them on the top of the ground,
13 cover them up with a little topsoil and grow grass on
14 it. It's called uranium mill tailings. So, there are
15 lots of different strategies.

16 MEMBER POWERS: Can you explain how
17 depleted, how there's any risks at all? I mean, I
18 live pretty close to Grant, New Mexico, and we have,
19 ostensibly a mountain of undepleted uranium there,
20 have always had so. And there are a lot of very weird
21 people in New Mexico, but I don't think any of it
22 comes from genetic --

23 (Laughter)

24 (Simultaneous speaking)

25 CHAIRMAN RYAN: The point is now, I think

1 they're making the same point, is that the quality of
2 distribution substrate from uranium and its
3 characteristics in terms of how it's disposed, and the
4 characteristics you assume from intruder and their
5 access, can now really change the basis you estimate.

6 MEMBER POWERS: Yes.

7 CHAIRMAN RYAN: So I think it's something
8 that if we're going to follow that path, it has to be
9 done very carefully to really be realistic. But one
10 thing I'm getting to is, very quickly an inadvertent
11 intruder which is what we are protecting, becomes an
12 advertent intruder.

13 He's not inadvertent for very long.
14 Sooner or later he's going to figure out, this isn't
15 Mother Nature and something's happening here. So, you
16 know, I struggle with how you allow a scenario to run
17 for lifetimes or longer, when sooner or later the
18 inadvertent intruder is advertent and knows what's
19 going on, or at least has recognition, this isn't
20 Mother Nature.

21 MR. ESH: Yes, and I would say those are
22 good points. It would be helpful if you could point
23 us to other analogous regulatory programs where those
24 philosophies are used, because then we could point
25 back to those from the waste area, okay, here's what's

1 done in reactors.

2 They take into account some future
3 intelligence of the people that are, something's
4 happening to them in this scenario and they're
5 reacting this way. I mean some examples or analogues
6 would be helpful.

7 As to the point of mill tailings and
8 depleted uranium, they're tremendously different in
9 concentration space. Mill tailings in the U.S. are
10 about a tenth of a weight percent uranium or so,
11 whereas the depleted uranium is about 80 weight
12 percent uranium, as it's generated now and packaged
13 and this would --

14 CHAIRMAN RYAN: But there's hundreds and
15 hundreds of times more tailings than there are
16 uranium.

17 MR. ESH: Well I don't know. If you put
18 500,000 metric tons of uranium in a facility and
19 compared that to a mill tailings facility, I think if
20 you look at the total quantities disposed, you're
21 going to end up with hundreds of times more uranium in
22 the low-level waste disposal facility than you have in
23 a mill tailings disposal facility.

24 CHAIRMAN RYAN: But again, the risk is
25 really related to a concentration-based metric, not

1 necessarily the total quantity.

2 MR. ESH: But the risk for something like
3 radon exposure and/or groundwater exposure, if you
4 don't have a solubility limit or you have a high
5 solubility limit, is driven by concentration.

6 CHAIRMAN RYAN: All fair comments, and I
7 think that points to the case, you know, the point
8 that, I don't think there's one size fits all. So I
9 think that the requirement has to be really focused on
10 whether the site-specific conditions that you must
11 analyze to reach a competent evaluation.

12 MEMBER BLEY: I'd like to go back to the
13 argument before this one, and maybe you can explain it
14 to me a little better, but the idea that in thousands
15 of years the depleted uranium will be more of a hazard
16 than the current spent fuel doesn't make much sense to
17 me, because if the spent fuel were much lower than it
18 is, like it will be in many years, we wouldn't be
19 treating it the way we do now.

20 MR. ESH: Yes.

21 MEMBER BLEY: But is the risk of that, it
22 might be greater than this stuff that has decayed
23 completely down, but it's still probably not very
24 high.

25 MR. ESH: Yes, so is your question, is the

1 risk of the spent nuclear fuel lower? Yes, I agree
2 with that, it is lower. The problem is the spent
3 nuclear fuel risk, for the transcriptionist, decreases
4 asymptotically or exponentially, whereas the depleted
5 uranium curve builds in over time, gets higher,
6 because of the ingrowth of lead-210 and radon in
7 particular, or radium-226, lead-210, radon that comes
8 in, in the decay chain.

9 But the uranium itself, you have enough
10 uranium itself that you have to be smart about how you
11 manage it, because it essentially is a concentrated
12 industrial metal. And I don't care whether it's
13 uranium, lead, mercury, whatever, you have to be smart
14 about how you manage a concentrated substance of some
15 sort.

16 MEMBER BLEY: Nobody would dispute that I
17 think, but this started from Sam's comment that we
18 don't want to treat this stuff the way we treat spent
19 fuel. When you say, well yes, but in thousands of
20 years uranium waste will be higher, and the fact is we
21 can't see that curve you drew, but the uranium curve
22 doesn't go up as far as the spent fuel curve.

23 MR. ESH: I'll make an action to send you
24 a reference to the U.K. report where they put all the
25 same materials in it and analyzed it, that's what I

1 was referencing.

2 MEMBER BLEY: That would be great.

3 MR. ESH: We've done our own calculations
4 internally to understand the problem, but I don't have
5 a report I can send you for those. But that's a
6 report that's out there in the public, and you can
7 look at it and see what they did and see the curves
8 for yourself.

9 MEMBER ARMIJO: Of these hundred, these
10 large, large quantities of depleted uranium, how much
11 of that is DOE, or military, or defense-related waste,
12 not the civil nuclear program waste? Is it, I
13 understood the bulk of it was defense-related.

14 MR. ESH: Yes, I'm not exactly the right
15 person to answer it but I'll try anyway. There's a
16 large quantity of it now which I believe is considered
17 to be the DOE stockpile, but as you run the enrichment
18 facilities, the commercial enrichment facilities, then
19 they're going to generate material over time.

20 And as you go out a few decades, I think
21 the quantities are fairly comparable. You'll have
22 about the same amount from the DOE stockpile right now
23 as is going to be generated commercially.

24 MEMBER ARMIJO: Is the depleted uranium
25 that's come out of the U.S. enrichment for example, is

1 that considered civil waste not DOE waste?

2 MR. MCKENNEY: It is owned by the
3 Department of Energy, and as one of their actions is
4 to -- sorry, this is Chris McKenney, Performance
5 Assessment Branch Chief. Then they either try to
6 dispose of it on their own sites, but they also have
7 the option to use commercial disposal and it tends to
8 save the government money.

9 There it is another commercial nor
10 anything else, it's just DOE waste. And so they have
11 looked at the option of using commercial disposal
12 options for a number of their waste types including
13 depleted uranium. And so that is why the potential
14 became part of the discussion. Of course this whole
15 issue raised because of a commercial developer --

16 (Simultaneous speaking)

17 MR. MCKENNEY: -- but the DOE is probably
18 the largest producer of commercial waste disposed per
19 a year now.

20 MEMBER ARMIJO: Yes, okay. So let's say
21 a new enrichment guide, LES or maybe the GE laser or
22 whatever it is. Those guides would generate DU,
23 pretty small quantities compared to USEC. But they
24 have no option except to go to a commercial disposal
25 site.

1 MR. MCKENNEY: 1996 Privatization Act
2 makes that a little more complicated in the fact that
3 they have the option also of giving it to DOE. And
4 DOE --

5 (Simultaneous speaking)

6 MR. MCKENNEY: -- at cost to LES or
7 whatever has to pay the disposal cost, right.

8 MEMBER ARMIJO: Sure.

9 MR. MCKENNEY: DOE can take title to it
10 and then dispose of it through their means, which
11 would mean, also looking to get back at privatization.

12 MEMBER ARMIJO: This is a long way for me
13 to get around to the fact that DOE has their own
14 system, and regulations, and practices that they've
15 had in place, and I did get three of their comments to
16 the preliminary language which I thought were very
17 good.

18 And so I was trying to understand which
19 was the elephant, and it looks like the elephant is
20 DOE and the depleted uranium that they've got and
21 they're going to get. And so whatever we do for the
22 civil case should be, I would think consistent with
23 their practices, unless we see some terrible flaw in
24 what they're doing.

25 CHAIRMAN RYAN: Just for the sake of a

1 number, there's 5,247 curies of uranium-238 disposed
2 at Barnwell as we speak. That's it. And it will be
3 there for a long time unless they add to it with some
4 more.

5 Most of it is, or a lot of it is depleted
6 uranium metal that's been used as counterweights,
7 shielding packages, those kinds of things, and has,
8 you know, been declared waste through DOD. So that's
9 a lot of, but that's the numbers, 5,247 rounded off,
10 curies.

11 MR. ESH: Yes, I believe we got numbers
12 like that. I don't remember what they are off the top
13 of my head, but from each of the disposal facilities
14 when we were starting this process, they gave us some
15 numbers for what they actually had disposed of to
16 date.

17 CHAIRMAN RYAN: Yes, that's as of
18 7/12/2011, from Barnwell. I didn't look at the other
19 sites because quite frankly they didn't take nearly as
20 much, that's most of it, was Barnwell.

21 MR. ESH: Now I believe the Clive facility
22 has more curies of uranium.

23 CHAIRMAN RYAN: Than Barnwell?

24 MR. ESH: Yes.

25 CHAIRMAN RYAN: Okay, I didn't know that.

1 MR. ESH: Than Barnwell, yes.

2 CHAIRMAN RYAN: So anyway that's, I can't
3 imagine it would be a huge amount more.

4 MR. ESH: I think it was something like
5 17,000 but my memory is.

6 CHAIRMAN RYAN: 17,000? Okay, all right,
7 well that's fine.

8 (Off microphone comments)

9 CHAIRMAN RYAN: Thank you. I guess we're
10 back to you, Andrew.

11 (Laughter)

12 (Simultaneous speaking)

13 CHAIRMAN RYAN: Thank you very much for
14 your patience.

15 MR. CARRERA: Let's get to the last bullet
16 of number 8, Long-term Analysis, which is a new
17 requirement, and when we see a few comments along the
18 line of proposing a higher dose limit for the analysis
19 beyond 20,000 years.

20 We also received comments concerning what
21 was the purpose and uses of this long-term analysis,
22 and some comments also suggest that we should
23 eliminate the definition of long-lived waste.

24 Other propose turn it up where the limit
25 of the ten percent of the initial radioactivity, which

1 is in the proposed definition of long-lived waste in
2 the preliminary proposed rule language, should be
3 stated as a requirement somewhere else.

4 CHAIRMAN RYAN: So in other words their
5 proposal is that no more than ten percent of the total
6 inventory should be long-lived?

7 MR. ESH: No, it's --

8 CHAIRMAN RYAN: I didn't quite understand
9 what he --

10 MR. ESH: Yes, the definition that we
11 derived was based on, if you look at the tables in
12 61.55, one of the isotopes that they identify as long-
13 lived is carbon-14. And if you decay carbon-14 after
14 20,000 years, you have about nine point something
15 percent of it left at 20,000 years.

16 So we figured a consistent definition with
17 that is, if you have ten percent or more of your
18 activity remaining at 20,000 years, we would call that
19 long-lived waste. It's consistent with the existing
20 table.

21 CHAIRMAN RYAN: It's an activity-based
22 consideration, not a risk-based consideration.

23 MR. ESH: Yes well, I mean, the risk comes
24 into play when you do the assessment against the
25 various performance objectives, but the characterizing

1 the material as to its longevity, I don't know how you
2 do that besides looking at its half-life for instance.

3 CHAIRMAN RYAN: Yes, but that's not
4 necessarily risk-informed although, I agree it's a
5 metric you can use.

6 MR. ESH: It's kind of like whenever you
7 do a performance assessment, you may do in the
8 biosphere area, a screening evaluation to determine
9 what pathways you may need to include and which ones
10 you don't need to include.

11 I think this is kind of analogous to that.
12 You do some sort of processing up front to know how to
13 do the calculations for different types of materials
14 down the stream.

15 CHAIRMAN RYAN: And that's not dissimilar
16 than how physics rules of thumb, ten times the half-
17 life, and I don't have a health physics problem and,
18 you know, those kinds of things, but that's based on
19 practical limits for, you know, well established
20 scenarios as opposed to being risk-informed. It's
21 really not risk-informed to just use that kind of
22 rule. It can be very much not risk-informed.

23 MR. ESH: Well, and we looked at what
24 other people do to define long-lived waste and they'll
25 do things like say, if the half-life is greater than

1 30 years, that's long-lived waste.

2 So we thought this approach was better
3 than that, but there's not a very eloquent way of
4 doing it that we could think of. If the Committee has
5 some ideas, we'd be happy to entertain them.

6 CHAIRMAN RYAN: Thanks. But, you know,
7 again I think the emphasis shouldn't be on that
8 definition to drive the bus, and I think this is the
9 case you've certainly emphasized, is it that emphasis
10 should be on the risk-based performance assessment to
11 drive the bus. So that's the fact that I think gets
12 us over this hurdle.

13 MR. ESH: Well, hopefully you'll see that,
14 because the only place that this definition comes into
15 play is when you have long-lived waste and you hit the
16 61.13(e) criteria as we've developed it, to show how
17 your system is performing over time, and to provide
18 the number for what you think's going to happen at
19 very long time.

20 But we didn't assign a dose limit to that
21 number. It's basically a transparency for our
22 stakeholders, and I'd call it a engineering/scientific
23 criteria to demonstrate, or show how the various
24 components in your system are going to limit or reduce
25 the amount of, the release of long-lived waste.

1 CHAIRMAN RYAN: Well we'll hold that
2 thought until we get into more detail.

3 MR. CARRERA: Slide number 9, please.
4 Period of Performance, which is a topic dear and near
5 to Dave's heart. David talked about it at great
6 length for the past couple of briefings.

7 We received comments supporting a range of
8 numbers for a period of performance, and the rule
9 language from 1000, to 10,000, to 20,000 years and
10 even out to peak dose. However, we see few or limited
11 technical basis supporting period of performance other
12 than the 20,000 years.

13 Others thought that the period of
14 performance should be specified though guidance
15 instead of regulation. We've also received comments
16 that the 20,000 years period of performance places
17 unnecessary burden to facilities that accept short-
18 lived waste, and I believe that's what we've heard
19 from the Committee as well last time, and we
20 appreciate that position.

21 That next bullet, agreement state
22 compatibility. Some comments suggest that we should
23 recommend the strictest compatibility level to ensure
24 a consistency in implementation among the agreement
25 states, while others suggest a more flexible level of

1 compatibility, and to work with the states so that
2 there would be no unintended consequences.

3 MEMBER ARMIJO: Andrew, could you refresh
4 my memory of what you mean by compatibility?

5 CHAIRMAN RYAN: Look.

6 MR. CARRERA: Jim?

7 MR. DANNA: I'll take it. This is Jim
8 Danna, Rulemaker Branch. I'll take a shot at it. I'm
9 not an expert, but the compatibility category is the
10 way in which Agreement States have to adopt the NRC
11 regulations.

12 The strict compatibility category is like
13 a B, where the Agreement States have to adopt our
14 regulations as written. And a Category C would be
15 where they have to adopt something that has the intent
16 of the regulation, but they have some flexibility and
17 they can be stricter. And then there's other
18 compatibility categories, but --

19 MEMBER ARMIJO: But currently, let's say
20 facilities that aren't dealing with depleted uranium,
21 I get the impression that flexibility is one of the,
22 is pretty standard with the Agreement States.

23 MR. DANNA: It depends. For every
24 regulation, and the regulation is broken down into
25 different quantities of different compatibility

1 categories, so it would depend on exactly what
2 requirement we're talking about.

3 MR. WIDMAYER: What's the compatibility
4 requirement for the performance objectives currently,
5 for Part 61? And that's the portion that you're
6 adding to, right, so you'd assume it would be stricter
7 compatibility?

8 MR. DANNA: It could be either way with
9 the way it's implemented, in which the different
10 requirement could be a C which provides flexibility in
11 the implementation. The objective could be the same,
12 but the implementation could be different.

13 CHAIRMAN RYAN: I think it's helpful for
14 the Subcommittee and the full Committee to recognize
15 that at least so far, all the low-level waste sites
16 are Agreement States. So this will be a state
17 regulation issue, at least at this point for the
18 foreseeable future. I don't know of any initiatives
19 to sites in non-agreement states at this point.

20 MR. CARRERA: Lisa, did you have anything
21 to add to the compatibility?

22 MS. LONDON: No, I think Jim covered it
23 well. Compatibility --

24 (Simultaneous speaking)

25 MS. LONDON: This is Lisa London from the

1 Office of General Counsel. I think Jim covered it
2 well. Compatibility Level A and B are essentially
3 identical, they don't adopt our regulation, they adopt
4 regulations that are essentially identical.

5 MEMBER ARMIJO: To meet the intent, yes.

6 MS. LONDON: C is to meet the intent, but
7 A and B are essentially identical, so that was all I
8 wanted to add. Thank you.

9 CHAIRMAN RYAN: Thank you.

10 MR. CARRERA: Thank you, Lisa. Moving on
11 to the last bullet of Slide number 9, Near Surface
12 Disposal. We received comments questioning whether
13 it's even appropriate to dispose of depleted uranium
14 at near surface facility, while others proposed a
15 minimum disposal depth requirement for it's disposal.

16 Others suggest that to limit changes in
17 this rulemaking is not protective of public health and
18 safety. Slide number 10, please.

19 We also received comments in the areas of
20 the Commission's direction, saying that this
21 rulemaking is consistent with the comprehensive
22 revision of Part 61, and this is not a limited scope
23 rulemaking as directed by the Commission.

24 Others suggest that depleted uranium
25 should not be classified Class A waste. And we

1 received comments in the areas of the rule language
2 saying that it, at some sections, specifically
3 61.7(a)(1), 61.7(c)(2) and 61.55(a)(6) is confusing
4 and could be shortened, deleted, or clarified.

5 And speaking to the waste stream neutral
6 approach, there are support and disapproving comments
7 of this approach. The disapproval would suggest that
8 this rulemaking concentrate on DU rather than adopt a
9 one-size-fits-all approach, and that blended waste
10 should not be part of this rulemaking. Slide number
11 12, please.

12 As I mentioned earlier the staff
13 appreciate all the comments that we received from
14 stakeholders. As a whole we see the comments going
15 either way, in support and disapproval of what we
16 proposed, and overall the comments balance out pretty
17 well.

18 We didn't see any showstopper, and we are
19 okay and comfortable with the current direction that
20 this rulemaking is going. However, there are
21 instances where we felt that certain issues is not
22 balanced. In that case, we looked at the technical
23 aspect of the comments and considered revisions for
24 the proposed rule language.

25 And in the next few slides I will talk

1 about the revision that the staff is considering for
2 the proposed rule language, resulted from the comments
3 received.

4 And on this slide, Slide number 12, we
5 received a couple of comments that we should include,
6 natural system and environment as part of the evaluate
7 uncertainty in a performance assessment. We thought
8 it was a very good comment and revised the language in
9 Section 61.13(a) to clarify that the evaluated
10 uncertainties in a performance assessment covers the
11 disposal system, which encompass the disposal
12 facility, natural system, and the environment.

13 And the staff is considering this revision
14 for the proposed rule language, and on the screen you
15 see red text with strike out and underline. The
16 strike out are the text that's in the preliminary
17 proposed rule language, and the underlined is the new
18 text that the staff is considering as a revision to
19 the already proposed rule language. Slide number 13,
20 please.

21 As I mentioned before, we received
22 comments regarding the requirement that intruder
23 barrier must be shown to be affective over the
24 duration of the compliance period, and we've received
25 comments saying that's unreasonable, it can not be

1 done.

2 We appreciate the comments and revised the
3 language in Section 61.7(c)(7) to clarify that the
4 technical basis provided for the performance of
5 future, I apologize, of the intruder barrier, will
6 determine how long the performance should be credited.
7 And we crossed out that over duration of the
8 compliance period part.

9 And the Staff is also considering this
10 revision for the proposed rule language.

11 CHAIRMAN RYAN: Okay, that's a good step,
12 I think. I still struggle with the fact that an
13 inadvertent intruder becomes an advertent intruder at
14 some point. An example, I'm familiar with this bylaw,
15 there are brass plates stamped radioactive material,
16 do not dig into concrete, alarmed, concrete reinforced
17 barrier, over them is Class C disposal cells.

18 (Simultaneous speaking)

19 CHAIRMAN RYAN: Somewhere along the line,
20 our brass may rot somewhere down the line, but for a
21 while it's going to hold up for, you know, quite a
22 long while. Why can't some of those kind of things be
23 incorporated into the rule?

24 I think at some point we have to address
25 the idea that an inadvertent intruder, which we have

1 an obligation to protect, I don't deny that for a
2 second, becomes an archaeologist and at some point,
3 you know, buyer beware, I mean they're --

4 MEMBER ARMIJO: Well, you know, I just
5 don't understand this obligation to protect someone
6 far into the future from low-level waste exposure, and
7 putting incredible burdens on people living today
8 where no safety benefit, you know, this whole concept
9 is, to me it is unjustified.

10 But the way you've changed the language of
11 these barriers, there has to be some barriers. And
12 they don't have to be evaluated over the period of
13 performance of the facility or 20,000 years. So that
14 means these are the barriers that probably exist today
15 in a low-level waste facility.

16 CHAIRMAN RYAN: Correct.

17 MEMBER ARMIJO: Which is great, you know.
18 I agree that they're buried, I mean, I think our job
19 is to protect people --

20 (Simultaneous speaking)

21 CHAIRMAN RYAN: And I'm adding to this
22 point by saying at some point we need to bring a
23 closure to the inadvertent intruder, because they are
24 going to become archaeologists at some point.

25 MR. GROSSMAN: Dr. Ryan, this --

1 CHAIRMAN RYAN: Once they intrude,
2 whenever they intrude. Yes, I'm sorry, Chris.

3 CHAIRMAN RYAN: This is Chris Grossman of
4 the NRC staff. The original Part 61 did envision such
5 a scenario. There were a series of what I'll call
6 generic scenarios that were used on a reference site
7 to develop the Waste Classification Tables in 61.55.

