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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

RADIATION PROTECTION AND NUCLEAR MATERIALS

SUBCOMMITTEE

+ + + + +

TUESDAY

APRIL 9, 2013

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Michael T. Ryan, Chairman, presiding.

COMMITTEE MEMBERS:

MICHAEL T. RYAN, Chairman

J. SAM ARMIJO, Member

HAROLD B. RAY, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

NRC STAFF PRESENT:

DEREK WIDMAYER, Designated Federal Official
LARRY CAMPER, FSME
ANDREW CARRERA, FSME
DAVE ESH, FSME
CHRISTOPHER GROSSMAN, FSME
DEBORAH JACKSON, FSME
MICHAEL LEE, FSME
CHRIS McKENNEY, FSME
ABY MOHSENI, FSME
LEAH PARKS*
GREGORY SUBER, FSME
PRIYA YADAV*

ALSO PRESENT:

WARD BRUNKOW*
TED BUCKNER*
DIANE D'ARRIGO*
RUSTY LUNDBERG*
CHRISTOPHER THOMAS*

*Present via telephone

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P R O C E E D I N G S

(8:30 a.m.)

CHAIRMAN RYAN: All right, we'll go ahead and open the meeting. This is a meeting of the Advisory Committee on Reactor Safeguards, Radiation Protection and Nuclear Materials Subcommittee.

I'm Michael Ryan, Chairman of the Subcommittee.

ACRS members in attendance are Sam Armijo, Dick Skillman, Harold Ray, Steve Schultz. Dana Powers and Dennis Bley will be joining shortly, I believe.

The purpose of this meeting is to discuss the rulemaking language in 10 CFR Part 61, proposed revisions to low-level waste disposal requirements. The proposed revisions were published in the Federal Register for public comment this past December.

The Subcommittee will gather information, analyze the relevant issues and facts, and formulate proposed positions and actions as appropriate. The Subcommittee will meet and discuss again on this matter on June 20, and which the matter will be taken up by the Full Committee at the 606 ACRS Full Committee meeting in July.

This meeting this morning is open. The rules of conduct are that your participation in the

meeting will be published in the Federal Register as part of the notice for the meeting. Derek Widmayer is the Designated Federal Official for the meeting.

A transcript of the meeting is being kept, and will be made available on the ACRS webpage. Therefore, it is requested that speakers first identify themselves and speak with sufficient clarity and volume so they can be readily heard.

We have not read received any requests for time to make oral statements from anyone prior to today's meeting. However, there will be time made available at the end of the proceedings for anyone who wishes to comment at that time to make a comment at that time.

I understand there are a number of folks who are listening in on the meeting on our bridge line. The bridge line will kept in a listen-only mold to minimize noise disturbance here in the meeting room, but we will open it for any comments that anyone wishes to make at the end of the proceedings.

Thank you.

We will now proceed with the meeting. I call upon Deborah Jackson, Deputy Director of the Division of Intergovernmental Liaison and Rulemaking and FMSE, to open the proceedings.

INTRODUCTION

BY DEBORAH JACKSON

DEPUTY DIRECTOR JACKSON: Thank you, Mike, and good morning to everyone.

We are here today at your request to give you an update on the work with the Part 61 rulemaking up to December 2012. At our meeting with you in June, we will discuss public comments on the proposed rule.

Over the course of this rulemaking, the staff met with the ACRS on multiple occasions to provide updates and solicit the Committee's views on certain technical issues related to the Part 61 rulemaking and implementation guidance document development.

These meetings resulted in an ACRS comment letter dated December 22, 2011. This letter provided four recommendations to the staff with regards to the approach to this rulemaking. In a response letter dated November 3, 2011, the staff discussed its views on the ACRS recommendation approach. Mike Lee will be discussing the views in greater detail in the next presentation.

Next slide.

This rulemaking began when the staff received direction from the Commission to engage in a

limited-scope rulemaking to add requirements for site-specific technical analysis prior to the disposal of significant quantities of depleted uranium and blended waste.

With this direction, we were to identify the technical requirements that would apply to the site-specific analysis and develop a guidance document that outlines the parameters, assumptions, and those things conducting with such site-specific technical analysis.

In the SRM in 2012, listed at the second bullet, the Commission directed the staff to expand the ongoing limited-scope provision of Part 61 to include the following issues:

1. Allowing the licensees the flexibility to use the latest ICRP dose methodologies in the site-specific assessment for the disposal of all radioactive low-level waste;

2. developing a two-tiered approach that establishes a compliance period that covers the reasonably foreseeable future, and a longer period of performance that is not a priority and established to evaluate the performance of the site over longer time frames;

3. providing flexibility for disposal

facilities to establish site-specific LORW acceptance criteria based on the results of the site's performance assessment and intruder assessments; and

4. recommending a compatibility category element of the revised rule that ensures alignment between the states and federal government on safety fundamentals while providing the states with the flexibility to determine how to implements these safety requirements.