8 And one of those scenarios included a
9 variant which was an intruder discovery scenario in
10 which the original scenario was a construction type
11 scenario where someone may come onto the site to
12 develop a residence, begin excavation --

13 MEMBER ARMIJO: Love Canal. Okay, you
14 know, but I think we've learned a lot since Love Canal
15 and does that really apply today --

16 MR. GROSSMAN: Let me finish my thought,
17 please. The advantage of this is, the discovery is
18 that as they dig into the soil, some of this material
19 becomes recognizable. Operations stop. The
20 assessment examines the exposures to that point and
21 then is done. And that helped form the basis for some
22 of the values that are in the table at 61.55. We
23 envision continuing that philosophy in the intruder
24 assessment, that becomes site-specific.

25 We will talk a little bit more about some

1 of the guidance that we would provide and how to deal
2 with that for a site-specific assessment, in terms of
3 demonstrating that the material would be recognizable,
4 et cetera, and we can discuss that further when we get
5 to that section.

6 But we feel we do incorporate that kind of
7 a philosophy into, well one, that it's already
8 incorporated into the rule, and that we plan to
9 continue that as we add to site-specific intruder
10 assessments.

11 MEMBER ARMIJO: So you would have very
12 strict constraints on what the intruder is capable of
13 doing? He's capable of reading the sign, or
14 recognizing he's dug into a waste thing and at that
15 point, he just can't keep going. He can't build an
16 orphanage there, or, you know.

17 MR. ESH: Yes, that's --

18 MEMBER ARMIJO: Somehow you've got to
19 truncate this thing or it becomes so open-ended.

20 MR. ESH: I think that --

21 MEMBER ARMIJO: There's no solution.

22 MR. ESH: The problem is that in that,
23 okay, in current disposal practices, they put material
24 in carbon steel drums for instance, maybe in some
25 cases cementitious packaging of some sort, and those

1 sorts of materials have durability over, certainly the
2 tens of year time frame. And for cementitious
3 materials we do a lot of research on that in waste
4 disposal programs, and try to determine what sort of
5 durability they'll have over much longer time frames.

6 And we generally think that people can
7 take into account that sort of information if they
8 have it. In many cases we find that they feel it's
9 just easier if they don't credit that sort of
10 information, and just do the analyses, and set some
11 limits on what they take operationally, whatever to
12 get through the licensing process. They want to
13 minimize their pain in getting through the licensing
14 process --

15 CHAIRMAN RYAN: Another aspect is you have
16 to assume the failure of institutional controls, and
17 by that I mean, you know, there's huge amounts of
18 money in long-term care products --

19 MR. ESH: Yes.

20 CHAIRMAN RYAN: Wait a second. And those
21 funds are capable of going basically forever. Because
22 they're earning interest, and the amount that they
23 take out for maintenance every year is trivial
24 compared to the total amount in.

25 So, you know, we assume institutional

1 barriers end at some point. Now I'm not sure that end
2 means, you know, 100 years, probably not, 300 years,
3 probably not. You know, so there's long periods of
4 time where the money's still there to make sure that
5 folks recognize it for what it is.

6 MR. ESH: Yes, and the institutional
7 control period was not pulled out of thin air. I
8 mean, when the regulation was developed in the early
9 '80s, they had a series of public meetings with, like
10 interactions like this where they got all sorts of
11 opinions, and that kind of reflects the consensus
12 opinion at that time. Now is there a different
13 opinion today? We didn't have a lot people comment --

14 CHAIRMAN RYAN: But at that time the
15 amount of money collected wasn't set at all.

16 MR. ESH: And that's probably a good
17 point. But I think that --

18 CHAIRMAN RYAN: Especially if there's lots
19 of money for the one site, I'm very familiar with,
20 there's lots of money in place at the Barnwell
21 facility, for example. Yes, sir?

22 MR. MCKENNEY: This is getting into the
23 territory --

24 CHAIRMAN RYAN: Could you?

25 MR. MCKENNEY: -- specifying

1 performance assessment branch issue. Our limit to
2 rulemaking was not to change the entire framework of
3 Part 61. And the institutional control period, and
4 the use of institutional controls, and the inadvertent
5 intruder are all the major portions of the framework.
6 That is what the second rulemaking is supposed to
7 consider, is to changes to the overall comprehensive
8 change to Part 20.

9 CHAIRMAN RYAN: But it's very hard for us
10 Chris, to separate the dancer from the dance here. We
11 have to kind of understand the whole picture, the way
12 things are going, you know, in order to formulate an
13 opinion.

14 MR. MCKENNEY: You know, the staff has not
15 fully went to all of those hind positions and areas
16 for the briefing.

17 CHAIRMAN RYAN: Fair enough.

18 MR. ESH: And the one point I would add
19 about, Dr. Ryan, your point about the inadvertent
20 intruder becoming an advertent intruder. For
21 something like depleted uranium, you do not have to
22 become an advertent intruder, ever.

23 Because if you bury it and it's below, say
24 the depth of where somebody puts in a foundation for
25 a home, you can run into technical problems with radon

1 emanation without ever digging into the material. So
2 you could effectively put a house above it. You don't
3 know you put your house on a waste disposal facility,
4 and you get a lot of radon in your house. All of us
5 have radon in our houses today.

6 CHAIRMAN RYAN: I was going to say, that
7 happens anywhere in the eastern U.S.A.

8 MR. ESH: And it's derived from much lower
9 concentrations of uranium in the environment
10 surrounding our homes than what we're talking about
11 putting in the disposal facility here. So just an
12 additional point to think about.

13 CHAIRMAN RYAN: But that is so token, the
14 amount of land involved is very much smaller than the
15 amount of, or from the amount of concentrations are
16 right now. So there's populations in our society.

17 MR. ESH: Yes, I agree with that.

18 CHAIRMAN RYAN: Okay.

19 MR. CARRERA: All right, let's move on to
20 Slide number 14, please. Period of Performance
21 Language. The staff considers revision to the
22 language in 61.41(b) and 61.42(b), to provide
23 flexibility to facilities that only except short-lived
24 waste or low concentration of long-lived waste.

25 These requirements call for an estimation

1 of peak annual dose that occurs within 20,000 years
2 following closure of the disposal facility. Staff
3 considered this revision based on comments received,
4 indicating that 20,000 years period of performance
5 placed unnecessary burden to a facility that accepts
6 only short-lived waste.

7 And as far as what the staff heard from
8 the Committee, this change reflects the requirement
9 for disposal facility to perform a dose monitoring out
10 to 20,000 years to find the peak annual dose. And
11 once you found the peak annual dose and it's less than
12 20,000 years, the facility has an option of justifying
13 why they don't need to do a full-blown assessment out
14 to 20,000 years for that particular case.

15 This helps alleviate the resources needed
16 to do a full-blown assessment out to 20,000 years if
17 your site that only accepts short-lived waste. And
18 there are the technical staff to my right will talk
19 more about this in their draft guidance document
20 presentation.

21 MEMBER ARMIJO: What is, you know, I'm
22 sure you understand the difference between what you
23 mean by evaluates and estimates, but to me it looks
24 like pretty much the same thing. And so is that
25 really a substantive change that you've made. So

1 could you explain what this change really means, from
2 evaluates to estimates?

3 MR. ESH: That change is not significant,
4 it is just a word change. The second part of it I
5 think, we believe gives more flexibility for the
6 situation where if you have a facility that's only
7 taking short-lived waste, or they take low
8 concentrations of long-lived waste, they'll run their
9 calculation, estimate their peak, and then make an
10 argument as to why they've captured the peak. That
11 argument could be running their calculation out to
12 20,000 years and showing --

13 CHAIRMAN RYAN: This is a subtle way of
14 saying, very little bit of uranium or a lot of
15 uranium.

16 MR. ESH: Yes, and it's a way that allows
17 somebody to make a risk-informed argument for their
18 specific facility performance, that they've captured
19 it in the evaluation. From a practical standpoint, we
20 don't see that there's a large additional burden to
21 needing to run your calculation out if you set up your
22 calculation.

23 There is a big additional burden if you
24 have to argue about what exactly is going on out at
25 those longer times, and you have disruptive processes,

1 and climate change, and all those sorts of things,
2 that becomes a much harder problem. And we believe it
3 should be a harder problem for concentrated long-lived
4 waste. So that's kind of the approach we made. It
5 may look subtle, but we think it's more significant
6 than subtle.

7 (Simultaneous speaking)

8 CHAIRMAN RYAN: -- change from, I mean
9 it's a big difference if you're in.

10 MEMBER ARMIJO: Yes, at some point, I'd
11 appreciate it if you would address the difference in
12 the NRC's proposed rule language and the Department of
13 Energy's use of 1000 years and why you think they're
14 wrong. You must, because they've got the bulk of DU
15 and they're treating it one way, and you would propose
16 to treat it a different way, so that's got to be
17 resolved.

18 CHAIRMAN RYAN: Okay.

19 MR. CARRERA: Okay, thank you. Next
20 slide, number 15, please. We have received comments
21 in regards to the waste stability language in 61.7(c)
22 which we thought was very good comments. That
23 indicates that you can also get unstable waste from
24 mixing low activity waste with long-lived low activity
25 waste. So we went back and proposed revision to the

1 language to clarify that point, and the staff is
2 considering this revision for the proposed rule
3 language. Slide number 16, please.

4 In the ambiguous language area we received
5 comments indicating that the language in 61.7(a) and
6 61.55(a) (6) is ambiguous wording and unnecessary. We
7 agreed, and the staff is considering deletion and
8 revision to the language in these two sections to
9 reduce ambiguity and improve readability. That's all
10 I have for today, thank you.

11 CHAIRMAN RYAN: Thank you, Andrew. Your
12 brief introductory presentation went a little long,
13 but it was very helpful. I think we've covered a lot
14 of ground we may not have to cover later.

15 Derek, one comment I'd offer you is, again
16 I took a look at the existing site, and under it a top
17 20 radionuclides that are in the disposal facility, I
18 used, or I decay-corrected the inventory to July 12th,
19 which is the day I did it.

20 And there's just a few radionuclides that
21 are still around in any appreciable curie quantity.
22 Cesium is one, nickel-63 is another, very little
23 strontium, a little bit's left, uranium-238, 5000
24 curies, carbon-14, and Tech-99.

25 So I offer you that thought, not that I've

1 got any particular, you know, interest in the number
2 here, but very quickly we're homing in on a half a
3 dozen radionuclides to the report.

4 And I just offer you the thought, that if
5 the guidance and not necessarily the rulemaking
6 language themselves, but perhaps yes, could really
7 focus on those radionuclides that are around after, I
8 don't know what the right number is David, whether
9 it's 300, 500, or 1000, some of those have changed a
10 little bit.

11 Cesium's gone, you know. Strontium is
12 gone in just 500 years. Maybe that's a way to focus
13 this a bit, just something to think about. So I offer
14 you that observation. But that's a real inventory for
15 a real site that's operated since '71. And has
16 covered a lot of evolution, so that's I think useful
17 data to evaluate.

18 MR. ESH: You know, we looked at that
19 data, we had those figures for the Committee in the
20 previous talk about the ratio of the inventories and
21 the activities. I think that all the facilities also
22 had what I would call a fairly significant amount of
23 thorium-232, I believe it was. We got the information
24 from the DOE MIMS database and also we looked at the
25 2005 Barnwell closure report, I believe it was the

1 inventory numbers.

2 CHAIRMAN RYAN: That's inventory as of,
3 received as of, whatever the date was, I've got it on
4 the --

5 MR. ESH: One thing that a commenter made
6 at a public meeting and really got me thinking was, I
7 wonder if there's some unintended consequences of the
8 Waste Classification Tables, because then that drives
9 people to characterize and report those isotopes.

10 But there are other isotopes that aren't
11 in the tables that I would expect show up in waste
12 streams, that maybe go under-characterized or under-
13 reported, that I think if we take the, you know, a
14 unit concentration of a whole set of isotopes, and run
15 forward, and look at their dose conversion factors,
16 and their mobility, and the environment, and all those
17 sorts of things.

18 There are isotopes that aren't in the
19 tables that could cause a problem for a disposal
20 facility, so I would just throw that out as like, you
21 know, moving forward when we go to possibly a
22 comprehensive rulemaking, I think it would address
23 that issue, where the current regulation doesn't
24 really address it.

25 CHAIRMAN RYAN: That's one possibility,

1 and the other that I know is true also, is that
2 there's a tendency to go in the other direction. The
3 last thing you want to have happen on a waste manifest
4 is to underestimate what's in the package.

5 So people will tend to use MDAs for hard
6 to detect radionuclides and report them as being
7 present, because they're required to report it
8 according to the MDA. So you now have an inventory
9 accumulating that's not real.

10 MR. ESH: Yes, and I --

11 CHAIRMAN RYAN: You know Jim Harris did a
12 very excellent study on power plant resin waste, you
13 know, that we had certain radionuclides were reported
14 that in fact were there in orders of magnitude less
15 inventory.

16 MR. ESH: Yes, and I don't know what the
17 cost may be associated with something like that, but
18 certainly the techniques that are available today are
19 tremendously more powerful and more available
20 technically so.

21 CHAIRMAN RYAN: GE's study was in the '90s
22 so it's not too far away from, you know, real decent
23 detection technology. But, you know, from a
24 generator's point of view the last thing they want to
25 do is say, oh, what you've shipped is more than what

1 you wrote on the manifest. That's a violation.

2 If I'm conservative and overestimate what
3 I shipped a little bit, I'm okay. So that's a very
4 important area, that the precision with which what is
5 accumulated in an inventory is an important point on
6 both sides.

7 MR. ESH: Yes, you'll see strange things
8 when you look at all the disposal sites. Like one
9 site may have a zero for a certain isotope and all the
10 other sites have it. And so you are scratching your
11 head like, was this a specific waste stream that
12 resulted in this isotope, or they just didn't report
13 it because it wasn't part of --

14 CHAIRMAN RYAN: I think it would be a
15 service to add some, and maybe it's in guidance, maybe
16 it's not in the rule itself, but to say, these are the
17 radionuclides that are in play from a performance
18 assessment standpoint, so the precision and/or
19 accuracy with which they are reporting might be
20 helpful to focus on, you know, early on.

21 MR. ESH: You know, I don't think we go to
22 that detail, but we do have a section on inventory in
23 Chapter 3 that we talk about the bulk of the inventory
24 that's --

25 CHAIRMAN RYAN: One thought is, why do we

1 have these tables? We have these tables for
2 convenience because of Marcus, but now that we can
3 measure a wide array of radionuclides fairly easily,
4 why don't we just say what's the inventory? Write
5 that down.

6 MR. ESH: Yes, I think it was, at the time
7 it was, I mean the mind set was there were two
8 options. You could take this table approach and then
9 apply it to all sites, or you could allow each site to
10 generate estimates of what it can take, and people can
11 demonstrate what they've, the generators can
12 demonstrate what they've generated and then send it to
13 the appropriate site.

14 Well at the time that 61 was initially
15 developed, they thought there was going to be a lot of
16 disposal sites, and they didn't want to have a lot of
17 variance in how Agreement States or how people were
18 determining what concentrations they could take, and
19 so they took the table approach, one size fits all.

20 CHAIRMAN RYAN: I think the other part of
21 it is computing of power, and data collection, and
22 analysis power in computing was terrible compared to
23 what it is today. So these are very complicated
24 things to accumulate and measure and record in the
25 late 1960s.

1 I mean, we didn't even have a PC in 1960.
2 So, you know, I think, again I just offer you the
3 thought that updating on the technological power of
4 data analysis, collection analysis, and computing
5 needs to be somehow recognized as offering some
6 economies here in this process.

7 And maybe the regulations can be
8 simplified to recognize that that's, you know,
9 collecting data is not nearly as hard as it used to
10 be. All right, sorry, go ahead.

11 MS. YADAV: Okay. All right, my name is
12 Priya Yadav, I'm a Project Manager for the Division of
13 Waste Management, Environmental Protection. I'm
14 managing this effort of just creating this guidance
15 document but Dave and Chris are doing all of the hard
16 work.

17 So I'm just going to talk for a couple of
18 minutes and just kind of give some context about what
19 the document is, what it's not, and then Dave and
20 Chris are going to go into more technical
21 presentations for each section of the guidance
22 document.

23 You heard from Andrew about, kind of the
24 first part of our SRM, which is to conduct the
25 rulemaking to require site-specific analysis prior to

1 disposal of large quantities of depleted uranium.

2 So now you're going to hear about the
3 second part of our SRM, which is to develop a guidance
4 document that goes along with this rulemaking, develop
5 this for public comment that outlines the parameters
6 and assumptions to be used in conducting these
7 analyses.

8 So we see the purpose of our document then
9 is to provide implementing guidance to go along with
10 these rule changes, and specifically to assist
11 licensees and applicants in conducting their analyses
12 to demonstrate compliance with the performance
13 objectives in Part 61.

14 We've defined the term site-specific
15 analysis in our document to have these four
16 components, and Dave and Chris will go into specific
17 details about each of these components in their
18 presentations.

19 But we've organized it by performance
20 objectives, so performance assessments conducted to
21 perform compliance, to demonstrate compliance with
22 61.41, intruder assessment for 61.42, the site
23 stability assessment is for 61.44, and then the long
24 term analyses are only for long-lived waste, and that
25 extends beyond the compliance period.

1 This Guidance Document is not an effort to
2 consolidate all of the guidance that currently exists
3 about conducting these analyses, simply because that
4 is a multiple-year effort and would take more people
5 than we have tasked to do this.

6 And so given the time that we have to
7 complete this guidance document, our approach has been
8 to include enough information that licensees and
9 applicants can conduct these analyses, but then refer
10 to other documents for sort of more background
11 reference information.

12 MEMBER ARMIJO: Somebody trying to comply
13 with the rule would have to go to these four
14 documents?

15 MS. YADAV: Well first they would go to
16 our document, and that would give them enough
17 information that they could conduct these analyses.
18 If they need any additional background information,
19 for example we have a chapter on performance
20 assessment, whereas this top document here took, you
21 know, like five to ten years to develop and it's a --

22 CHAIRMAN RYAN: I think it's fair to say
23 yes, Sam, they would have to go to all the documents.
24 They couldn't get it from the one document.

25 MEMBER ARMIJO: Yes, and, you know, I

1 understand. I don't know what's in them, but if
2 they're conflicting guidance, if there's a gaps in the
3 guidance that might have been appropriate before the
4 rule was changed.

5 CHAIRMAN RYAN: Well, I think it's fair to
6 say that we can not agree. That anybody that's
7 attempting to, you know, meet the requirements under
8 what's proposed and filed up here, will have to, you
9 know, develop a licensing plan, integrate in some way
10 all of these documents plus the new Guidance Document,
11 and make some kind of a proposal to the regulator,
12 whether it's in an Agreement State or the NRC, to say
13 here's what we plan to do.

14 So it's not something where I could just
15 pick a couple of handbooks off the shelf, and put
16 something together and have high expectation, I'll do
17 it in one pass. It's going to be a, you know, a time
18 consuming, expensive, and complicated interaction to
19 get any new application for any new site through the
20 system. Is that a fair, you would agree with that?

21 MR. ESH: Yes, I think that's fair. One
22 thing I would add is that, yes, we do intend for this
23 document to fill in any holes. So if we didn't fill
24 in any holes we would want to know that, so we can
25 fill them in.

1 And the other thing is that two of these
2 documents on this list aren't directly applicable to
3 low-level waste. NUREG-1854 is for incidental waste,
4 new waste determinations, and NUREG-1757 is for
5 decommissioning.

6 But they are more modern efforts and cover
7 a lot of the same topics of some things that you might
8 deal with in low-level waste disposal. For instance
9 there is a Pendexter section in NUREG-1757 that has to
10 do with engineered barriers, and how you develop bases
11 for engineered barriers and demonstrate them, et
12 cetera.

13 So there is analogous information in some
14 documents, and as Priya said, ideally we would like to
15 consolidate the Guidance, but that effort at the
16 bottom to produce the Consolidated Decommissioning
17 Guidance was a very big effort, involved a lot of
18 people and a lot of time to produce that.

19 CHAIRMAN RYAN: Well, I just offer you the
20 thought, it would be an asset in your document if you
21 had three or four pages of summarizing what you think
22 the key features are in these documents, that people
23 could emphasize over, say other parts of the document.
24 So if you kind of road-mapped that so, you know,
25 references for other --

1 PARTICIPANT: Yes, we saw that.

2 CHAIRMAN RYAN: -- all the references for
3 yours, and here's the sections and parts that we think
4 are particularly useful and valuable in these four
5 documents, and any others you want to add to the list.
6 But it would give applicants and, you know, licensees
7 I think a leg up on getting the process.

8 MS. YADAV: That's exactly what we have
9 tried to do. We have a section called The Use of
10 Other NRC Guidance Documents that we call a crosswalk,
11 that we refer the reader to specific sections of these
12 Guidance Documents where we think that augment, you
13 know, in some of our sections if we couldn't
14 duplicate, you know, ten pages, 100 pages in these
15 other documents, we refer them to specific sections to
16 augment for, you know, specific topics. So we hope
17 that's a useful tool that, you know, and you can give
18 us feedback on it, and if it's a useful reference for
19 licensees and applicants.

20 MR. WIDMAYER: The Standard Review Plan
21 doesn't seem to be referred to here. Was that?

22 MS. YADAV: This is not a list of all the
23 documents. We have a whole chapter on the documents
24 that refer to, but this just four of the kind of the
25 main ones that we refer to also.

1 MR. WIDMAYER: But the process that Mike
2 was just referring to, you would go to the Standard
3 Review Plan to generate your license application, so
4 it would seem like that would be the number one
5 reference you'd have.

6 MS. YADAV: These are specific to actually
7 conducting the analyses so these have a little bit
8 more meat on how to do a performance assessment, how
9 to do an intruder assessment. And these are kind of
10 more of the, a couple of the more recent documents,
11 but we definitely refer to NUREG-1200, which is I
12 think the one --

13 CHAIRMAN RYAN: Yes.

14 MS. YADAV: -- you're referring to.

15 CHAIRMAN RYAN: But again, I think tying
16 these back, I agree with Derek, tying those back in,
17 at least having them, you know, on the list in your
18 reference system, we talked about would help.

19 MR. ESH: Yes, and what I said about the
20 holes I would say, I think NUREG-1200 is very complete
21 in a lot of ways. When you add in these new materials
22 and the requirements, then you start dealing with some
23 issues that, and considering how things have evolved,
24 there are some things, there are some technical issues
25 that we had to cover in this Guidance that aren't

1 really in NUREG-1200, such as uncertainty, and risk
2 dilution, probabilistic analysis.

3 I'm going to talk about that as we go
4 through this presentation, but those are all areas
5 that you will not find in detail or at all in NUREG-
6 1200, which are kind of things that apply today.

7 CHAIRMAN RYAN: Thank you.

8 MEMBER ARMIJO: Okay, would the SRP have
9 to be changed at all in order to comply with this,
10 with the amended rule Standard Review Plan?

11 MR. ESH: I don't believe so. We looked
12 at the Standard Review Plan. Certainly there, you
13 could add, I think, new sections to the Standard
14 Review Plan. But that's part of what the purpose of
15 this document is intended to do.

16 Whenever we set out about it we said,
17 well, do we want to be prescriptive and make like a
18 Standard Review Plan, or do we want to be risk-
19 informed and afford some more flexibility as to how
20 you would go about the process?

21 And because of the site-specific nature of
22 a lot of the things we're dealing with, we thought it
23 was better to do the risk-informed approach which is
24 what we've used in our more modern, more recent
25 guidance like NUREG-1854, and even I would say the

1 high-level waste Standard Review Plan is somewhat
2 risk-informed at least.

3 It covers topical areas, but then it gives
4 you flexibility about how you go about providing the
5 information within those topical areas. It doesn't
6 give you a punch list of, you know, lock down A, B, C
7 and then do 1, 2, 3, so.

8 MEMBER ARMIJO: All right, thank you.

9 MS. YADAV: As Dave mentioned, a key theme
10 that we've kept in mind as we were developing this
11 document is, how to implement the SRM in a risk-
12 informed manner. So as we're discussing the primaries
13 and assumptions to be used in these analyses, we've
14 been trying to kind of talk about them in a broad
15 sense and not be very prescriptive in saying
16 specifically what parameters need to be used.

17 So we've tried to do that in a way that
18 allows licensees and applicants to kind of adapt the
19 guidance to their site-specific conditions and allow
20 them some flexibility. So we have a lot of examples
21 in the document, a lot of flow charts, and Dave and
22 Chris are today in their presentations, going to give
23 you a few examples of how we've used this approach
24 throughout the document.

25 This is just an outline of our document.

1 We're going to walk through all these sections today,
2 most of these sections today, and we'll walk through
3 by author. So Dave is going to cover kind of the
4 general technical analysis section, which covers
5 things like model support, model abstraction.

6 Chris is going to cover performance
7 assessment modeling, and then have a good detailed
8 section on the intruder assessment, and then we're
9 going to back to Dave for the site stability, long-
10 term analysis, talk about some other considerations
11 like setting inventory limits.

12 And then we have a section on performance
13 confirmation which includes things like when to update
14 the performance assessment, kind of a maintenance
15 plan. And that's it. But the last section is our
16 crosswalk section I just talked about. So I'm going
17 to turn it over to Dave and Chris now to go into kind
18 of more detail on each of the sections.

19 (Off microphone comments)

20 MR. ESH: All right. Thank you, Priya.
21 I'm going to start off with the general technical
22 analysis considerations, so what's covered in this
23 section of the Guidance Document is the scope of the
24 assessment, what we'll commonly in this field see the
25 terminology is features, events, and processes,

1 scenarios.

2 It covers what we call general elements of
3 the assessment, and I'll show you what those are. The
4 period of performance, there's guidance provided for
5 it. I'm not going to talk in detail today about the
6 dosimetry section or the peer review and expert
7 elicitation section, but I'm prepared to discuss those
8 if you would like.

9 And then we also have, in this General
10 Technical Analysis section, we talk about uncertainty.
11 So first in the scope of the assessment, under the
12 scope of the assessment, we provide approaches or how
13 you may go about doing features, event and process
14 identification, screening, and implementation.

15 And what you'll see if you look at the
16 literature is, people will use formal or informal
17 approaches, and they'll take a top-down or bottom-up
18 approach. Commonly it's iterative, and all of this we
19 reflected in the Guidance.

20 The features, events or processes the
21 Guidance describes, may be eliminated based on a
22 probability argument, a bounding consequence, or a
23 physical reasonableness argument. And these features,
24 events, and processes form the basis of the scenarios
25 that you use in your assessment.

1 So this issue, or this area is really
2 about, how do you determine the completeness of your
3 model, or the completeness of your analysis. If we
4 look at the example on slide 10, I don't intend for
5 you to read this, but certainly you can and we can
6 discuss it if you want to.

7 But basically this example is directly out
8 of the Guidance Document, and we've put material like
9 this in there to facilitate use of the document. It
10 basically, is the question, is my site simple or
11 complex?

12 And the reason why that is in the document
13 is because under the scope of the assessment, we
14 describe that if you have a simple site, then a more
15 informal process, or especially a top-down process may
16 be appropriate for defining the scope of your analysis
17 and the scope of your model.

18 Whereas if you're dealing with a complex
19 site, you're probably looking at a more formal
20 process, or a bottom-up type of approach to define the
21 scope of your assessment. That's what's done where
22 you take a database or what may be termed a FEP list,
23 and you go through some sort of screening process of
24 that database.

25 There's various databases that have been

1 developed out there in the technical community that
2 people use for this purpose in the waste disposal
3 field. So that example we hope provides some ability
4 to be smart about determining the scope of your
5 assessment and tailoring it to the type of problem
6 that you're dealing with.

7 In the general elements area on slide 11,
8 this is where we describe the general technical
9 elements of the analysis. And we've broken them up
10 into system description, data adequacy, data
11 uncertainty, model support, model uncertainty,
12 integration and model abstraction.

13 These are kind of the building blocks that
14 form the performance assessment and the technical
15 analyses. So if we're doing a risk-informed approach
16 to developing a performance assessment and reviewing
17 a performance assessment, if you get these basic
18 building blocks right and you have adequate quality
19 assurance, then you should be able to have confidence
20 in a good product or a good outcome.

21 So this allows us by making up these
22 general elements to ensure that a proper model and a
23 proper review of that model, or a proper assessment is
24 done. These general elements comprise the framework
25 of the evaluation. And we provide guidance in each of

1 these areas in the document.

2 Now if we switch to the period of
3 performance, what we have in the document is what we
4 think is risk-informed guidance. It discusses the
5 flexibility that you can be afforded for short-lived
6 waste or for low concentrations of long-lived waste,
7 and I'll show you an explicit example on the next
8 slide.

9 The staff views that the primary
10 differences are in the level of detail or
11 justification for the calculation, so if you can
12 demonstrate that I don't have a lot a long-lived waste
13 or I don't have any long-lived waste, I'm primarily
14 dealing with short-lived waste, then your
15 calculations, and the level of support that you have
16 to provide for your calculations are a lot different
17 than if you do have a lot of long-lived waste.

18 And we think that's an appropriate way to
19 go, and it doesn't induce an extra regulatory burden.
20 In fact, it allows people to be smart about their
21 analyses. The guidance also provides our expectations
22 for the long term analysis, what that looks like.

23 We had a number of stakeholders comment on
24 that, especially in our Agreement States, and we're
25 sensitive to the effect that this regulation will be

1 applied, or an equivalent state regulation will be
2 applied in the Agreement States. So if they have
3 questions about how they would do it, then we haven't
4 delivered the mail on it, so to speak.

5 The period of performance example here is
6 directly out of the Guidance and it talks to the
7 problem of, if you only have short-lived waste or low
8 concentrations of long-lived waste, and in the example
9 we say 1/10th of the values listed in Table 1 of
10 61.55, which would be comparable to Class A waste.

11 Well you're going to do the assessments to
12 show that you can satisfy the performance objectives,
13 but you're not going to get into this business of the
14 complexity that comes in at later times. And so we
15 think our intent in the Guidance is very clear of what
16 we would expect from the analyses.

17 And I would remind everybody that it is
18 guidance, too. And people can and do ignore the
19 guidance as they choose. Not that we intend for them
20 to do that, we hope that they follow the guidance, and
21 it's very clear in what we intend and how we would
22 solve the problem if we were doing it in not an
23 Agreement State.

24 But the difference between regulation and
25 guidance, and why some stakeholders will comment so

1 much on it about this should be in one place, or this
2 should be in another place, is because you do have
3 flexibility in guidance where you don't have the
4 flexibility in the regulations, basically.

5 CHAIRMAN RYAN: So, just to spend a second
6 on the key point, is that if you have 1/10th of the
7 table values for the long-run radionuclides, your
8 burden is really much lower, is what you're saying?

9 MR. ESH: Is what we intend to say, yes.

10 CHAIRMAN RYAN: I'm sorry.

11 MR. ESH: I mean, the text talks about
12 that. I mean, it's basically, that we want people to
13 be smart about it. So, you know, does it make much
14 sense if you say, I have a few parts per million of
15 uranium or whatever that I'm taking in my facility,
16 and the soil beside the facility has those same
17 concentrations, that you would want to spend a lot of
18 detail on a calculation to say what the risk from that
19 may be?

20 The person is not going to be spending, or
21 the community is not going to be doing any
22 calculations to demonstrate the risk from the natural
23 soil, so why would you distinguish that from the
24 disposal facility?

25 Unless if it was, of course, of a

1 different form, different mobility, all those sorts of
2 things, that comes into play. But we expect, I mean
3 the philosophy in the guidance, and hopefully when you
4 eventually see it, is we expect people to be smart
5 about it and tailor their analyses to their problem.
6 Which means more complexity for the hard problems,
7 more basis, less complexity, less basis for the
8 simpler problems.

9 We have a section on uncertainty in this
10 chapter of the Guidance. It covers a variety of
11 topics, any one of these we could have a great
12 discussion on, I'm sure. We do say that probabilistic
13 approaches are preferred but deterministic approaches
14 are acceptable.

15 You can certainly for a number a problems,
16 do a deterministic calculation and that's perfectly
17 fine, and demonstrate that you meet the criteria.
18 Particularly when you have a simple problem or, you
19 know, limited concentrations of material, probably the
20 effort and the communication barrier that you run into
21 with a probabilistic analysis may not be worth it.

22 CHAIRMAN RYAN: Just to test that thought
23 a little bit, I mean one cut to me is, you have a lot
24 of radionuclides that will decay if you accept ten
25 times the half-life as completely. They'll decay

1 within, certainly, you know, the operational period
2 plus the initial funded, you know, long-term care
3 period.

4 I'd take those completely out of play and
5 say they'll be detected by routine on-site and closure
6 period monitoring, and we'll deal with it if they show
7 up in a way that's unacceptable. Done. I mean is
8 that the kind of thing you would consider?

9 MR. ESH: Waste characteristics are one
10 thing that I would consider, yes. The one difficulty
11 with that is that the risk from the short-lived
12 material in these types of problems is derived by, I'd
13 say the discreteness of the features in the system.

14 So if you have a natural system with a lot
15 of heterogeneity and things like fractures, or dikes,
16 or some complex geology, that can even for short-lived
17 radionuclides cause you some challenges in your
18 performance assessment.

19 But in general I agree with you. If
20 you're dealing with short-lived waste, make the
21 analysis easy, focus the complicated analysis on the
22 concentrated long-lived waste.

23 CHAIRMAN RYAN: Yes, and if you've got a
24 highly-fractured system you're probably not going to
25 site there.

1 MR. ESH: You're probably not going to
2 site it there, but sometimes they learn things later
3 that they didn't learn initially, after all. Now for
4 the probabilistic analysis, we advocate the use of the
5 peak of the mean output to compare to the regulatory
6 limits.

7 We talk in this section about the
8 limitations of one-off analyses, especially for
9 deterministic analyses. In these types of systems you
10 usually have some pretty sparse information, and you
11 have a lot of uncertainties in the interpretation.
12 The robustness of the one-off analyses and the
13 interpretation of those can create some challenges.

14 So we talk about that in the Guidance. We
15 talk about risk dilution, which comes into play with
16 uncertainty and parameters, or features that typically
17 affect the timing of the releases from these types of
18 calculations. That's something we felt that there's
19 not, the example that Derek gave about the Standard
20 Review Plan, you won't find that sort of discussion in
21 it.

22 Model uncertainty, there is a expectation
23 that people will address model uncertainty. It's
24 usually addressed pretty weakly, I would say. If the
25 model support is good, then you're going to have less

1 model uncertainty. But if the model support is
2 limited, which comes into play for lots of these types
3 of calculations, then you have more model uncertainty.

4 And there's not, even if you look at our
5 fields outside of waste management, there's not a lot
6 of robust ways that people deal with this model
7 uncertainty problem. They basically just keep
8 cranking on the problem and developing information
9 until they think they have enough confidence to move
10 forward, instead of taking model uncertainty and
11 developing some sort of propagation of it through the
12 system. We have a good data uncertainty example --

13 MEMBER POWERS: Have you ever seen anybody
14 do this model uncertainty?

15 (Off microphone comments)

16 MR. ESH: I'm sorry?

17 MEMBER POWERS: Have you seen someone deal
18 with model uncertainty?

19 MR. ESH: Not in low-level waste disposal,
20 no. In the high-level waste disposal program they
21 evaluated model uncertainty. They basically looked at
22 alternative conceptual models and the NRC guidance was
23 basically, you want to look at alternative conceptual
24 models that are consistent with your data.

25 So if you have very limited data, you

1 might have a number of models that are consistent with
2 your data. If you have a lot of data you should be
3 able to hone in on one model.

4 The problem becomes if you have limited
5 data and you get into this issue of people dreaming up
6 models that are consistent with that limited data, and
7 then you put them all together and you may be way out
8 in left field in terms of, like the risk that you're
9 estimating. You still have to come back to some sort
10 of physical reasonableness, and some sort of ability
11 to constrain the results of those calculations.

12 CHAIRMAN RYAN: There is one example,
13 David, Barnwell is and I'll pick on it again, where
14 there was a tremendous effort previously, and even
15 currently today to calibrate the groundwater model
16 based on the entire system, which is precipitation and
17 all the rest of it.

18 So they actually have the ability now to
19 predict fairly accurately the response of the
20 saturated zone surface from various rain events.

21 MR. ESH: Yes they do. And generally I --

22 CHAIRMAN RYAN: So that's an example I
23 think that have been some significant effort to
24 calibrate.

25 MR. ESH: They do, generally I'd say

1 people do much better in the groundwater pathway part
2 of the problem, because there's a lot of experience of
3 dealing with contamination problems and transport in
4 environmental media.

5 It's in the other parts of the performance
6 assessment that can be very important issues around
7 the source term, release rates, and the material
8 science, and corrosion of engineered systems over
9 time. Those areas, there tends to be maybe a little
10 more uncertainty in these types of problems that you
11 run into some more model uncertainty. So but the
12 Guidance covers a lot of different topics on
13 uncertainty. I think this is Chris' turn now.

14 MR. GROSSMAN: So what David talked about
15 were kind of general considerations in performance
16 assessment methodology that apply to many of the
17 analysis that the rule will require. What we're going
18 to get into now is just specifically performance
19 assessment modeling issues.

20 And this again, performance assessment
21 being the assessment to demonstrate compliance with
22 61.41. We won't spend a lot of time on performance
23 assessment today because a lot has been written on it
24 in the past, and so this Guidance really is intended
25 to supplement previous approaches and it points

1 heavily to NUREG-1573's PA approach.

2 And we supplement that in a couple of
3 areas with the source term radionuclide transport. We
4 also point to some of the other documents in the
5 section, such as the Incidental Waste Guidance, which
6 is a little bit more modern PA methodology maybe than
7 1573, but they're consistent with each other.

8 So as I said, the Guidance here is
9 intended just to supplement in predominantly these two
10 areas. We outline site-specific parameters to
11 consider, and as Priya mentioned earlier, we don't
12 specify specifically what needs to be considered.

13 We talk in a general sense about some of
14 the processes and parameters that would need to be
15 considered in an analyses, and I've got some examples
16 here that pertain to specifically the DU issue, like
17 the radon, and modeling of radon in a performance
18 assessment, things like emanation, how do you account
19 for that, as well as migration through the subsurface
20 of the radon gas.

21 That's a little bit of a unique challenge.
22 That is tied to the uranium issue, and so we did spend
23 some time talking about some of the issues associated
24 with radon. In this Guidance on performance
25 assessment we did make some recommendations based on

1 staff experience.

2 We have some guidance on how to treat the
3 evolution of the disposal system over time, as climate
4 systems may change for long periods of time and how do
5 you account for that? Particularly in areas like that
6 affect the geochemistry or potential radionuclide
7 transport characteristics.

8 And some of that evolution may also have
9 an impact on the engineered barrier system
10 degradation, that's EBS here. I forgot to define that
11 acronym, I apologize. And so things like waste
12 containers, waste forms, how do changes in a disposal
13 system over time affect the degradation rates of those
14 materials.

15 And finally we have guidance on primary
16 model support, and Dave talked a little bit about
17 this. Developing support for the models, in terms of
18 the, that you would use to characterize degradation
19 rates for waste forms and waste containers, as well as
20 migration parameters.

21 So next we're going to transition over to
22 the intruder protection, and--oh, there it is, okay,
23 can you still hear me if I am pointing back at the?

24 (Simultaneous speaking)

25 MR. GROSSMAN: I realized I pointed at the

1 wrong people. Okay, so --

2 MEMBER POWERS: Before you get into this
3 question that I'm totally into figuring out, in this
4 intruder scenario, why did you bring that up? Do we
5 have data on lots of people intruding on disposal
6 sites that leads us to believe that they do so?

7 CHAIRMAN RYAN: No.

8 MR. GROSSMAN: I think Dr. Armijo brought
9 up one example that was kind of contemporaneous to
10 when Part 61 was originally developed, which was the
11 Love Canal example. That was a kind of a
12 contemporaneous example of things that were happening
13 at the time, that provided some impetus for the
14 protection of the intruder that was developed in the
15 original Part 61.

16 MEMBER POWERS: Usually, I write down
17 anything that Mr. Armijo says. I guess I missed his
18 particular example.

19 MEMBER ARMIJO: Well, you know this is a
20 very difficult thing for me to accept because of the,
21 it's a hypothesis and so the intruder can be a small
22 number of people, a large number of people, adults,
23 children, who knows what their capabilities are?

24 So to me, if I understood that the
25 intruder is a very well defined number of people with

1 certain capabilities, he can read, he can write, he
2 can dig a hole so many feet deep, and that's it. Then
3 I can start to say, okay well, I can do an analysis on
4 what would happen to that person if he happened to
5 just land on top of my site and only did those things.

6 My concern is that this intruder can
7 develop, in time develop all sorts of capabilities,
8 and turn a hypothetical issue into something big, when
9 it shouldn't be a big deal.

10 MEMBER POWERS: One concern about the
11 origins, I mean, to me, somebody here can say, gee we
12 ought to develop these sites so that intruders can't
13 get to the material, then they must have been
14 motivated by something.

15 MR. GROSSMAN: There are, I think a couple
16 of considerations, and I'll talk, if I don't address
17 them, what he's thinking. One is, you're in the near
18 surface environment, and humans are much more active
19 in the near surface than they may be in other
20 environments, such as deep geological disposal.

21 And so that there's a recognition that we
22 are active in that environment. And I think the
23 second then is the concept here of low-level waste, is
24 your concentrating and containing waste and so you
25 have the waste there in the near surface, and because

1 of that containment then, there is a need to protect
2 someone who may intrude into it unknowingly.

3 CHAIRMAN RYAN: You know, having been
4 involved when it was first regulated as a licensee, it
5 takes away the first 100 years, because there's
6 institutional controls, there's institutional control
7 funds.

8 And so everything like cobalt and the
9 other short-lived stuff is out of play. But what it
10 does address at least, and I'm not sure I agree and
11 like all aspects of it, but it does address those
12 radioactive materials that are there for 100s or 1000s
13 of years.

14 I mean I can give you the numbers right
15 here of what's around after 300, and it's, you know,
16 5000 curies of uranium and a few other odds and ends.
17 The part where I have seen it evolve to where I'm not
18 sure it's exactly as helpful as it could be, is that
19 pure calculations of radon doses at a house that I've
20 excavated on top of a waste trench, you know, and I've
21 got a basement, that quite frankly isn't realistic.

22 I mean, I'm going to hit stuff, like 10-
23 inch thick reinforced concrete pads over hundreds of
24 feet. They're going to tell me something's different.
25 So I wonder if it doesn't need to be revisited and

1 refreshed with regard to what is a realistic
2 intrusion.

3 And I'm not sure how long it should be an
4 obligation. Is it 10,000 years into the future that
5 we should do it or not --

6 MEMBER POWERS: My thinking goes something
7 like this, Mike. If I look at the archaeological
8 evidence as was stated, man is very busy on this
9 shallow earth. But mostly he builds on top of things.
10 He doesn't really dig down into things, he builds on
11 top of things, that's why archaeologists can make a
12 living.

13 Because they go down and actually dig down
14 and, so I'm wondering what motivated somebody to think
15 that intruder, rather than somebody that paves over
16 the thing and builds on top of it, because that's what
17 we've done, historically.

18 Now I don't know if that's what we would
19 do now, but it's, I mean I've got, well we can't go
20 back 20,000 years, but I can go back 8000 years and in
21 99 percent of those cases people do build on top.