I'll note for item number four on that previous slide, the agreement states' compatibility, the staff is working with NRC Standing Committee on Compatibility on appropriate compatibility recommendations on these proposed revisions.

Now, for the last slide, the submitted agenda is different than, I believe, what's on this slide and that Mike Lee is going to discuss the ACRS comment letter. I think what we had submitted was different.

So today, we have five presenters. Mike Lee is going to go over the ACRS comment letter, and he'll discuss the 2012 public outreach initiative. Dave Esh and Chris Grossman well talk about the 2012 regulatory basis development document. Andrew Carrera will go over the proposed language that luminary

proposal language. And Aby Mohseni will discuss the path forward under Part 61.

So, with that, I'll turn it over to Mike Lee.

MICHAEL LEE: STAFF VIEWS ON THE ACRS RECOMMENDATION APPROACH

MR. LEE: Good morning.

CHAIRMAN RYAN: Good morning.

MR. LEE: Can everyone hear me?

CHAIRMAN RYAN: Yes.

MR. LEE: I drew the short straw, and I get to talk to the Committee about its earlier letter to the staff.

(Laughter.)

MR. LEE: While I was on vacation, I got volunteered -- no, I'm just joking. It's always a pleasure to talk to the Committee.

I'm currently in FSME, and this slide speaks for itself, so why don't we go to the second slide, please?

Just to provide some context, as everyone in this room knows, or is probably aware by now, the staff has received no fewer than three sets of direction on this particular rulemaking from the Commission.

The initial direction was provided in an SRM from the Commission in March 2009. This is in response to SECY-08-147, and that's been, in many respects, the primary driver for what we're doing in the rule.

If I were to amend the slide today, I would also acknowledge that there was a second piece of direction we received soon thereafter in connection with the blending paper that Jim Kennedy put together. So that was kind of the two pieces of information that were in play when the Committee first looked at the Part 61 rulemaking that the staff submitted.

Your letter dated September 22, 2011, reflects, as you know, a series of interactions the Committee had with the staff in the summer of 2011. And the Committee submitted four recommendations to the staff to consider. We subsequently reviewed those recommendations and responded to you and a letter dated November 3, 2011.

Slide three, please.

For the first part of this presentation, I'm going to follow this standard template, if you will. It shows what the Committee recommended to the staff initially in its letter, how the staff responded in the November 3rd letter, and then how we're

currently implementing it in the context of the rulemaking.

So your first recommendation, of course, was that Part 61 should not be amended in accordance with the staff's recommendations. We believe that, in response, we know we're doing with the Commission told us to do, which was to introduce an explicit performance assessment and human intrusion analysis for requirement for the Part 61 regulations. Heretofore, they did not exist.

(Cell phone ringing.)

MR. LEE: As a reminder, everyone please turn off your phones.

(Laughter.)

MR. LEE: I'm sorry.

Returning to slide three, in the context of the rulemaking that the Committee looked at previously, we did introduce an explicit performance assessment and intruder analysis requirement to the regulation, consistent with earlier Commission direction. So we believe we're doing what the Commission told us to do.

Slide four, please.

In the Committee's second recommendation, "Implementation guidance for Part 61 should not

specify it *a priori* a period of performance." The staff agrees.

Originally, we specified a longer-term period of performance. As you recall, that was a 20,000-your number consistent with the dose calculations that the staff did. However, the staff believes that it is important now to specify a period of compliance in the rule because that's the most recent set of directions we received from the Commission.

We now are proposing a time of compliance of 10,000 years and a longer unspecified period of performance based on risk insights that were developed consistent with the performance assessment.

CHAIRMAN RYAN: Mike, this might not be the right the right time to ask this question, but let me just put it out there.

MR. LEE: Sure.

CHAIRMAN RYAN: Somewhere between 100 years and 20,000 years, you go from quantitative to qualitative.

MR. LEE: Right.

CHAIRMAN RYAN: I'd like to understand somewhere during our conversation, maybe not even today, but --

MR. LEE: Yes, how the --

CHAIRMAN RYAN: -- through that --

MR. LEE: Either through the presentations later today or in the next presentation that we have in our second meeting with you all, we'll be able to articulate it.

CHAIRMAN RYAN: And I asked the question because I think it's critical that the Committee understand the details of what that transition is, from a quantitative to a qualitative assessment.