22 CHAIRMAN RYAN: But the thing I think
23 that's important is the assumption was at the time
24 that, for 100 years, you know, that's an institutional
25 memory that we'll fund and understand. And we have no

1 other choice but to assume that everybody's going to
2 dig into it thereafter. And excavate it, that was the
3 APRA assumption, there was no discussion of these
4 kinds of points, but --

5 MEMBER ARMIJO: So, the 100 --

6 CHAIRMAN RYAN: -- just a second.

7 MEMBER ARMIJO: I understand you but you
8 say the 100 years says after that, the regulatory
9 people, the government, what, doesn't exist?

10 CHAIRMAN RYAN: Whatever dose assessment
11 I'm going to do, the assumption is 100 years plus zero
12 days is when I make the assumption of the intrusion.

13 MR. ESH: You know, I don't think that,
14 it's not that the government doesn't exist, it's that
15 you have things like government error in records or,
16 you know, financial challenge that then causes
17 somebody to take the nuclear waste fund for instance,
18 and use it for other purposes.

19 I mean it's like you have those sorts of
20 things occurring, it's not collapse of society that
21 gets you into that scenario. It's much more subtle
22 things that come into play. And I would say that the
23 purpose of it is what Dr. Ryan said, it's not a
24 calculation of, you expect this to happen.

25 It's a stylized regulatory construct that

1 does a couple things. It deals with this, people
2 being busy in the near surface issue, and it provides
3 some limits for low-level waste disposal, as to what
4 you may take in that type of facility.

5 Because you can, material that maybe
6 doesn't pass the low-level waste analyses has other
7 places that it's supposed to be able to go. It's not
8 the last stop.

9 CHAIRMAN RYAN: It is a good point to open
10 the conversation though and say, well, what's magic
11 about 100 years, and the answer is nothing.

12 MR. ESH: Yes, well as I said, it was
13 derived based on interactions with stakeholders when
14 the regulation was developed. It wasn't a number
15 pulled out of thin air. It was like people like
16 ourselves coming together.

17 MEMBER POWERS: Yes, that number it's as
18 good as any, yes, I mean I think it's historically
19 defensible, I mean, I tend to look at things like, how
20 much do you actually recall about what the potensive
21 formations were and were what. Exactly nothing, you
22 know.

23 MR. ESH: And that, one thing that we're
24 doing, or a couple of other things I would point out.
25 One in the intruder area, we're recommending or

1 proposing a 500 millirem dose limit, which implies
2 that, you could interpret it as implying an
3 unlikeliness to the scenario.

4 Because if you expected the scenario to
5 happen, there'd be no reason why you wouldn't set the
6 dose limit the same as what you set in the 61.41 dose
7 limit. And we're proposing that it should be higher,
8 consistent with what was done when the table values
9 were developed.

10 So we think that is an appropriate way to
11 go in this area. The other thing that we're doing,
12 it's a work in progress, but I got to thinking and I
13 said, you know, instead of just arguing about this
14 topic with people, let's try to quantify it.

15 Because we have some things available to
16 us that maybe can help us at least get a rough
17 estimate of what we're talking about. So I'm working
18 with one of the individuals in my section who's a GIS
19 expert, to develop disturbance maps over space and
20 time to estimate the depth of the near surface that
21 has been disturbed as development has occurred. That
22 will give us some sort of number to know whether we're
23 in the ballpark or not.

24 CHAIRMAN RYAN: It's at least a framework
25 to think about it.

1 MR. ESH: It's at least a framework to
2 think about it besides just this hypothetical number
3 of people arguing back and forth. But let's sharpen
4 our pencil a little bit and see if it yields anything.

5 CHAIRMAN RYAN: Yes, and the other things
6 that could be taken care of with that kind of an
7 approach I think, David, are the fact that most of
8 these facilities will be in at least currently very
9 rural areas.

10 MR. ESH: Yes.

11 CHAIRMAN RYAN: They're not going to be in
12 areas of great disturbance and cities and all the
13 rest.

14 MR. ESH: There's a second requirement
15 that you're supposed to avoid areas of large
16 population growth when you pick a facility.

17 CHAIRMAN RYAN: Yes, so if you can somehow
18 calibrate a little bit of what, you know, what are the
19 disturbance rates, and loss of knowledge rates for
20 those kinds of, you know, facilities, areas, and what
21 not. That's a step in the right direction, I think.

22 MEMBER ARMIJO: I don't have a problem
23 with 100 years, I have big problems with 20,000 years.
24 You know, and does this inadvertent intruder
25 evaluation have to be done out to that time, and I'd

1 say, why? You know, what obligation do we have today
2 to protect someone 20,000 years in the future?

3 I'm not talking about huge populations
4 either. We're just talking about the limited number
5 of people that might stumble onto these sites, and
6 when all memory has disappeared and no --

7 MR. ESH: And I would agree with you. If
8 in fact it was the intruder performance objective that
9 was going to be completely driving your decisions with
10 respect to long-lived waste. But the reality is for
11 some isotopes, you're going to be limited by 61.41,
12 the normal evolution of the system to release into
13 groundwater, et cetera.

14 And so for other isotopes you're going to
15 be limited by the intruder type assessment. Generally
16 for the short-lived isotopes, you're going to be
17 limited by the intruder assessment, and for the long-
18 lived isotopes you're going to be limited by 61.41,
19 not by the intruder assessment.

20 If in fact as we go forward, we're finding
21 that, okay the 20,000 year intruder results are
22 driving the decisions people are doing with their
23 material, then I think that would be a reason to look
24 at it and think about the point that you have is, you
25 know, is this the right thing to do?

1 CHAIRMAN RYAN: And I think that exact
2 point ought to be in the Guidance.

3 MEMBER BLEY: Well, that's what I was
4 wanting to ask, you know, the kind of things you were
5 talking about just a minute ago, about things you're
6 researching that could make this a cleaner process.
7 When is it likely that, that would be available to
8 people who are going to be trying to do these
9 calculations?

10 MR. ESH: I was hoping we would have
11 something that I could talk about to the Committee in
12 this time frame, but we're not there yet. It's turned
13 out to be a little more complicated. I'm always
14 optimistic about things like this.

15 CHAIRMAN RYAN: That's fair, I think,
16 you're in the process of developing, but I think this
17 very topic and these materials that you're developing
18 really should be in the Guidance.

19 MR. ESH: Yes, in this particular area, I
20 don't know whether it's going to yield results of,
21 well the probability is 1E to the minus 5, or it's 1E
22 to the minus 1. You know, I have no idea how it's
23 going to turn out, I just thought it's an area where
24 we should probably quantify a little better, and that
25 may give us some regulatory basis for whatever we

1 choose.

2 And because this is a limited scope
3 rulemaking, we don't feel like we have to go head on
4 about this intruder performance objective right now.
5 As we go forward to the more comprehensive rulemaking,
6 we think that would be the opportune time to bring
7 some of this information into play and see if it's the
8 right framework or not.

9 CHAIRMAN RYAN: Well it's certainly, you
10 know, if you bring this work to closure, it's
11 certainly a good way to, you know, risk-inform the
12 whole process in this area.

13 MR. ESH: Yes, this idea came, didn't come
14 early enough to me to allow --

15 CHAIRMAN RYAN: So you're seeing it better
16 late than never, David.

17 MEMBER BLEY: I don't have a good mental
18 picture of the overall rulemaking, this limited one in
19 the larger scale, and how the things you're trying to
20 develop would align with when people will have to do
21 something about these things. Are you going to talk
22 about that somewhere along the line here?

23 MR. ESH: I think --

24 MEMBER BLEY: I'm sure you hoped to have
25 things already, but are we going to have the chance

1 that we have a rule out there that people have to
2 respond to, and you haven't been able to give them
3 really good tools yet?

4 MR. ESH: Well, I think that the rule that
5 we'll have, the staff will have confidence in this
6 rule, and its supporting basis, and its Guidance
7 Document at the time it goes out. If we're doing some
8 other efforts to prepare for a more comprehensive
9 rulemaking, I don't think that affects our decisions
10 about what we're doing in this limited scope one.

11 So I don't know if I answer your question,
12 but that's kind of how we feel about it. We aren't
13 going to go out with something now that we aren't
14 confident is the right thing to do.

15 MR. GROSSMAN: Okay, where was I?

16 CHAIRMAN RYAN: Slide 17.

17 MR. GROSSMAN: Not yet. I'm sorry. So I
18 don't, I'm not aware of how familiar the Subcommittee
19 is with the intruder protection requirement. We have
20 kind of three legs showing here to the intruder
21 protection, and this is under the proposed rule.

22 Two of the legs already exist in the
23 current rule, namely being that in order to
24 demonstrate protection of inadvertent intruders, you
25 have to demonstrate compliance with the waste

1 classification and segregation requirements, so this
2 is going to the tables, determining your classes, and
3 making sure that they are segregated according to
4 class types, et cetera.

5 CHAIRMAN RYAN: Yes I might, just for
6 everybody's benefit, that's not only the generator's
7 responsibility, it's typically something that's fully
8 inspected before or as the waste is received for
9 disposal, so the Agreement States where the licensing
10 bodies like the NRC itself would certainly have a
11 thumb on that right at the front end.

12 MR. GROSSMAN: Right. And the
13 classification part was developed during the
14 development of the Part 61, through what I'll call the
15 reference analyses. And so they used a reference
16 site, they developed a set of reference scenarios for
17 an intruder assessment, and they used those then to
18 develop the Waste Classification Tables.

19 And so there is a set of kind of human
20 activities that could occur, that has been used in the
21 past, and we'll bring those forward in the intruder
22 segments.

23 CHAIRMAN RYAN: I think it's very
24 important for everybody to understand that those
25 intrusions were envisioned in systems that were much

1 less robust than what's used now.

2 These were cardboard boxes, earthen
3 trenches, earthen covers and, you know, the idea that
4 you would build a house on a disposal trench,\ or have
5 some other kind of intrusive activity, did not really
6 recognize the robustness of waste forms, waste
7 containers, or currently technology that's in place
8 currently at the existing sites.

9 MEMBER ARMIJO: So would the tables be
10 different today?

11 CHAIRMAN RYAN: Oh yes.

12 MEMBER ARMIJO: If you generated those
13 tables today based on the way you're --

14 CHAIRMAN RYAN: In my opinion they would
15 be. Now they certainly would be for, I want to guess,
16 let's just pick a round number for the sake of the
17 argument, 500 years, but after that you could then
18 argue that concrete degrades, or reinforced concrete
19 degrades.

20 It would be in the longer term scenario
21 that David spoke about, but I think for a large
22 portion of the decay of the radioactive material, it
23 would be very difficult to be an inadvertent intruder
24 today.

25 MR. GROSSMAN: So part of mentioning that

1 is to segue into what I'm going to spend the rest of
2 the time on, is the new part, the intruder assessment,
3 because that's largely what we deal with in the
4 Guidance.

5 But that isn't necessarily something
6 that's all that new, it's an extension we feel of this
7 part of the requirement that was originally there.
8 There was an assessment done. This is using the
9 Commission's direction to make that more site-
10 specific, and allow licensees the flexibility to
11 incorporate some site-specific information into that
12 assessment.

13 CHAIRMAN RYAN: One key point though, is
14 I'm assuming, the probability of intrusion is still
15 one.

16 MR. MCKENNEY: Except for the fact that we
17 don't require 25 millirem, which would be true if we
18 had a probability of one, Dr. Ryan. Make probability
19 one then every intruder will be a member of the
20 public, and member of the public dose limit for Part
21 61 is 25 millirem.

22 CHAIRMAN RYAN: So I have a probability of
23 a new intruder, the probability of one where 60 out of
24 500 millirem dose limit?

25 MR. MCKENNEY: Yes.

1 CHAIRMAN RYAN: But the probability of
2 intrusion is still one.

3 MR. MCKENNEY: When you assume it's --

4 CHAIRMAN RYAN: You assume it's going to
5 happen, period. So that's a probability of one.

6 MR. MCKENNEY: Well, now that would be
7 saying that every --

8 MEMBER ARMIJO: Well that's a
9 deterministic analysis, then.

10 CHAIRMAN RYAN: It's a deterministic
11 number but they use a different dose limit for that
12 long term intrusion. You can split the hairs on how
13 it's viewed, but that's what happens. The
14 calculational rate's a probability of one.

15 MR. GROSSMAN: So since the intruder
16 assessment in terms of site-specific analyses is new,
17 this section of the Guidance is more of a stand-alone
18 section. It does draw upon, kind of the philosophy
19 that underlies 15.73, being it tries to be PA-like, as
20 much as it can given that it's a hypothetical
21 construct.

22 It also draws on 1854 for that reason.
23 1757 in terms of scenario development, we drew on that
24 heavily in terms of reasonable foreseeable scenarios
25 and how to develop those for a site-specific basis.

1 And it does touch on the branch technical position on
2 concentration averaging.

3 MEMBER ARMIJO: Do you have a, just
4 definition of what the inadvertent intrusion
5 performance objective is?

6 MR. GROSSMAN: That's the rule language.

7 CHAIRMAN RYAN: It's the whole rule?

8 MR. ESH: No, no, 6142.

9 MR. GROSSMAN: 6142, it's that section of
10 the rule, that's the performance objective for
11 protection of inadvertent intruders. And so
12 apparently what it requires are the top and the left
13 bubbles. And the proposed rule would add the lower
14 right quads, intruder assessment.

15 MEMBER ARMIJO: I'm just going to keep on
16 reading and I'm trying to find out in words.

17 MR. ESH: I can read this to you if you'd
18 like. It's real short.

19 MS. YADAV: It's slide 14 from Andy's
20 presentation.

21 (Simultaneous speaking)

22 MR. ESH: All right. Design operation
23 enclosure of the land disposal facility must ensure
24 protection of any inadvertent intruder into the
25 disposal site who occupies the sites, or contacts the

1 waste at any time after active institutional controls
2 over the disposal site are removed. The annual dose
3 must not exceed 500 millirems total effective dose
4 equivalent. That is something new we added.

5 MEMBER ARMIJO: So that the only number I
6 see is the 500 millirem, that's the only
7 quantitative?

8 MR. ESH: Yes, and in part A of 61.42 as
9 imposed.

10 MEMBER ARMIJO: And it's 500 millirem?

11 CHAIRMAN RYAN: TEDE.

12 MEMBER ARMIJO: TEDE for, okay. So that's
13 the number that you have to meet.

14 MR. ESH: Okay?

15 MEMBER ARMIJO: And if you didn't have
16 depleted uranium, if you did it at 100 years, it's
17 never going to get worse?

18 MR. ESH: Not, well not necessarily.
19 Other uranium goes into these facilities, as Dr. Ryan
20 mentioned, Barnwell has 5,248 curies of --

21 CHAIRMAN RYAN: Something like that, yes.

22 MR. ESH: -- uranium-238. They also have
23 thorium-232, so anything that has some ingrowth, and
24 if that material was in some way processed or purified
25 and then disposed of, so it's not a secular

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1 equilibrium, then you can get some ingrowth of some of
2 the daughters over time that can have a greater
3 propensity to cause risk than the parent.

4 CHAIRMAN RYAN: And those times are very
5 long compared to the --

6 MR. ESH: They're long for those low
7 specific activity nuclides, I guess you could probably
8 have some shorter ones that have similar behavior.

9 MEMBER ARMIJO: Okay, thank you.

10 MR. GROSSMAN: As I mentioned, we'll focus
11 on the intruder assessment for the rest of my portion
12 of the talk. And it's an assessment to estimate
13 potential doses to an inadvertent intruder. It's
14 required for 61.42.

15 We intend it to be a PA-like methodology.
16 There is some recognition that it's a hypothetical
17 construct, and that you are not explicitly considering
18 probabilities in this like you might in a more PA
19 methodology.

20 CHAIRMAN RYAN: Well you are, the
21 probability of intrusion is fun.

22 MEMBER ARMIJO: That doesn't make it
23 probabilistic.

24 CHAIRMAN RYAN: Well I think it is a
25 probability they've assumed. I just want to make the

1 point that it is a probability of one, period.

2 MR. MCKENNEY: So is the person at the
3 fence line.

4 CHAIRMAN RYAN: Okay.

5 MR. GROSSMAN: The Guidance though, does
6 bring in some qualitative ways to consider likelihood,
7 and I'll talk about this in scenario formation, ways
8 that you can develop site-specific scenarios that
9 might be more in line with your current site
10 conditions or practices.

11 And the intent really is to identify, are
12 there any additional site-specific design and control
13 measures that might be required for the site, given
14 the wastes that are taken and the characteristics of
15 the disposal system as a whole.

16 CHAIRMAN RYAN: You know, I can think of
17 at least one site where their site fence is inside a
18 very large reservation that doesn't have public
19 access. So which fence do I use? I mean, you have
20 the flexibility to allow those kind of patterns, you
21 know, of placement and all of that.

22 MEMBER ARMIJO: You're talking military
23 reservation?

24 CHAIRMAN RYAN: I'm talking about, yes,
25 the Hanford Reservation, it has a U.S. Ecology Site

1 inside it.

2 MEMBER ARMIJO: Yes but, you know, if you
3 go way out in time and those things exist, and that's
4 --

5 MR. ESH: I think they would have to
6 shrink their footprints not maintain them, but there's
7 people from DOE here who could talk to that.

8 CHAIRMAN RYAN: Well I'm just saying, I
9 mean you do have the flexibility to recognize the
10 particular physical realities of a given site.

11 MR. GROSSMAN: I'll talk about some of
12 that in the scenario analysis.

13 CHAIRMAN RYAN: Okay great, I didn't mean
14 to pick on you.

15 MR. GROSSMAN: No, that's okay, it's a
16 segue. So the PA-like methodology here, we draw a
17 lot, this was actually kind of co-authored from 1573,
18 which they used for the performance assessment and
19 then adapted to the intruder assessment, but a similar
20 process.

21 You form your scenarios that you may
22 expect to occur based on site conditions or your
23 practices. And then you conceptualize and abstract
24 the system or simplify the physical processes going
25 on, conduct your consequence modeling.

1 And then you evaluate your site disposal
2 performance, at least the performance objective. If
3 the objective is met, fine. If not, then you may need
4 to develop some options. Some of the options may
5 include refining your analysis, maybe you've got to
6 sharpen your pencils and go back and collect more
7 site-specific data, et cetera. You may need to change
8 design, include additional barriers, et cetera, or
9 potentially set inventory limits.

10 MR. WIDMAYER: Does this allow you the
11 possibility of saying, okay I'm not going to have an
12 intruder?

13 MR. GROSSMAN: We'll talk about that in
14 the scenario formation, the guidance on that.

15 CHAIRMAN RYAN: You've made a very
16 important switch in what you just said, set inventory
17 limits. We've got a concentration-based receival
18 system, and we're switching to what I think is the
19 right way to deal with the site, which is the
20 fractional release from the inventory, is what the
21 performance assessment's all about. Now in France,
22 there's a paper out on it or several actually, where
23 they don't limit concentrations, they limit the
24 inventory of a given site.

25 MR. ESH: But they limit the inventory in

1 a container volume, which is affectively a
2 concentration, too. It's just a concentration by a
3 different name.

4 CHAIRMAN RYAN: But that doesn't drive the
5 bus, though. What drives the bus is the site-wide
6 inventory.

7 MR. ESH: But they do both, they do the
8 site-wide inventory and the container limit, and they
9 can limit what the facility can accept based on
10 either, the container or the facility, not just the
11 total facility.

12 CHAIRMAN RYAN: Well, the total facility's
13 kind of the end point though, right. They can't
14 exceed that, but they can deal with packaging and
15 arrangements of packages to deal with different
16 concentrations of material.

17 MR. ESH: Yes, I think the issue is, you
18 have a limit on what you can put in one package,
19 potentially. But then you can have different limits
20 based on how much the facility can take.

21 CHAIRMAN RYAN: Yes, and the package limit
22 is really designed for operational protection of
23 workers more than it is the long-term performance.

24 MR. ESH: I would guess so.

25 CHAIRMAN RYAN: That's true. So it's

1 still the fractional release from the inventory that
2 drives the risk bus for a low-level waste site. It is
3 not a package by package inventory, except as that
4 aggregates up to some concept, and I know it could be
5 a complicated intricate one of fractional release from
6 that inventory to an environmental vector. That's
7 what drives the risk bus, and if we're heading toward
8 that, that's terrific.

9 MR. MCKENNEY: Always in the rule. 61.41
10 always existed.

11 MR. GROSSMAN: So in some cases for
12 existing sites, at the end of the life, if you're up
13 in PA you may need a performance mitigation or new
14 sites you may decide if your options don't work out,
15 selecting a new site, that's a kind of kick-out
16 clause.

17 If you need to sharpen the pencils or
18 maybe redesign the analyses, then you might go back
19 through the loop again. And so I'm kind of pointing
20 out the iterative nature of.

21 MEMBER ARMIJO: It would help me a lot if
22 you could just describe the starting point where this
23 scenario or scenarios, exactly what are they?

24 MR. GROSSMAN: Okay, that's a good segue
25 for what I'm about to talk about.

1 MEMBER ARMIJO: And you're going to get
2 into that because, to me that sets, the result's going
3 to depend on what this intruder can do. and how many
4 there are. And how long they stay there, a bunch of
5 other stuff unrelated to the actual site itself. And
6 that's arbitrary, or defined in some way. And so I'd
7 like to understand that.

8 MR. GROSSMAN: So the first part of the
9 intruder assessment, very much similar to what you
10 might do in a PA, except in this case it's more
11 constrained. It is scenario analysis, and so this
12 would be evaluating what scenarios would result in
13 your greatest dose for compliance.

14 And here we're qualifying that by
15 reasonably foreseeable scenarios, and so we're not
16 trying to leave this open for unlimited speculation
17 about anything that could happen. We're trying to use
18 site information, site-specific information to
19 constrain that to some degree.

20 And so we do envision this process,
21 considering the site information, to allow licensees
22 the flexibility to define what reasonably foreseeable
23 is for their site. Now that provides them flexibility
24 in the near term, particularly when it comes to like
25 land use in a region.

1 Like the example of, potentially it being
2 on a reservation in the near term, if that's
3 envisioned, I can foresee a licensee using that as a
4 rationale for limiting scenarios.

5 We ran into a problem at longer time
6 frames, when you go out further in time, site-specific
7 scenarios based on cultural information I'll call it,
8 and which I'll explain more on a later slide, things
9 like land use becoming more difficult to defend
10 because predicting human activity over long periods is
11 very difficult to do.

12 And so we felt that for longer time
13 frames, kind of falling back to the default scenarios
14 that were used or considered in the development of
15 Part 61, would limit endless speculation about future
16 human activities, because these activities are typical
17 activities that humans have been engaged in for
18 periods of time.

19 Things like residence building, living on
20 a site, you know, agriculture, those kind of
21 activities, and so we felt that would limit then,
22 endless speculation about what could occur for long
23 periods. And so that's described in the Guidance.

24 The default scenarios for those who may
25 not know. There are four that we'll pull out in the

1 Guidance. Two of these come from the EIS that was
2 used to develop Part 61, that's the intruder-
3 construction/discovery scenario, and intruder-
4 agriculture scenario.

5 Intruder-drilling was developed later in
6 an update to that impacts assessment, and a later
7 NUREG/CR-4370. The intruder-well was actually
8 developed in the EIS, the impact assessment for Part
9 61, but it wasn't a major scenario.

10 And so I'll kind of run through kind of
11 the concept for each of these scenarios. Intruder-
12 construction is, someone has come on to the site to
13 construct a residence, was the hypothesis used in the
14 development of Part 61.

15 They began excavating a foundation for a
16 house that included a basement, and intruded into the
17 waste. That waste is brought up to the surface,
18 dispersed somewhat on the surface as they backfilled,
19 and spread around the area and then the workers were
20 exposed. So this is an acute exposure kind of
21 scenario.

22 CHAIRMAN RYAN: You're assuming though,
23 that, I mean again, this is fine for 1970 when it was
24 written. But wastes aren't going to be used as loam
25 for a lawn. I mean they're concrete, they're resins,

1 they're things that, you know, would be recognized.
2 How do you, you know I think a lot of that kind of
3 public scenario assumptions really need to be
4 refreshed with what's reasonable.

5 MR. GROSSMAN: One of the assumptions was
6 that the waste forms were not recognizable. If the
7 waste forms were recognizable it kicked you into the
8 discovery scenario, in this case. And at that point
9 then, the excavator backed off, their exposures were
10 limited to the period that they were digging down to
11 the discovery and then stopped.

12 And so there is some recognition for that,
13 and we intend with the Guidance to carry that
14 recognition forward.

15 CHAIRMAN RYAN: And if there have to be
16 intruder barriers, you will get a return on your
17 drill bit that will tell you this is not right, real
18 quick, like within three feet of the surface before
19 you hit any radioactive material.

20 MR. GROSSMAN: Right.

21 CHAIRMAN RYAN: That's all creditable.

22 MR. GROSSMAN: That's the intent, is if
23 you can demonstrate that, that could occur and for how
24 long it can occur, then we would envision that
25 licensees can use that information to limit scenarios.

1 MR. MCKENNEY: And the Guidance also has,
2 you don't have to use the default scenarios. You can
3 use site-specific scenarios. And using even the
4 default scenarios still would take into account site
5 conditions which it would, what is the actual depth of
6 your burial compared to what the assumptions were
7 where the other thing --

8 CHAIRMAN RYAN: Yes, okay.

9 (Simultaneous speaking)

10 MR. MCKENNEY: -- scenario, dug down three
11 meters, and you're well below that with your waste
12 starting at 15 meters, like WCS affectively after
13 covered, then that scenario would result in big zeros.
14 So you would be looking at the other scenarios for
15 what ones would intersect with your facility.

16 So it's a combination of the generic
17 structure of the original scenario, but still with
18 your site-specific conditions, and --

19 CHAIRMAN RYAN: Yes, that sounds pretty
20 good. Because it's very clear that you can use site-
21 specific data to better inform the structure of a
22 given type of scenario, that's fine and dandy. Okay.

23 MR. GROSSMAN: So the intruder-agriculture
24 was kind of the chronic extension I think then of the
25 intruder-construction, this is the person who would

1 live in the residence that was built onsite, and they
2 grow some of their food in the soil that was formerly
3 waste that was unrecognizable and spread on the
4 surface.

5 Intruder-drilling was later considered in
6 an update to the methodology of Part 61. In this case
7 you had a drill crew onsite, they may have been
8 installing a well or exploring for resources. And so
9 they drilled through the waste site unknowingly, and
10 in this case the drilling mud was put into a mud pit
11 and so forth and there was --

12 CHAIRMAN RYAN: You know, I guess in most
13 soils drilling that I've seen, you start hitting
14 something like what was disposed, one, it won't look
15 the same, again and up and to it, it's going to rattle
16 the, you know, the drill rig right off its feet.

17 MR. ESH: It depends, and the issue is, it
18 depends on your disposal system. So like, if you're
19 disposing of barrels and carbon steel in a trench and
20 you cover your trench up, and you advance forward 200
21 years, I don't know how much carbon steel, if it, say,
22 it's a human environment, how much carbon steel you're
23 going to find there.

24 CHAIRMAN RYAN: If I'm doing that within
25 the last 40 years, I'm going to have some kind of an

1 intruder barrier on top of it. You know, I just think
2 that's a bit of a reach to, when is it unrecognizable?

3 MR. ESH: Well, I think what Chris said is
4 we allow people to provide a basis for when it's
5 recognizable and when it's no longer recognizable, so
6 that affords you flexibility to demonstrate what you
7 think you need to demonstrate.

8 (Simultaneous speaking)

9 MEMBER POWERS: I actually like what
10 you've done here. I like the fact that you constrain
11 speculation because that can quickly become rampant.

12 MEMBER ARMIJO: Well, if it's constrained,
13 well defined, prescriptive in my opinion, then you'd
14 say, that's the only thing you'd have to evaluate.

15 MEMBER POWERS: I think they are, once you
16 get out, the end of this kind of intermediate term
17 period that they've essentially, because of the
18 speculation problem, they've essentially made it
19 prescriptive.

20 PARTICIPANT: I mean, hopefully by --

21 MEMBER POWERS: But done with flexibility
22 to say, well, you don't have to do this.

23 MR. WIDMAYER: I still want to know if I
24 can flexibilize myself out of the inadvertent
25 intruder?

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1 (Simultaneous speaking)

2 MEMBER ARMIJO: That's a bigger issue
3 perhaps.

4 MR. ESH: I think if you, did you say
5 flexibilize?

6 MR. WIDMAYER: Yes.

7 (Laughter)

8 MR. ESH: Flexibilize yourself out of the
9 inadvertent intruder scenario completely, you're
10 affectively relying on controls for longer than the
11 100 years that's put in the regulation. So, because
12 I think you're always going to have some land use.

13 It might not be very disturbing, you might
14 not build a house, but you can have recreational use,
15 hunting, hiking, all those sorts of things that happen
16 that you should, at a minimum have that type of
17 scenario if you're not going to be doing the
18 disturbance scenario. But it becomes difficult to
19 argue you're not going to do the disturbance scenario
20 --

21 MR. WIDMAYER: If I put all of my long-
22 lived waste or anything that I have a problem with the
23 intruder, 100 meters or deeper, and I put it out in
24 the middle of nowhere where I don't speculate
25 anybody's going to build a house over the next 10,000

1 years?

2 MR. ESH: Yes, I think that's fine, Derek,
3 I don't disagree that certainly disposal depth is a
4 very good way to mitigate this risk.

5 MR. WIDMAYER: I'm trying to give Dr.
6 Armijo a chance to figure out how to --

7 (Simultaneous speaking)

8 MR. ESH: But I would say what's the
9 likelihood, if I asked you 500 years ago, what's the
10 likelihood that there's a multi-million person city in
11 the middle of the desert in Nevada, what would you
12 have said to me? I think you would have said the
13 probability is zero.

14 CHAIRMAN RYAN: He's got you there.

15 MEMBER POWERS: People said that ten years
16 before it was built, they said that back when they
17 were trying --

18 MR. ESH: That's what you're dealing with,
19 with the human part of the process, is that --

20 (Simultaneous speaking)

21 MEMBER ARMIJO: But you always go back to
22 this thing if somehow, everything we know up to now,
23 all our technology, all our history, all our
24 regulatory practices, our government, has somehow just
25 been lost.

1 And all of sudden we know nothing, and we
2 just are innocents wandering around the desert
3 deciding to drill a well. And 500 years from now,
4 1000 years from now, 20,000 years from now, and I
5 think current generations have no responsibility for
6 those people if society falls apart.

7 Now if society continues, we have a
8 government, maybe the right thing to do is we don't
9 close up a site at 100 years automatically. You do an
10 assessment then, and say should we close it up or not?
11 You know, the city's building around us.

12 It seems to me like there's a more
13 practical ways to deal with this as you go, rather
14 than trying to predict what may happen way out in the
15 future, based on an assumption that we're going to
16 close this thing down and then forget about it.
17 Society will fall apart, and then intruders will be
18 wandering around doing a variety of things.

19 CHAIRMAN RYAN: I think there is an option
20 for that, and that's in the institutional control
21 period. There certainly is for the sites I'm familiar
22 with. There's no guarantee it's going to continue,
23 and there's no guarantee it's going to stop.

24 It's based on the assessment of the
25 performance data and the environmental monitoring

1 data, as that closure period marches on.

2 MR. MCKENNEY: Based on a current
3 experience of institutional controls is that they
4 don't really rely, they aren't reliable. We've had
5 many occurrences of failure of institutional controls
6 over the last 30 years just from Superfund sites, and
7 other sites --

8 MEMBER ARMIJO: From nuclear facilities?

9 MR. MCKENNEY: -- and underground sites,
10 and others where you're getting to a point in the
11 environmental monitoring where you're like going back
12 every five years. You don't have anyone there
13 anymore. That's when the intrusion can occur, in
14 between there, is if there is faulty maps or other
15 things like that.

16 And you can still have well drilling or
17 resource things, or you can just have people who go
18 through. And that is one of the things, not with a
19 full government's release, but there is a period in
20 time which there was access that was available and
21 that was, it will be done.

22 People doing construction all over the
23 place hit gas lines that should have been well known
24 about it, they're being used right now, but they hit
25 them now.

1 MEMBER ARMIJO: I think the conditions --

2 MR. MCKENNEY: -- or obstruction

3 concentrations, so --

4 MEMBER ARMIJO: I would think that you can

5 go to the Los Alamos Laboratory and find periods where

6 they have encountered in reports of construction

7 discoveries from the late '50s that --

8 (Simultaneous speaking)

9 MR. ESH: No, I think that's what we're

10 talking about. I mean we work for government, and

11 we're much less confident putting faith in the

12 intelligence of government, so that's effectively what

13 we're talking about here.

14 MEMBER POWERS: But, I mean, still you had

15 built this in where you give them credit, and the

16 intruder runs into something, that he's going to

17 respond, he's not a complete idiot. And say, oh, it's

18 warm and nice and I want to get down here and cuddle

19 up into this stuff.

20 (Laughter)

21 CHAIRMAN RYAN: On the other side of that

22 coin, you can envision a site that has a very robust

23 institutional control fund in the tens, if not hundred

24 millions of dollars, or \$100 million and, you know,

25 there's at least some form of government that's got

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1 cognizance and oversight of the facility that's funded
2 for, you know, very long-term care monitoring and
3 maintenance.

4 So, you know, you can go to the end of
5 that spectrum. I think the idea is if this, you know,
6 at least allows for a probability that's fairly
7 reasonable that the appropriate long-term care would
8 occur.

9 (Off microphone comments)

10 MR. GROSSMAN: Slide 21. We do allow
11 licensees in the Guidance the flexibility to consider
12 site-specific scenarios and this gets into much of
13 what we talked about already. They can account for
14 physical information, and so an intruder who
15 encounters an engineered form that's still intact and
16 recognizable would not be, we don't envision them to
17 be so stupid as to continue.

18 CHAIRMAN RYAN: Chris, somewhere on the
19 next few slides, I'll let you pick a place to take a
20 break, because we're scheduled for a break, and I
21 don't want to hold folks too long without.

22 MR. GROSSMAN: Okay, I forget, how many do
23 I have here? Let me finish mine and then we'll take
24 a break at site stability, and then Dave can come back
25 --

1 CHAIRMAN RYAN: That's at Page 21?

2 MR. GROSSMAN: That'll be slide 22.

3 CHAIRMAN RYAN: Okay.

4 MR. GROSSMAN: Okay. And so some of the
5 information that we talk about that licensees could
6 consider for physical information would be things like
7 waste characteristics. If my waste has disappeared,
8 no need for intruder assessment to go beyond that, and
9 so you can consider the time frame over which your
10 waste would produce a hazard for an intruder to
11 encounter.

12 Facility Design, do I have barriers in
13 place, et cetera. And site conditions, you know, is
14 it hospitable, or inhabitable environment, those sort
15 of things. Also for the near term, the Guidance
16 focuses on land use and that being acceptable for
17 constraining scenarios.

18 Longer term, as I mentioned, that becomes
19 more problematic and more challenging to do because
20 trying to predict what human land use would be over
21 long-term is difficult, if not impossible. And so the
22 Guidance, it does kind of specify that, that would be
23 used more for the near-term considerations.

24 And then the site-specific scenario should
25 consider changes in things like the site environment

1 over time, the degradation of engineered barriers over
2 time, those kind of things.

3 So once you've formed your scenarios, and
4 then we would abstract your system or simplify it for
5 mathematical models. And in this case, intruder
6 assessment is similar to PA but probably more
7 simplistic than a PA. It's an onsite assessment and
8 so you're not looking at off-site transport in that
9 case.

10 What you're probably focusing on here are
11 intruder barriers, source term, what are the
12 concentrations that an intruder might encounter.
13 There may be some onsite migration, and then the dose
14 assessment itself.

15 And so we have guidance in terms of
16 extracting each of these areas, and how to represent
17 them in a model or ways that a licensee may take to
18 represent them in a model.

19 And so for like intruder barriers, there's
20 guidance on assessing the capabilities of the
21 barriers, how they'll degrade over time, and
22 uncertainties associated with that degradation in
23 their capabilities.

24 The source term, we kind of envision two
25 main source term scenarios, I'll call it, for lack of

1 a better term right now, direct contact and then
2 potential for some onsite migration. The onsite
3 migration being like radon diffusion to the surface,
4 and which the intruder never actually contacts the
5 waste but may be exposed to it unknowingly still. And
6 then we get to the dose assessment. So with that, if
7 there aren't any questions, we can go to a break.

8 MEMBER ARMIJO: How about just living
9 there? That's the radon thing, you know. Somebody
10 decided he's going to build a housing development
11 right over the --

12 MR. GROSSMAN: So they never contact the
13 waste, but they say they still --

14 MEMBER ARMIJO: And you recount that they
15 live there forever. Do you have a scenario for that?
16 Would that be something that the depleted uranium is
17 the --

18 MR. GROSSMAN: Right.

19 MEMBER ARMIJO: -- the culprit.

20 (Simultaneous speaking)

21 MR. MCKENNEY: We're focused on annual
22 dose. Even I find now, that over a year that a member
23 of public lives there really does not come into the
24 equation that much, because it's an annual dose,
25 saying it's the contact is --

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1 MEMBER ARMIJO: Okay.

2 MR. MCKENNEY: -- largely, so for an
3 actual individual it doesn't really matter if he lives
4 there for five years, ten years, or anything else.

5 MEMBER ARMIJO: As long as you stayed
6 below the 500?

7 MR. MCKENNEY: Yes, right. Because any
8 long period of extra radon that you'd be getting, so
9 that a dose for that individual would actually go up
10 quite a bit, but not increase your volt during that
11 human lifetime because of the slowing growth of all of
12 the parents.

13 CHAIRMAN RYAN: Or 100 human lifetimes in
14 a row. You remember --

15 (Simultaneous speaking)

16 MR. MCKENNEY: Right, the lifetime dose
17 may be quite a bit different than the annual dose.

18 CHAIRMAN RYAN: Anyway, okay. Well that's
19 a good place to take a break, we're scheduled for
20 about 15 minutes so we'll reconvene at 3:40.

21 (Whereupon, the foregoing matter went off
22 the record at 3:23 p.m. and resumed at 3:41 p.m.)

23 COURT REPORTER: Come to order, please.

24 CHAIRMAN RYAN: Thank you. Okay, who's
25 up? Chris, are you up? Oh, David's up again. David?

1 Thank you.

2 MR. ESH: Let's change gears now and we'll
3 start talking about the site stability assessment.
4 What you see on slide 23 here is a diagram of the
5 major components of the site stability assessment,
6 which involves the site characterization. So that's
7 where you're looking at the characteristics of your
8 site including the disruptive processes that may
9 affect it, mainly natural disruptive processes.

10 The technical assessment that you may
11 perform to evaluate the stability, and in this
12 Guidance Document we cover the approaches, tools, and
13 models, and associated uncertainty with the
14 assessment.

15 And then you may attempt to mitigate the
16 instability through engineered design, and we give
17 some guidance on developing engineered designs for
18 stability and talk about some long-term
19 considerations. And then how all of these things are
20 integrated or combined with evaluation and monitoring.

21 So the site stability assessment applies
22 to the stability of the waste facility and the site.
23 For something like short-lived waste, you're going to
24 be primarily focused on the stability of the waste,
25 and maybe somewhat the stability of the facility.

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1 For longer-lived waste, then it becomes
2 much more a stability of the site problem, unless you
3 went to a very robust engineered design, but those
4 typically aren't utilized for low-level waste disposal
5 in the present day.

6 Stability is required for 61.44 and what
7 we expect, and it's conveyed in the Guidance, is that
8 people will tailor their analyses to the types of
9 wastes disposed, as I discussed under the first
10 bullet.

11 Now the next three points are important,
12 and I'd like the Committee to think about, and if you
13 have some views, certainly express them or maybe give
14 us some feedback in the future. But one area that we
15 would like some feedback on is the disruptive events
16 cutoff frequency.

17 So in, say the high-level waste program
18 they defined what events you should consider down to
19 a low probability, cutoff frequency of 1E to the minus
20 4 chance of it occurring over the next 10,000 years or
21 implied 1E to the minus 8 per year annual frequency.

22 In this Guidance we didn't specify a
23 numerical value for the cutoff frequency. What we
24 basically say is that, include those events that are
25 probable of course, over your evaluation period

1 consistent with the type of waste you're disposing of,
2 to unlikely.

3 So that implies a higher cutoff frequency
4 than, say, what was used for Yucca Mountain. And we
5 think that's appropriate because if we do have the
6 intruder assessment performance objective, 61.42, that
7 involves some sort of human activity at the site
8 and/or some form of disturbance, possibly.

9 That form of disturbance results in
10 usually higher concentrations and less dispersion than
11 would be associated with a very low frequency natural
12 event of some sort. So that gives you a kind of a
13 floor of where to set the cutoff frequency for
14 considering disruptive events.

15 MEMBER BLEY: You turned it to Yucca, what
16 did Yucca use? I don't remember.

17 MR. ESH: They used 1E to the minus 4
18 chance of occurring over 10,000 years, or affectively
19 1E to the minus 8 per year annual frequency.

20 MEMBER BLEY: And you just argued that you
21 want something lower than Yucca?

22 MR. ESH: No, higher.

23 MEMBER BLEY: Higher, okay.

24 MR. ESH: Higher, because we have the
25 intruder performance objective that results in direct

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1 disturbance and less dispersion than would be
2 associated with these very low frequency natural
3 events, is kind of the construct that we came up with.

4 MEMBER ARMIJO: David, what are these
5 disruptive events, is that a volcano, massive flood,
6 or?

7 MR. ESH: Yes, I'll show you in the next
8 slide here. The next point is the instability we're
9 recommending is defined by risk, not loss of material.
10 So you could have some situations where maybe you have
11 a large loss of material but you also have low risk.

12 Maybe there's very high dilution
13 associated with the event, for instance. But we do
14 recognize and some stakeholders expressed this in
15 their comments that hey, it's just not reasonable. If
16 you have a site and it's going to be completely
17 destroyed by some process.

18 They didn't come out and say that you
19 can't define the risk, but they said, that should be
20 exclusionary for taking that action. You haven't put
21 the site in a good place if it's going to be massively
22 disrupted.

23 (Off microphone comments)

24 MR. ESH: So for large loss of material,
25 the risk may not be able to be defined, is what we

1 talk about in the guidance. So your question, what
2 sort of processes are you talking about? Well, in the
3 site stability assessment we are recommending that
4 it's tailored to the type of material you're disposing
5 of and to the particular site.

6 So if you're disposing of short-lived
7 waste or say low concentrations of long-lived waste,
8 then you're much more concerned with the shorter time
9 scales and smaller spatial scales than you're talking
10 about with higher concentrations of long-lived waste,
11 where you're worried about the stability of the site
12 itself, as opposed to stability of the waste or the
13 facility.

14 The types of processes that we're talking
15 about are things related to climate, tectonic, so
16 earthquake type events, faulting, igneous activity, so
17 volcanic activity, but mainly for near surface
18 disposal, the bottom three.

19 Erosion processes, which can be event-
20 driven, or kind of continual processes, biologic
21 effects, so disturbance of biota for instance,
22 disruption of barrier material for instance, and then
23 climate effects such as glaciation as you go out for
24 longer times.

25 So this figure is in the Guidance

1 Document, and it's attempting to help risk-inform the
2 site stability assessment so people can tailor it, the
3 types of things they consider, and the time and
4 spatial scales that they consider for their particular
5 problem.

6 So the topics that we discuss in the
7 Guidance are disruptive processes, natural and
8 anthropogenic, what are available tools and models to
9 evaluate site stability, what are some approaches that
10 you can use for the assessment.