MR. LEE: Sure.

CHAIRMAN RYAN: You know, where we draw conclusions from analytical data, it's pretty clear to everybody, you're above or below something.

MR. LEE: Right.

CHAIRMAN RYAN: But how we make a decision based on qualitative criteria is not clear.

MR. LEE: Sure.

CHAIRMAN RYAN: Generally and specifically, in this case, it's not clear at all, to me at least. So that's one area where I think we hopefully will spend a little bit more time --

MR. LEE: Sure. Yeah.

CHAIRMAN RYAN: Again, not necessarily today, but --

MR. LEE: Well, seeing that I drew the short straw, I'll volunteer Dave Esh to talk to that later, either later today or in the next two.

CHAIRMAN RYAN: That's fine. Whenever we get to it is fine. I just thought I'd get it out on the table.

MEMBER SKILLMAN: Mike, let me follow up on Dr. Ryan's question.

MR. LEE: Yes.

MEMBER SKILLMAN: In this discussion sometime today, I would like to her the distinction between the period of performance --

MR. LEE: And the time of compliance.

MEMBER SKILLMAN: -- and institutional control period.

MR. LEE: Oh, okay. Sure.

MEMBER SKILLMAN: It seems to me that one is the analytical for how the progeny may affect what might be discovered many, many years from now. But institutional control period has a direct bearing on the ability to identify it, discover it.

You have a driver's license that expires every two years.

MR. LEE: Sure.

MEMBER SKILLMAN: You have another kind of

permit that might expire after five years. I'm wondering if there isn't a connection between the period of performance and the institutional control period that would serve to address some of the concerns that this Committee has.

MR. LEE: Well, I think the short answer is, the original institutional control period is a derivative of how the waste classification system under Part 61 was first developed, and that's described in the EIS that dates back to the late 1970s and early 1980s.

The staff arrived, based on its analyses, at 100 years, and that's pegged to the waste classification scheme which pegs out, I think, for class A.

There was no period of performance under the original regulation. The original regulation was predicated on assumptions related to siting, design, and the basic classification system in the context of those concentration levels for the isotopes identified.

Currently, there's no nexus between the two, but we can get into this discussion later on.

MEMBER SKILLMAN: Great.

MR. LEE: Either Dave or Chris Grossman

will speak to it when Brian comes up.

MEMBER SKILLMAN: Well, like Chairman Ryan, I'm just getting it on the able right now.

MR. LEE: It's good to have these --

MEMBER SKILLMAN: Thank you.

MEMBER ARMIJO: Mike, one of the things I'd like to hear about this morning from the staff is: How does one actually satisfy your compliance requirements that you're going to propose in this rule? Exactly what does someone who manages one of these facilities have to do to demonstrate that this is the appropriate compliance period, and this is how it's satisfied? It's all analysis; right? No one can guarantee what's going to happen 10,000 years from now.

So what will it take to satisfy the staff that the requirements of this proposed rule have been met?

MR. LEE: Well, I don't put too much on Dave's plate, but the short answer is that in the numerical performance assessment that's been proposed for the 10,000-year time of compliance, you'd run the numbers for 10,000 years and evaluate them against the 61.41 performance objectives.

The details of the analysis, the

attributes of the features that we believe should be included in the performance assessment, will be discussed in detail in the guidance document that goes out in parallel with the draft rule text.

Dave, is there anything you'd add, or?

MR. ESH: I think I already have indigestion and it didn't even get to me; it sounds like my plate is filling up.

(Laughter.)

MR. ESH: For this topic, yeah, I plan to talk about it in detail after we get through Mike's spot. So we can wait and talk about it then in context with the slides, or we can talk about that now, whichever you prefer.

MEMBER ARMIJO: When you're ready to talk about. Why don't we cover it in the --

MR. ESH: I'm making notes here to try to remember to talk to these things, and if I forget, just remind me.

MEMBER ARMIJO: We'll try.

CHAIRMAN RYAN: Thanks, Dave.

MR. LEE: I think I'm on slide five --I'm at the end. Thank you very much.

I have another presentation.

On slide five, the Committee noted that it

believed that its earlier recommendations were equally applicable to both DU as well as other low-level waste. The staff agrees, for the reasons that are outlined in our earlier letter responding to your comment.

We believe that once you become more familiar with the current edition of the rule text, you'll begin to see how we've implemented that direction, or how it comports with your views.

The final slide of this series, slide six, applies to Recommendation 4. Compliance with the performance objectives of the disposal system after institutional control ends, as well as the possible doses to the hypothetical intruders should be evaluated considering the features, events, and processes for a given site for a period of time, commensurate with the risk for a specific facility and site.