11 And in this area we do get a little more
12 prescriptive, we have some steps that you can walk
13 through to try to do the evaluation. We talk about
14 uncertainty, of course. We try to talk about that in
15 all our sections, where applicable.

16 And then there's guidance on engineered
17 barriers, especially engineered barriers for erosion
18 control, because that's one of the primary processes
19 we consider that may be affecting stability. And then
20 we also talk about some long-term considerations.

21 So there's a difference, if you need to
22 demonstrate an erosion control barrier for a few
23 hundred years compared to many thousand years, for
24 instance. You're talking about different problems.

25 And one of the things I would show you is

1 from this figure in the document, which is taken from
2 NUREG/CR-2642, which shows that under different
3 climate conditions and different conditions at the
4 top, moisture availability, temperature fluctuations,
5 and how, basically organic matter production, you have
6 different processes that are going to really affect
7 your rock durability.

8 And in this case erosion control review is
9 primarily achieved by using durable rock. The types
10 of rocks you select and how you do that evaluation,
11 should be tailored to the types of material you want
12 to dispose of.

13 There's a lot of good, old NUREGs and
14 technical reports and guidance documents on this topic
15 and a variety of other topics, and as I said at the
16 outset, we attempted to evaluate this information and
17 bring forward a lot of it that we thought was useful
18 and important.

19 But ideally that's a much bigger effort.
20 There's a lot of material out there, and if we really
21 wanted to do a great job at it, it's going to be
22 something that we will do in the comprehensive
23 rulemaking. But I do feel that what we have now is a
24 very good product for the limited rulemaking.

25 So then the next section after site

1 stability analysis that we have is on long term
2 analysis, and I want to make it clear it's only
3 required for the disposal of long-lived waste. And
4 the two analyses types that we're looking for are an
5 analyses of how the design and site are going to limit
6 the long-term impacts.

7 MEMBER BLEY: On the last one, could you
8 come to a conclusion about where you were thinking
9 about setting that limit, you said above, higher than
10 at Yucca?

11 MR. ESH: Oh, I see, the disruptive event
12 cutoff frequency. Yes, we didn't provide a numerical
13 value. What we basically said is, probable to
14 unlikely consistent with the material you're disposing
15 of.

16 So if you have short-lived waste that you
17 could argue, it's basically gone in 500 years, well
18 probable to likely would, in my interpretation would
19 be up to maybe a ten percent chance of occurring over
20 500 years, or ten times 500, one over ten times 500,
21 1 in 5000 type of frequency you would look at for that
22 type of calculation.

23 If you go out to 20,000 years, then you'd
24 be looking at 1 over 20 times ten, or one in 200,000,
25 is that, five even minus five, I believe, cutoff

1 frequency.

2 MEMBER BLEY: Okay. Because I was
3 thinking of what we do with reactors for risk to
4 people alive today, not out in the future sometime,
5 and LERF I think, dose commission still sits at about
6 ten to minus six per year.

7 MR. ESH: Okay, so it would be somewhat
8 consistent with that.

9 MEMBER BLEY: And that's a bad, I mean
10 that's a bad release. That's very energetic and very
11 large.

12 MR. ESH: Yes, and so this issue comes
13 into play though, when you're dealing with the
14 extended time frames as how, what sort of events do
15 you want people to analyze and what sort of frequency
16 you think is appropriate for them to analyze.

17 MEMBER BLEY: And I was just kind of
18 reflecting on what Sam said earlier and I, whether we
19 totally discount the future, which is hard to buy
20 into, it seems protecting future better than we
21 protect today is a little hard to justify.

22 MR. ESH: Yes, that's a principle in the
23 transgenerational equity literature that you'll see,
24 that you have an obligation to protect the present
25 generation primarily, and then you also have an

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1 obligation to protect future generations, but not at
2 the expense of the present generation.

3 And that becomes very complicated if you
4 have to invest a huge amount of resources today to
5 afford that protection in the future.

6 MEMBER ARMIJO: They make it very clear
7 though, that you're, and I haven't bought into it,
8 it's a moral or legal obligation, but they argue that
9 your obligation is limited to catastrophic. Protect
10 people in the future from catastrophic situations that
11 you've created today.

12 MR. ESH: Yes.

13 MEMBER ARMIJO: And that's not
14 unreasonable. So but from a very low exposure, I
15 don't think that's really consistent with that
16 thinking. So that's where I have a problem with it.
17 Low-level waste, why are you protecting somebody
18 20,000 years out into the future from some limited
19 exposure, low dose of low-level waste. If it creates
20 a burden on present. It just doesn't make sense to
21 me.

22 MR. ESH: I mean, if you were purely
23 looking at the world from a risk perspective, you
24 would argue that almost all of our nuclear-related
25 limits are probably way too low, considering the risks

1 that we accept in all sorts of other fields and
2 activities.

3 But that certainly is a good comment and
4 certainly in this limited scope rulemaking, we didn't
5 feel we had much ability to do anything drastic in
6 that area. In the more comprehensive rulemaking, it's
7 certainly an issue to discuss, but what you'll find in
8 other waste disposal programs or in other problems is,
9 they'll take it a step further.

10 In some cases they'll say, you have an
11 obligation to protect the future generation the same
12 as today. Not just catastrophic, but you have an
13 obligation to afford the same protection to.

14 MEMBER ARMIJO: And they have no
15 obligation to protect themselves, that what it
16 implies, and I'd say nonsense.

17 MR. ESH: Well I would say --

18 MEMBER ARMIJO: You know, first of all,
19 that's a philosophical point of view.

20 MR. ESH: Yes.

21 MEMBER ARMIJO: And a lot of people might
22 agree with it, a lot of people might disagree with it.
23 But the point is, it's not a law. It's not an NRC
24 policy as far as I can tell.

25 MR. ESH: No, and I think that we would

1 benefit from, because the waste problems are a little
2 different or a lot different, especially with the time
3 frame, we would benefit from having something like
4 that then we could use to formulate the constructs
5 that we make on these types of problems.

6 So the site stability analysis we covered,
7 disruptive processes, available tools and models, the
8 approaches to the assessment, uncertainty, the
9 engineered barriers, and the long term considerations.

10 Two types of analyses that we expect are
11 analyses of how the design and site limit the long-
12 term impacts, and then a calculation of the peak
13 annual dose, and this is kind of a transparency with
14 stakeholders' requirement.

15 We think at a minimum, this first type of
16 analyses is your showing how your science and
17 engineering is going to limit the impacts from your
18 action. We don't think that's a high barrier to get
19 over. Do the best that you can based on your current
20 science and technology, and show us how your system is
21 working and your site is working.

22 The second part is calculation of the peak
23 annual dose. We don't assign a limit to it. What we
24 would do if the facility was in NRC space, if we were
25 doing the review and evaluation, is we would consider

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1 these longer term doses in the context of the site
2 environmental assessment.

3 And that way you can put them in the
4 right, you don't have to be obligated to a very low
5 dose value for a long period of time, the risk context
6 that's a lot different than that. You can put things
7 in the proper context and look at all the impacts, and
8 essentially I believe for these longer term things you
9 would want to make some sort of cost-benefit argument
10 as to what you're doing is appropriate.

11 So for the long-term analysis section, we
12 provide guidelines for long-term isolation, so those
13 are things that generally are favorable to achieving
14 waste stability and long-term stability, such as, you
15 know, there are some examples in the literature of
16 some very long-lived near surface environments.

17 And those that are generally hyper-arid,
18 and you want to have low relief, for instance, that's
19 just one example, a couple of features that attribute
20 to long-term isolation. Certainly depth, as I believe
21 Derek mentioned earlier, that's a good way to achieve
22 long-term isolation.

23 The Long-term Analyses section provides
24 the scope of the long term assessment, what should be
25 done in it and the types of analyses. And in it we

1 discuss barrier and component analyses, so these are
2 types of things you can do to demonstrate how your
3 system is performing, both your engineered barriers
4 and your natural system barriers. And you can do
5 various approaches, one-on, one-off, or different
6 types of factorial analyses to demonstrate how your
7 system is performing.

8 So then moving on, our next section in the
9 Guidance is Other Considerations, and this is where we
10 talk about things like inventory limits, and
11 mitigation, and insignificant quantities. The
12 inventory limits we think is important that it is a
13 method to manage irreducible uncertainties.

14 So if you're getting into one of these
15 situations of like high technical argument or maybe
16 you have sparse data, one way to manage that is to
17 change the amount of material that you're taking.
18 That's a good way to mitigate your uncertainties.

19 Some uncertainties may be irreducible in
20 these types of problems, but the what you do with the
21 inventory is one that's under your control.
22 Mitigation actions that we don't expect, especially
23 for conservative assessments with a good technical
24 basis, but it's not unanticipated that it could occur.

25 Sometimes you get new information, new

1 scientific and technical information, either in
2 general about how things work, or specifically at a
3 particular site, that may call into question your
4 previous assessment and cause you to need to take some
5 sort of action.

6 In most cases, usually a reassessment
7 technically might be the only mitigation you need, but
8 in rare circumstances you might need to look at
9 removing some material that we would expect and the
10 Guidance talks about, you should do a cost-benefit
11 analysis and look at some things like worker exposures
12 if you were in that sort of situation.

13 And then we think it's useful to define
14 insignificant quantities to help risk-inform the
15 process. Just because you have a few atoms of some
16 material doesn't mean that you necessarily need to be
17 performing a detailed technical analysis of it.

18 So the people do define some insignificant
19 quantities for their particular site, that may be a
20 good practice both operationally and from a regulatory
21 perspective, because for all the effort that we have
22 to spend reviewing something that is insignificant it
23 takes away from the effort that we can place on
24 something that is significant.

25 And I think that's lost when people argue

1 about small details, and minutiae, and some of these
2 types of problems and reviews is, you simply have to
3 be risk-informed in order to be provide the most
4 protection.

5 So in the Other Considerations section, we
6 provide things like flow charts that, you'll see this
7 when you get to see the Guidance Document. It's not
8 intended to look at in detail on this slide. It's
9 just an example of, we provide tools to help the
10 people using the Guidance use the guidance to
11 facilitate implementation.

12 And then the last section before the
13 Crosswalk section of the Guidance is a section that we
14 call Performance Confirmation. It's basically
15 consolidating the information that you would provide
16 under the requirements listed here to ensure that the
17 facility performs as intended.

18 And basically, technical analyses we
19 expect may be updated during operation, and will be
20 operated at final closure based on our proposed draft
21 rule language. The technical analyses should be
22 updated when significant changes occur.

23 We aren't specifying in the regulation
24 that it needs to be done at a regular interval. At a
25 minimum, it needs to be done if you have some sort of

1 significant change so that you can justify you're
2 taking material that you should take and you have
3 basis for it.

4 CHAIRMAN RYAN: Or you change your
5 disposal technology --

6 MR. ESH: Or change your disposal --

7 CHAIRMAN RYAN: -- or something like that.

8 MR. ESH: A variety of different things
9 you could do to alleviate the problem. We do place
10 emphasis on performance indicators rather than, say,
11 downstream monitoring in a well. NUREG/CR-6948 was
12 the NUREG that was developed by our research group a
13 few years ago, looking at monitoring of nuclear
14 facilities and especially waste disposal facilities.

15 And for them, there may be significant
16 contamination that could result by the time you
17 observe it in your monitoring well. If you're still
18 doing things at the facility, you want to learn about
19 problems early instead of late, so that you can take
20 some sort of action to mitigate them. So that's what
21 the basis for using performance indicators are.

22 So our conclusions on the Guidance
23 Document is, we feel it's risk-informed, there's a lot
24 of material in there that lets people do the right
25 thing with their analyses and it provides flexibility

1 when warranted. We don't provide infinite
2 flexibility.

3 There's some things the staff have
4 opinions on about the right way to do certain things,
5 and the Guidance Document says, this is what we think,
6 the way you should do it.

7 We are considering development of
8 consolidated guidance after the second comprehensive
9 rulemaking. That would be a big effort that would
10 have to be budgeted and all those sorts of things.

11 And one thing we felt might be useful,
12 because as was stated, all of this regulation or
13 implementation of this regulation for the operating
14 disposal facilities happens in Agreement States
15 currently, is maybe we should put together a class and
16 training materials to go through some of this.

17 And allow the Agreement States ask all the
18 questions they need besides just sitting there and
19 reading a 160 page document. So we thought that might
20 be a useful thing to do. We haven't done that yet,
21 but that might be a useful thing to do. We'd like to
22 hear your thoughts on it, so I think that's all we
23 have on the Guidance.

24 CHAIRMAN RYAN: Oh absolutely. I think a
25 lot of the Agreement States that have to deal with

1 this have, obviously limited staff. They usually have
2 one or two folks that have really dedicated their work
3 to the waste site. And, you know, those folks,
4 retired, get better jobs, they come and go, and so
5 it's kind of a constant.

6 PARTICIPANT: What could be a better job?

7 (Simultaneous speaking)

8 (Laughter)

9 CHAIRMAN RYAN: But I fully endorse your
10 comment that having something to support the Agreement
11 States, particularly in this transitional learning
12 phase that will come, is critical as well as a great
13 idea. I mean, I think it really has to be done
14 because they'll be floundering. Is nobody not in an
15 Agreement State?

16 PARTICIPANT: Yes.

17 CHAIRMAN RYAN: So, okay. Path Forward.

18 MS. JACKSON: I'll just sit here. For the
19 Path Forward we have three points, if Stan wants to go
20 through it. We do plan on coming back in September to
21 meet with the full Committee to --

22 CHAIRMAN RYAN: That's five times the --
23 three times the fun that you're having today.

24 MS. JACKSON: Yes.

25 (Laughter)

1 (Simultaneous speaking)

2 MEMBER POWERS: You need to think
3 carefully about when you come down here. Because
4 you're going to have to bring people up to speed in a
5 short period of time and things like that. And
6 there's a need to enter strong points early.

7 MS. JACKSON: Thank you, that's a good
8 point.

9 MR. ESH: We thought you would bring them
10 up.

11 MEMBER POWERS: Well, maybe with the
12 appropriate introduction from the Chairman, certainly
13 I can help you do that. But I think there are points
14 that certainly you helped me a lot today. But I think
15 that, that could appear very early in the discussion
16 of what you're trying to do.

17 The kind of conclusion statement that you
18 had that you, flexibility without infinite flexibility
19 and things like that, maybe that ought to show up very
20 early in your presentation so to kind of give them a
21 high sign, so they don't get too lost in the arcane
22 before they understand what you've been trying to do.

23 CHAIRMAN RYAN: Yes, and early on I would,
24 you know, you've got the goals and objectives for this
25 work, and I would say key results to date. And have

1 that key results to date right up front, and say we're
2 going to go through some of the background of these
3 key results and how we got there, but we wanted to at
4 least give you the outline of those key results --

5 MEMBER POWERS: Get your, your bottom line
6 is, in my mind, a lot stronger than your introduction
7 right now.

8 MS. JACKSON: Okay.

9 MEMBER POWERS: And you don't want to lead
10 that, the full Committee on, it's not a mystery. Hit
11 them with your best shot right up front, and then tell
12 us why you had that best shot, rather than building up
13 to the best shot.

14 MS. JACKSON: Okay, thank you for that.

15 MEMBER ARMIJO: One thing you may have
16 covered but somehow I missed, is the impact that this
17 rulemaking on the existing waste disposal sites, as
18 compared to a brand new site that's going to go into
19 the business.

20 You know, and under what conditions there
21 could be no impact, or if they start accepting let's
22 say depleted uranium, they've got to do something
23 else. And so that would help to put things in
24 perspective, at least for me it would.

25 MS. JACKSON: Okay. Did you want to say

1 something?

2 MR. MCKENNEY: Oh, for, this is Chris
3 McKenney. Already we have this bias going into the
4 rulemaking, first of all. The State of Utah put into
5 place a rule that required Energy Solutions to create
6 a PA that they had to supply in June of this year to
7 the State of Utah for their, they have a performance
8 assessment covers a lot of these characteristics, a
9 different time line at the time for period of
10 performance.

11 But they do have a PA already in place, or
12 a PA that they've submitted. And the State of
13 Washington's did go back for an EIS in the past time,
14 that they would have to, of course redo an analysis
15 for if they want to take more uranium or depleted
16 uranium, but they did include uranium in that
17 analysis.

18 They went up to 100,000 years for total
19 length of time, 10,000 years point of compliance,
20 period of performance 100,000 years for others, did
21 intruder dose analyses for the site. WCS has just
22 gone through it's original licensing with a peak dose
23 of a 40,000 to 50,000 year time period, which is what
24 their analysis had to do.

25 They did not have significant quantities

1 of depleted uranium in their original analysis so
2 they'd have to revise that. And I'm not quite up on,
3 eventually exactly what Barnwell tried to do. Oh, I'm
4 sorry about that. So I mean, so for --

5 MEMBER ARMIJO: You might just kind of let
6 people know up front, okay, in your presentation that
7 hey, this is where the impact is going to be, and this
8 is what's currently going on. It would help.

9 CHAIRMAN RYAN: Yes, that's something that
10 would be very helpful I think for the rest of the
11 Committee up front.

12 MS. JACKSON: Okay. And two more points.
13 We'd like to request a letter from the SRS after the
14 September meeting.

15 CHAIRMAN RYAN: No problem.

16 MS. JACKSON: Thank you. Because they
17 planned on having the whole package up to the
18 Commission in early 2012.

19 CHAIRMAN RYAN: Okay.

20 MS. JACKSON: And that ends the staff
21 presentation, thank you for your time.

22 CHAIRMAN RYAN: Thank you all very much
23 for an engaging session. I think it's been a real
24 beneficial conversation with the Subcommittee, and you
25 put a lot of work into organizing it for us today. We

1 really appreciate it very much.

2 I think it will help us work with you and
3 with the full Committee, and come up with a draft
4 letter that we'll work on at that meeting and finalize
5 during that meeting week. So we'll keep you up to
6 date on our letter writing schedule and plans so that
7 you can --

8 MS. JACKSON: Okay.

9 CHAIRMAN RYAN: -- observe that activity
10 as well. We're going on, Dr. Bley, any?

11 MEMBER BLEY: No, nothing. I look forward
12 to seeing the methodology when you get the --

13 MEMBER POWERS: I think I have to say that
14 I was very pleased at what I saw you trying to do in,
15 especially when you're trying to constrain rampant
16 speculation in the longer term. And that you were
17 still allowing good credit for barriers and defenses
18 and things like that.

19 I thought that was a very powerful concept
20 that you were trying to advance. I think I did not
21 appreciate as much before as I do after, that you were
22 working on a limited rulemaking package and that you
23 were constrained on what you could do here.

24 And that emerged as things went along. I
25 think you might want to lay that out pretty clearly at

1 the beginning with the full Committee, understanding
2 they will not appreciate what that is, and you'll have
3 to explain what you thought the constraints were on
4 that.

5 I think, much of the stuff I like. I
6 mean, there were lots of mysteries to me like, why
7 20,000 years and things like that. You guys could
8 explain that and you're going to have to pick some
9 number, all right 20,000 is the number.

10 But the general strategy of trying to
11 bring risk into this field, but you can't go whole hog
12 because we don't have what the initiator frequencies
13 are and things like that is, and it was pretty
14 interesting. You know, I think, I'm quite favorably
15 impressed with what they have tried to do here, given
16 the constraints that they had.

17 CHAIRMAN RYAN: Excellent.

18 MS. JACKSON: Thank you, the staff has
19 worked very hard.

20 MEMBER POWERS: It shows. It definitely
21 shows that you've thought about these things. I mean
22 just in the way you answered the questions, you didn't
23 treat us as stupid. You kind of explained things as
24 though you'd thought about it broadly, and I was quite
25 pleased by that.

1 MS. JACKSON: Thank you.

2 CHAIRMAN RYAN: Mr. Ray?

3 MEMBER RAY: Well, this is a learning
4 experience for me. I certainly look forward to
5 supporting the letter to the full Committee when it's
6 developed.

7 CHAIRMAN RYAN: Thank you.

8 MEMBER RAY: Based on --

9 CHAIRMAN RYAN: That you're satisfied with
10 our vigorous examination.

11 MEMBER RAY: What?

12 CHAIRMAN RYAN: If you're satisfied with
13 the Subcommittee's vigorous examination?

14 MEMBER RAY: Oh, well I'd --

15 (Laughter)

16 (Simultaneous speaking)

17 MEMBER RAY: Sufficient is the right word.

18 CHAIRMAN RYAN: Sufficient, okay. Dr.

19 Armijo?

20 MEMBER ARMIJO: Well, you can tell I'm
21 pretty apprehensive about, because I've seen, see a
22 lot of the language and the approaches that remind me
23 of what happened to the Yucca Mountain which I think
24 was excessive in so many ways.

25 But I think you present your case very

1 well. I don't agree with the 20,000 years, I think
2 the Department of Energy has it right and I think we
3 would have an issue there.

4 And the intruder, I really got to do a lot
5 more about that intruder, you've helped a lot in
6 explaining what they can and they can't do, and the
7 extent to which you feel obligated to protect them.
8 And that's still debatable, but I understand where you
9 are now.

10 And I think your wrap-up slide gives me
11 more comfort than what I felt at the beginning,
12 because I just saw this is getting, we're going to
13 turn low-level waste into the Yucca Mountain model,
14 which is, basically was so open-ended, I don't know
15 how anybody could ever make that thing work. So I
16 think you're ready. There'll be controversy.

17 MS. YADAV: I just want to make the
18 comment. You weren't present at the briefing that we
19 did, I think in June, where we presented our rationale
20 for the period of performance and how we selected?

21 MEMBER ARMIJO: I was here. I think, I'm
22 pretty sure I was here. And I didn't like it then
23 either --

24 (Laughter)

25 (Simultaneous speaking)

1 CHAIRMAN RYAN: All right. Dr. Armijo,
2 thank you. Let me add my thanks for again, a very
3 productive and I think engaging day. Everybody that
4 presented and those that were helping out, it's a, oh,
5 I'm sorry, we'll do that in a second, but I just want
6 to add my appreciation as well.

7 We do have time for any members of the
8 public or others that wish to make a comment? If
9 there are any folks who would like to make a comment
10 on the record, now is the time. Say none? All right,
11 great, so there's nobody else who wants to make any
12 additional comments at this time?

13 MEMBER ARMIJO: How about the bridgeline,
14 was there anybody?-

15 CHAIRMAN RYAN: Is there anybody on the
16 bridgeline?

17 PARTICIPANT: I don't think anybody
18 checked in.

19 CHAIRMAN RYAN: Nobody checked in at the
20 beginning, that's for sure. So if that's that, again
21 I want to thank the staff for a very engaging day,
22 we've learned a lot more. I've gotten a lot more
23 insight into the detail you presented today which
24 helped me a lot.

25 And it's been a good conversation, so with

1 that I think we're ready for a productive full
2 Committee briefing and a letter thereafter, so we've
3 kind of met our goal to get prepared for that.

4 MEMBER POWERS: Again, you want to think
5 carefully about that presentation, because it could
6 descend into just lots of debates over what you call
7 minutiae, and miss the really salient things.

8 CHAIRMAN RYAN: All right, with that, if
9 there are no objections, we'll call the Subcommittee
10 meeting to a close. We're adjourned.

11 (Whereupon, the meeting in the foregoing
12 matter was went off the record at 4:16 p.m.)

10 CFR Part 61: Guidance for the Low-Level Waste Rulemaking

Priya Yadav, Chris Grossman, David Esh

Division of Waste Management and
Environmental Protection
Office of Federal and State Materials and Environmental
Management Programs

**Advisory Committee on Reactor Safeguards
Meeting of the Radiation Protection and
Nuclear Materials Subcommittee**
August 17, 2011

Commission Direction

- SRM-SECY-08-0147 (March 18, 2009)
 - “...(2) to develop a guidance document for public comment that outlines the parameters and assumptions to be used in conducting such site-specific analyses”

Purpose

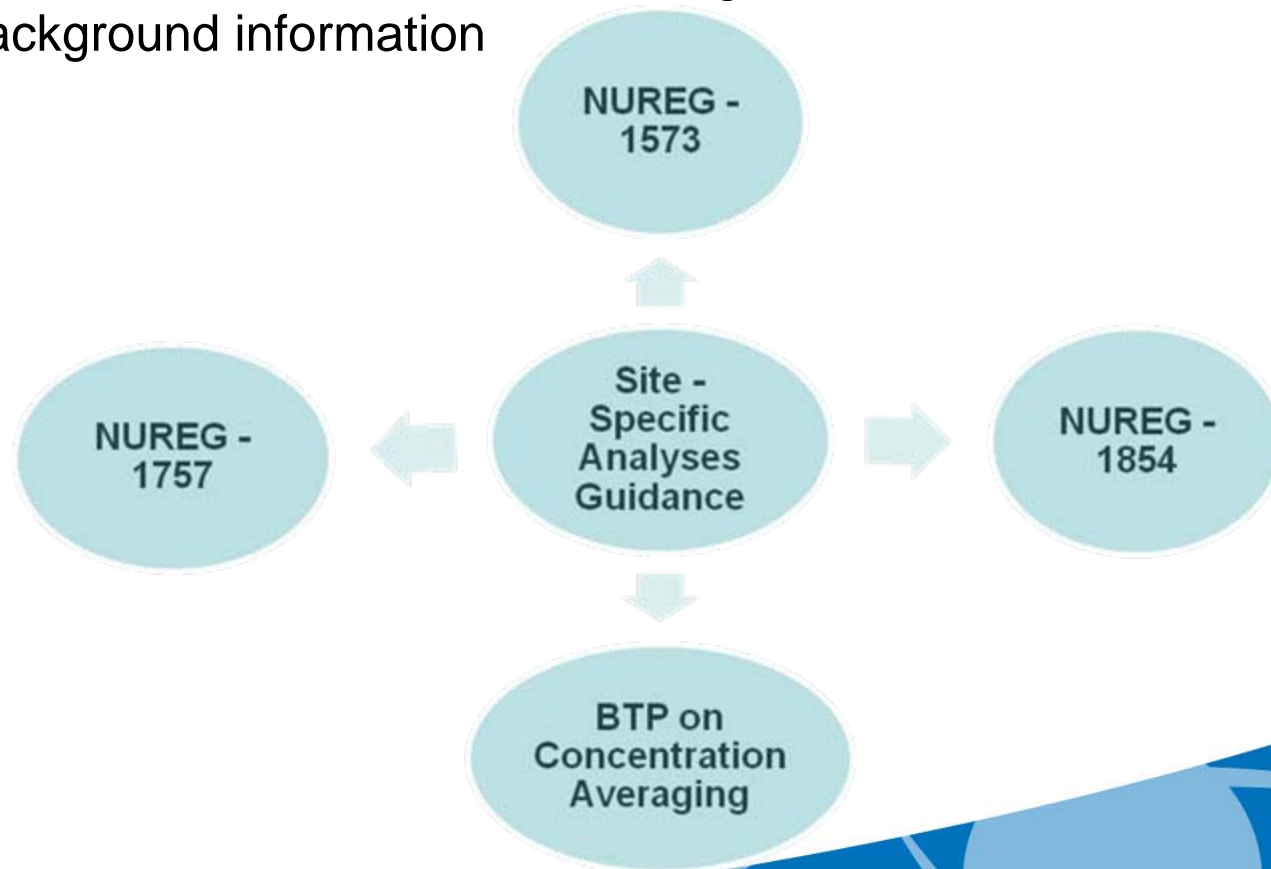
- Provides guidance on conducting site-specific analyses to demonstrate compliance with the performance objectives in Part 61:
 - Performance assessment
 - Intruder assessment
 - Assessment of stability of disposal site, and
 - Long-term analyses
- Provides implementing guidance in support of rule changes

Overview

- Supplement existing guidance:
 - NUREG-1573 , “A Performance Assessment Methodology for Low-Level Radioactive Waste Disposal Facilities” (October 2000)
 - NUREG-1854, “NRC Staff Guidance for Activities Related to US Department of Energy Waste Determinations” (August 2007)
 - “Issuance of Final Branch Technical Position on Concentration Averaging and Encapsulation” (January 1995, staff is currently updating)
 - NUREG-1757, “Consolidated Decommissioning Guidance”, (September 2006)

Overview

- Consolidates enough information to conduct analyses
 - Provides crosswalk to other NRC guidance documents for background information



Risk-Informed Approach



- Discuss parameters and assumptions to be used in analyses in a broad sense rather than a prescriptive manner
- Allows licensees and applicants flexibility to address site-specific conditions
- Examples of risk-informed approach provided throughout document

Outline

- Main topics:
 - i. Introduction
 - ii. General Technical Analyses
 - iii. Performance Assessment Modeling Issues
 - iv. Intruder Assessment
 - v. Stability Assessment
 - vi. Long-term Analyses
 - vii. Other Considerations
 - viii. Performance Confirmation
 - ix. Use of other NRC Guidance Documents

General Technical Analysis Considerations

- Scope of the Assessment – features, events, and processes (FEPs) and scenarios.
- General Elements
- Period of Performance
- Dosimetry
- Uncertainty
- Peer Review and Expert Elicitation

Scope of the Assessment

- FEPs – identification, screening, implementation:
 - Formal or informal
 - Top-down or bottom-up
 - Iterative
- May be eliminated based on probability, bounding consequence, or physical reasonableness.
- FEPs form the basis for scenarios.

Scope of the Assessment - Example

Example 2.1: Is my site simple or complex?

Simple sites are generally characterized by few disruptive processes, limited fast transport pathways, relatively homogeneous geology, high stability, and stable climatic conditions. Complex sites have higher uncertainty driven by more disruptive processes (individually and with cumulative effects), complex geology including fast pathways such as fractures, decreased stability and more highly variable climatic conditions. When there are more processes that can lead to significant releases, there will likely be higher complexity in the performance assessment of the site. The interpretation of site complexity will be influenced by the type of waste disposed. Long-lived waste disposal decreases the confidence that stability can be ensured and increases the expected variability in climatic conditions (because of the consideration of longer timeframes). In addition, the longer timeframes means that unlikely disruptive events will be more likely to be realized.

General Elements

- Describe the general technical elements of the analyses:
 - System description
 - Data adequacy
 - Data uncertainty
 - Model support
 - Model uncertainty
 - Integration
 - Model Abstraction
- General elements comprise the framework of the evaluation.

Guidance on Period of Performance

- Risk-informed, performance-based guidance:
 - Discusses flexibility for short-lived waste or low concentrations of long-lived waste.
 - Primary differences are in level of detail or justification for the calculations.
 - Provides expectations for long-term analysis.

Period of Performance – Example

Example 2.3: A facility is expected to receive typical low-level waste generated by commercial entities (e.g. limited concentrations of long-lived waste). The waste has concentrations of long-lived radionuclides at or below one tenth of the values listed in Table 1 of § 61.55. Additionally, the facility is expected to receive waste with long-lived radionuclides that are not found in Table 1 of § 61.55 that is less than the natural soils surrounding the facility.

Conclusion: A performance assessment should be completed to demonstrate compliance with § 61.41, § 61.42, and § 61.44. Because the waste is dominated by short-lived activity and long-lived concentrations are limited, specialized models and associated model support for long-term processes (e.g., cycling of climate) are not necessary.

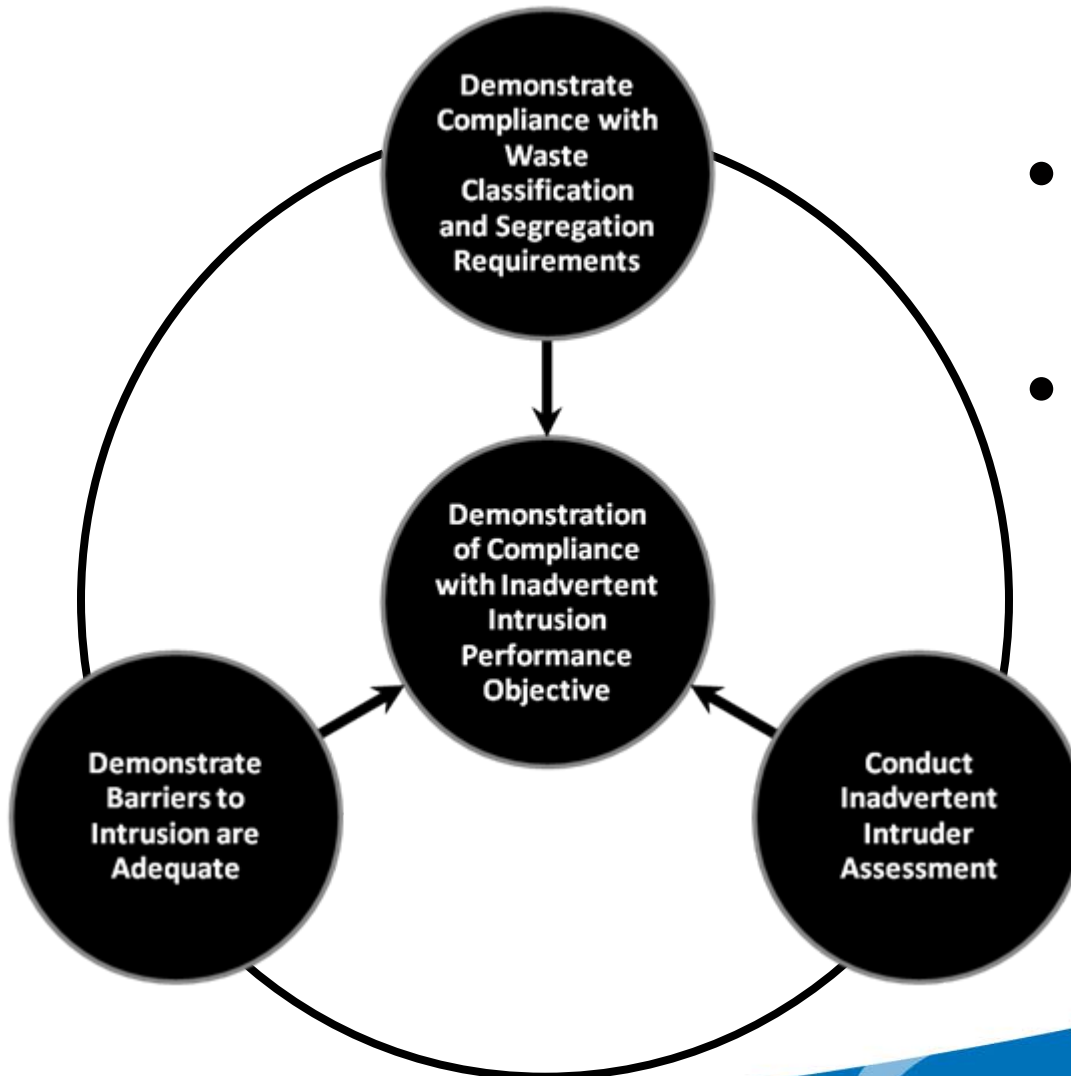
Uncertainty

- Probabilistic preferred, deterministic acceptable.
- For probabilistic, use peak of the mean output.
- Limitations of “one off” analyses.
- Risk dilution.
- Model uncertainty – consideration of physically unreasonable and highly speculative models should be avoided.
- Data uncertainty example: Transfer factors
 - Intra- and inter-site variability

Performance Assessment Modeling Issues

- Supplements NUREG-1573 PA approach
 - Source Term
 - Radionuclide Transport
- Outlines site-specific parameters to consider (e.g., radon, geochemistry, sorption, EBS degradation)
- Recommendations based on staff experience
- Evolution of the disposal system over time
- Parameter and model support

Intruder Protection

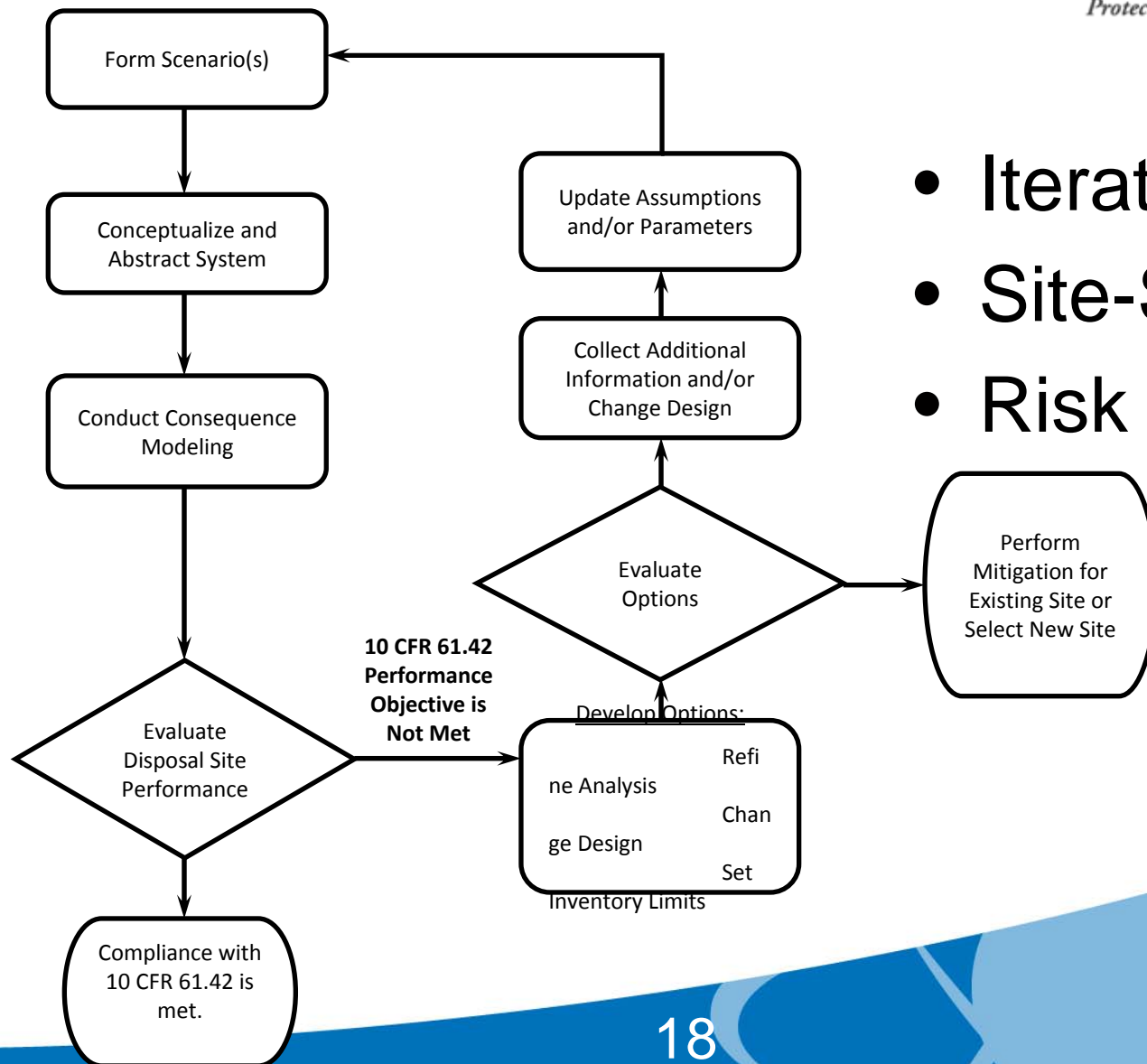


- Standalone
- Draws upon NUREG-1573, NUREG-1854, NUREG-1757, BTP

Intruder Assessment

- Estimate potential doses to an inadvertent intruder
- Required for § 61.42
- PA-like methodology
- Qualitatively considers likelihood
- Identify site-specific design and control measures (i.e., risk insights)

Intruder Assessment



- Iterative
- Site-Specific
- Risk Insights

Intruder Assessment: Scenario Analysis

- Evaluate *reasonably-foreseeable* scenario resulting in greatest dose for compliance
- Consider site information
- Flexibility to identify reasonably-foreseeable scenarios in the near-term
- For longer time frames, default scenarios limit speculation about human activities

Intruder Assessment: Scenario Analysis

- **Default scenarios**
 - Intruder-Construction/Discovery
 - Intruder-Drilling
 - Intruder-Agriculture
 - Intruder-Well
- Hypothetical constructs
- Provide reasonable bounds
- Limit speculation about human activities
- May not be appropriate at all sites

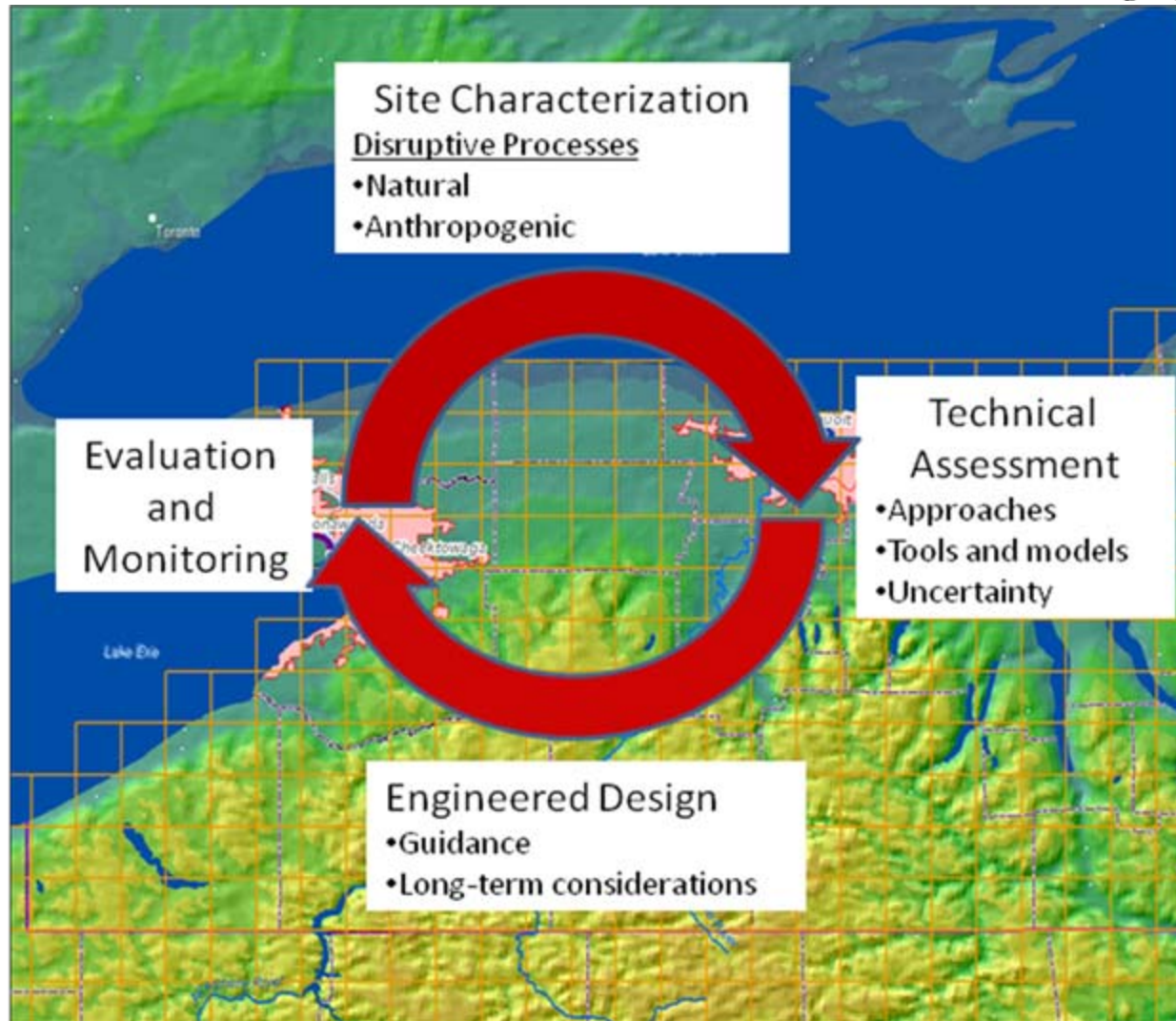
Intruder Assessment: Scenario Analysis

- **Site-specific scenarios**
- Account for :
 - Physical Information
 - Waste Characteristics
 - Facility Design
 - Disposal Practices
 - Site Conditions
 - Cultural Information
 - Land Use
- Consider changes over time

Intruder Assessment: Model Abstraction

- Intruder Barriers
 - Inhibit contact with waste and limit exposures
 - Assess capabilities, degradation, and uncertainties
 - Risk-informed
- Source Term
 - Estimate concentrations accessible to intruder
 - Direct contact vs. On-site migration
- On-site Migration
- Dose

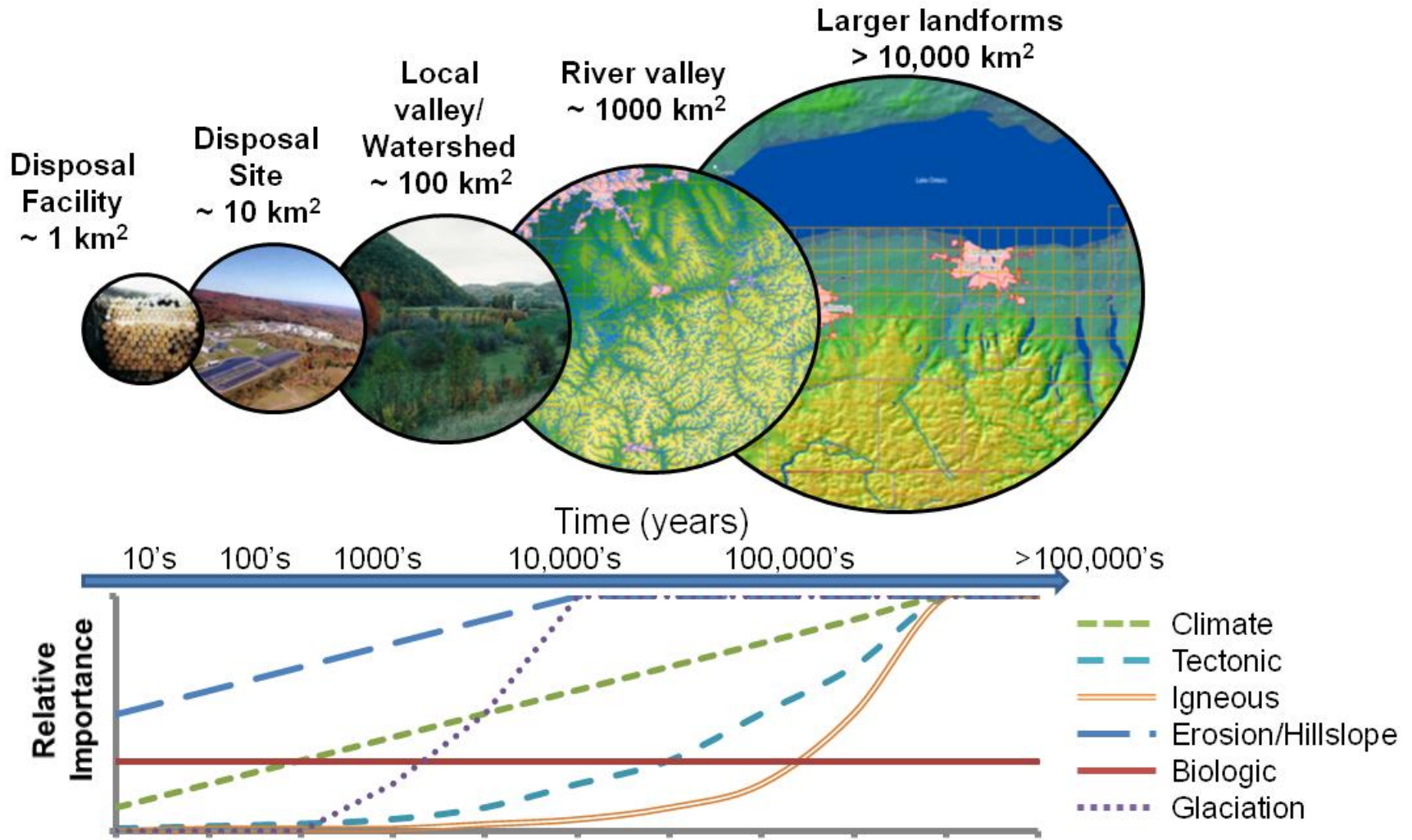
Site Stability Assessment



Site Stability Assessment

- Stability of waste, facility, and site.
- Stability is required for § 61.44.
- Tailor analyses to types of waste disposed.
- Disruptive events cutoff frequency – include those events that are probable to unlikely to occur over the compliance period.
- Instability defined by risk, not loss of material.
- For large loss of material, risk may not be able to be defined.

Site Stability Assessment



Site Stability Assessment

- Topics covered include:
 - Disruptive processes
 - Available tools and models
 - Approaches to the assessment
 - Uncertainty
 - Engineered barriers
 - Long-term considerations

Site Stability Assessment

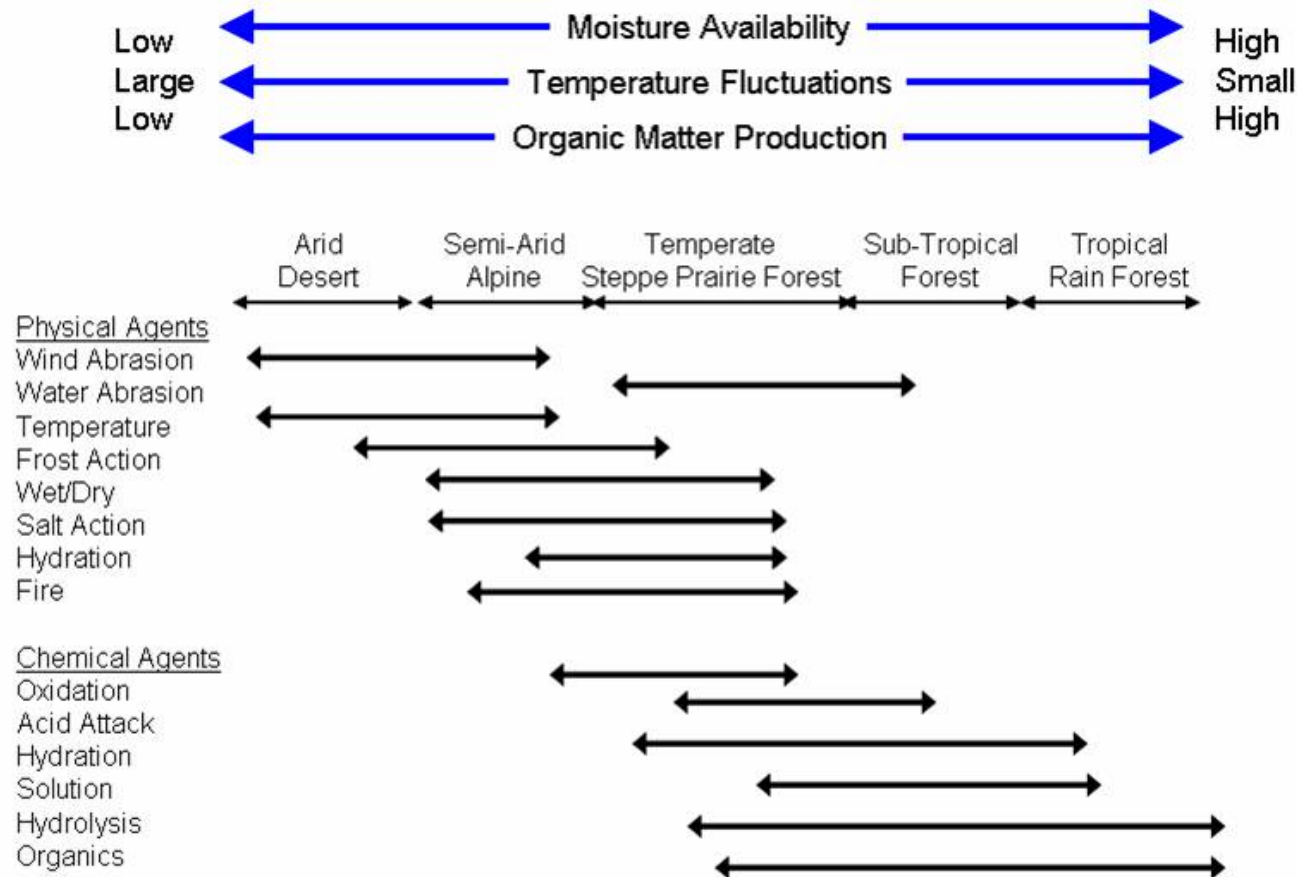


Figure 5-3 Macroscale Relationship Between Climatic Variables, Environments, and Rock Weathering Agents: Occurrence of Weathering as a Function of Climate (NUREG/CR-2642)

Long-Term Analyses

- Only required for disposal of long-lived waste
- Two types of analyses:
 - Analyses of how the design and site limit long-term impacts
 - Calculation of peak annual dose (transparency with stakeholders)

Long-Term Analyses

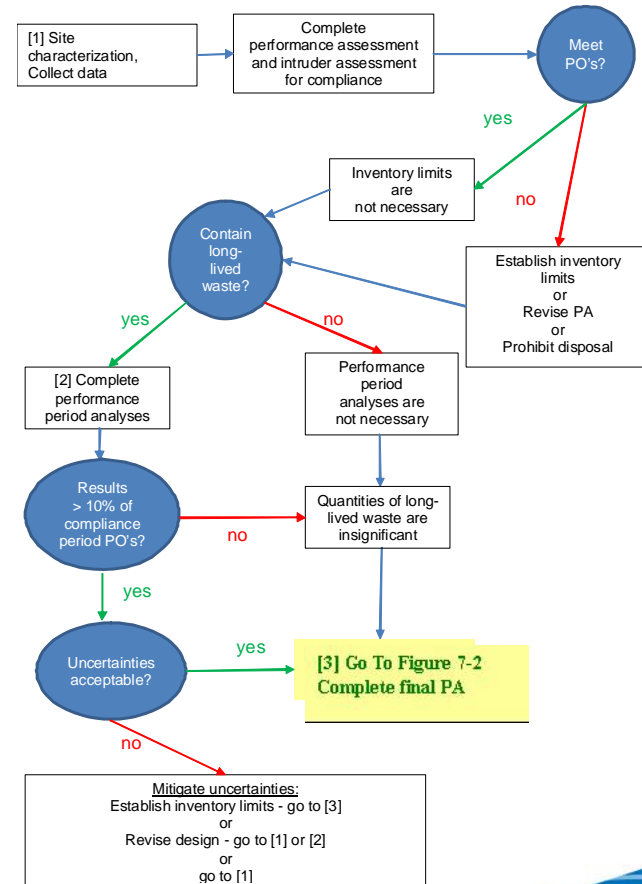
- Guidelines for long-term isolation
- Scope of the long-term assessment
- Types of analyses
- Barrier and component analyses
 - One-off
 - One-on
 - Factorial analyses (full or partial)

Other Considerations

- Inventory limits:
 - Inventory limits is a method to manage irreducible uncertainties
- Mitigation actions:
 - Not expected for conservative assessments with strong technical basis
- Insignificant quantities:
 - Useful to define to risk-inform the process

Other Considerations

- Guidance provides flowcharts to step through.
- Intended to facilitate implementation of the guidance.



Performance Confirmation

- Various requirements are provided to ensure the facility performs as intended [§ 61.7(c)(3); § 61.12(l); § 61.28, § 61.53(d)].
- Technical analyses may be updated during operation and at final closure.
- Technical analyses should be updated when significant changes occur.
- Emphasis placed on performance indicators.

Conclusions

- Guidance is risk-informed.
- Guidance provides flexibility.
- Staff considering development of consolidated guidance after second (comprehensive) rulemaking.
- Development of training materials (class) is being considered.

10 CFR Part 61: Stakeholder Comments on the Preliminary Proposed Rule Language

Andrew Carrera

Division of Intergovernmental Liaison and Rulemaking
Office of Federal and State Materials and Environmental
Management Programs

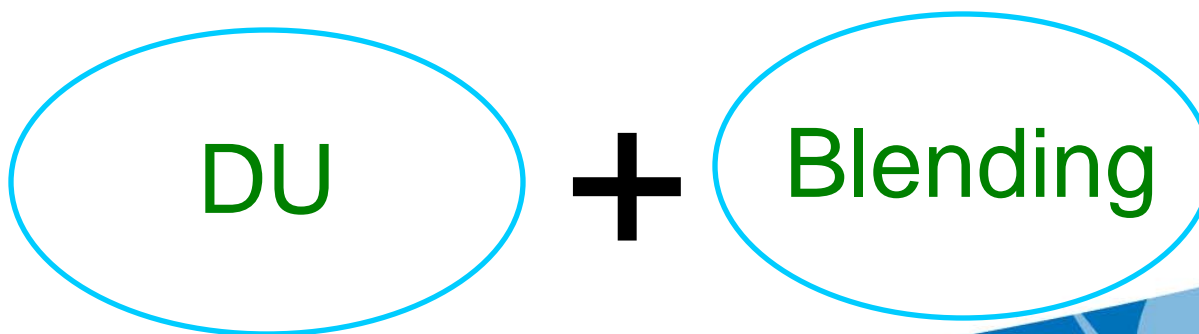
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**Advisory Committee on Reactor Safeguards
Meeting of the Radiation Protection and
Nuclear Materials Subcommittee**

August 17, 2011

Purpose of rulemaking

- SRM-SECY-08-0147:
 - Require site-specific analysis for disposal of large quantities of DU
 - Specify criteria needed for analysis
- SRM-SECY-10-0043:
 - Incorporate blending issue into the existing rulemaking for DU
 - Develop supporting guidance



Proposed Amendments to Part 61 Regulations

- Remain focused on limited scope rulemaking.
- Site-specific analyses:
 1. Performance assessment — to demonstrate compliance with the performance objective for protection of the general population from releases of radioactivity (§ 61.41)
 2. Intruder assessment — to demonstrate compliance with the performance objective for protection of inadvertent intruders (§ 61.42)
 3. Long-Term analysis — to demonstrate how the design of the facility considers the potential long-term radiological impacts (§ 61.13 (e))
 4. Update analyses at facility closure — to be updated and included with any application to amend the license for closure (§ 61.28 and § 61.52)

Proposed Amendments to Part 61 Regulations *(continued)*

- Other supporting changes
 1. Concepts, Definitions, TEDE.
- No explicit reference to DU or blended waste.

Stakeholder Involvement



- Preliminary proposed rule language and technical basis documents published for stakeholder comments on www.regulations.gov web site on May 3rd.
- May 18th public meeting.
- Comment period ended on June 18th.
- Some stakeholders also presented their views during the ACRS meetings on June 23rd and July 13th.

Stakeholder Comments

Stakeholder Comments

- 15 Comment letters received.
- Staff reviewed the comments and grouped them into nine issues.
- Issues considered are:
 - Performance assessment
 - Intruder assessment
 - Long-term analysis
 - Period of performance
 - Agreement State compatibility
 - Feasibility of near surface disposal
 - Commission direction (SRM)
 - Rule language
 - Waste stream neutral approach

Stakeholder Comments *(continued)*

- Performance assessment requirement
 - TEDE.
 - Should exclude radon exposures.
 - Should include PA maintenance plan.
 - Uncertainties.
- Intruder assessment requirement
 - Support of intruder dose assessment requirement.
 - Intruder dose assessment scenario is burdensome.
 - Suggests 100 mrem and even 25 mrem to be consistent with other regulations.
 - Intruder barrier.
- Long-term analysis
 - A higher dose limit for 20K years and after (e.g.100 mrem).
 - Eliminating definition of long-lived waste.
 - How to implement requirement.

Stakeholder Comments *(continued)*

- **Period of performance**
 - Support for 1K, 10K, 20K, and peak dose period of compliance.
 - Limited technical support for other period of compliance.
 - 20K places unnecessary burden to facility that accepts only short-lived waste.
 - Should be in guidance.
- **Agreement State compatibility**
 - Strict compatibility level vs. flexibility.
- **Feasibility of near surface disposal**
 - Propose minimum depth disposal requirement.
 - Question appropriateness of disposing of DU at near-surface facilities.
 - Proposed limited changes are not protective of public health and safety.

Stakeholder Comments *(continued)*

- **Commission direction (SRM)**
 - Proposed rulemaking is more consistent with a “comprehensive revision of Part 61”.
 - Objection to DU as Class A waste.
- **Rule language**
 - Language in §§ 61.7(a)(1), 61.7(c)(2), and 61.55(a)(6) is confusing and could be shortened, deleted, or clarified.
- **Waste stream neutral approach**
 - Support and disapprove of waste stream neutral approach.
 - Blended waste should not trigger site-specific analyses requirements.

Revisions Being Considered for Proposed Rule Language

Revisions Based on Comments

- Performance Assessment Language (§ 61.13)
 - (a) A performance assessment must represent features, events, and processes that can influence the ability of the waste disposal facility to limit releases of radioactivity to the environment. The features, events, and processes considered in the performance assessment must represent a wide range of phenomena with both beneficial and potentially adverse effects on performance. The performance assessment must consider the specific technical information provided in § 61.12(a) through (i). The performance assessment must evaluate uncertainties in the projected behavior of the facility-disposal system (e.g. disposal facility, natural system, environment). The performance assessment must identify the specific characteristics of the disposal site that are necessary to demonstrate compliance with the performance objectives in Subpart C of this part consistent with the specific technical information found in § 61.12....

Revisions Based on Comments *(continued)*

- Intruder Assessment Language (§ 61.7(c))
 - (7) An intruder assessment quantitatively estimates the radiological exposure of an inadvertent intruder at a disposal facility following the loss of institutional control. The results of the intruder assessment are compared with the appropriate performance objective. If intruder barriers are utilized, the intruder assessment must identify the intruder barriers and examine the performance of the barriers. The intruder assessment must also address the effects of uncertainty on the performance of the barriers. The barriers must inhibit contact with the disposed waste or limit the radiological exposure of an inadvertent intruder over the duration of the compliance period. The technical basis provided for the performance of the intruder barrier will determine how long performance should be credited. An intruder assessment can employ a similar methodology to that used for a performance assessment, but

Revisions Based on Comments *(continued)*

- Period of Performance Language
 - § 61.41

(b) Compliance with paragraph (a) of this section must be demonstrated through a performance assessment that evaluates estimates peak annual dose ~~up to~~ that occurs within 20,000 years following closure of the disposal facility.
 - § 61.42

(b) Compliance with paragraph (a) of this section must be demonstrated through an intruder assessment that evaluates estimates peak annual dose ~~up to that~~ occurs within 20,000 years following closure of the disposal facility.

Revisions Based on Comments *(continued)*

- Waste Stability Language (§ 61.7(c))
 - (2) A cornerstone of the 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 avoids the need for long-term active maintenance and reduces the potential for ~~inadvertent intruders to be exposed to the waste release of radioactivity into the environment~~. While stability is desirable; it isn't necessary from a health and safety standpoint for most low-level waste because the waste doesn't contain sufficient radionuclides to be of concern. This low-activity waste (e.g., ordinary trash-type waste) tends to be unstable, which can become a problem if it is mixed with higher activity waste. If lower activity waste is mixed with the higher activity waste or long-lived low-activity waste, the deterioration of the unstable waste

Revisions Based on Comments *(continued)*

- Ambiguous Language

- § 61.7(a)

(1) Part 61 is intended to apply to land disposal of radioactive waste and not to other methods such as sea or extraterrestrial disposal..... Technical requirements for alternative methods may be added in the future. ~~While there may not yet be detailed technical criteria established for all kinds of land disposal that might be proposed, a~~Alternative methods of disposal ~~may~~ can be approved on a case-by-case basis as needed.

- § 61.55(a)

(6) Classification of wastes with radionuclides other than those listed in Tables 1 and 2 of this section. If radioactive waste does not contain any nuclides listed in either Table 1 or 2 of this section, it is Class A. ~~Any waste classified under this subparagraph must be analyzed in the intruder assessment required by § 61.42.~~

10 CFR Part 61: Site-Specific Analyses for Demonstrating Compliance with Subpart C Performance Objectives

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**Advisory Committee on Reactor Safeguards
Meeting of the Radiation Protection and
Nuclear Materials Subcommittee**

August 17, 2011

Why are we here today:

- Provide update of Part 61 rulemaking
 - Inform ACRS regarding stakeholder's comments and staff's proposed rule text changes
 - Staff has modified its approach to enhance flexibility
 - Brief ACRS on draft guidance document
- ACRS briefings
 - June 2011 and July 2011
- Commission directions
 - Proceed with a rulemaking to require a site specific performance assessment prior to the disposal of significant quantities of DU and blended waste

Today's topics and presenters:

Topic

Presenter

Draft Proposed Rule: *Analysis of Comments Received on Preliminary Rule Language*

Andrew Carrera,
DILR

Discussion: *Guidance for Conducting Site-Specific Analyses for Part 61*

Priya Yadav,
David Esh, and
Christopher
Grossman,
DWMEP

Path Forward

Deborah Jackson,
FSME

10 CFR Part 61: Path Forward

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Advisory Committee on Reactor Safeguards
Meeting of the Radiation Protection and
Nuclear Materials Subcommittee
August 17, 2011

Path Forward

- In September, staff will brief ACRS full committee.
- Staff requests letter from ACRS following September full Committee meeting.
- Staff expects to send the proposed rule package to the Commission at the beginning of 2012.