The staff agrees, and we believe that in the context of the regulation that we developed in 2011, and the current version, we were consistent with that theme, and we would again be glad to point that out as we get farther into the presentation.

So, unless there are other questions with respect to your earlier letter, I can jump into the

second presentation I have, which speaks to the 2012 public outreach initiative.

CHAIRMAN RYAN: Please go ahead.

2012 PUBLIC OUTREACH INITIATIVE

MICHAEL LEE

MR. LEE: So, again, to put things in context, in 2011, the staff developed a rulemaking consistent with Commission direction in both SRM SECY-08-147 as well as the blending Commission paper that Jim Kennedy put together. For the life of me, I can't remember the number. I think it was 10.47, but it's in the record somewhere, and we can get to that number.

As the rulemaking was making its way through the concurrence process, we received additional Commission direction in the January 2012 SRM.

The Commission told us to take the existing direction they had given us and complement it with the additional requirements that they told us to go out and float with the public. Consistent with that direction, we were told to seek public feedback. We issued Federal Register notices, and we were very proactive in contacting our partners at the agreement states on what the Commission asked us to look at.

I believe Debbie has already spoken to those four additional initiatives in the earlier slides, so I'm not going to repeat them here.

So what the staff did was it kind of work on two fronts. The first front is we already had some pre-program public meetings. We were going to participate in certain public events. We also hosted our own independent events.

Slide three.

So if you look at slide three, you'll see a series of events that the staff participated or sponsored during the summer of 2012. The events that the staff sponsored have little stars after them.

We had public meetings in Phoenix, Dallas, and here and Rockville, Maryland. We had transcripts, and from those transcripts, we collected information from the public that were in attendance, and got their views on the four initiatives that the Commission asked to be added to the rulemaking effort.

Slide four.

The other initiative we undertook is we created a docket in the Federal Register. We announced that availability of that docket for receipt of public comments, and through the course of the summer, we received approximately 16 sets of comments from

various individuals, organizations, and entities, and they approximately corresponded to 200 individual comments, questions, and suggestions.

So, between the record and the meeting transcripts as well as the docket, we had a body of some data that we could evaluate and consider in the context of the four additional things that the Commission asked us to consider.

So turning to slide five --

MEMBER ARMIJO: Mike, before you --

MR. LEE: Yes, sure.

Slide four.

MEMBER ARMIJO: We got a copy of a letter from the Consortium for Risk Evaluation, with stakeholder participation three, and that's not on your list of commenters. Is that an oversight, or didn't they comments in time?

MR. LEE: You received a letter directly.

MEMBER ARMIJO: Yes. It was addressed to Larry Camper. It was just a copy of this letter --

MR. LEE: I think they --

MEMBER ARMIJO: -- C-R-E-S-P.

MR. WIDMAYER: I think the answer is I think it was within the time frame.

MEMBER ARMIJO: The reason I bring it up

is because their comments were pretty consistent with ACRS comments.

MR. LEE: That's E-S-P.

MEMBER ARMIJO: C-R-E-S-P.

SPEAKER: It's Cresp. What is the date on it?

MEMBER ARMIJO: Vanderbilt University, Howard University, Oregon State.

MR. LEE: Oh, I'm sorry; that -- we're kind of confusing two, we're talking about two populations of comments. The letter that I believe you're talking to is the one we received in a second round of comments that we submitted.

MR. McKENNEY: No, January 4, 2013.

MEMBER ARMIJO: This is January 4, 2013.

MR. McKENNEY: Which is --

MEMBER ARMIJO: So was early this year.

CHAIRMAN RYAN: Chris McKenney?

MR. LEE: Chris.

MR. McKENNEY: Just to clarify, that is in the second set of comments, none of which are on the chart above, because, as requested by the Committee, we're here to bring you up to December 2012 because we're not addressing the comments received on the draft proposal text that we put out in December. And

that Cresp letter will be discussed in June.

MEMBER ARMIJO: Okay. Thank you.

MR. LEE: Thank you, Chris. Just the kind of everybody on the right page.

You know, I'm confused. We went out for comments in 2011. We got additional direction in January 2012. We went out for comment yet again in calendar year 2012. The slides three and four summarize what we did in 2012 up until December to seek public input on both the original Commission direction as well as the second set of direction we got from the Commission.

The letter from Dr. Armijo, that you're referencing from the Consortium at Vanderbilt and, I think, Rutgers, was in response to a third outreach request made as recently as December of this year, and that will be discussed later. It's not part of this population that I'm talking now right now.

MR. WIDMAYER: Do the comments that you're referring to on the slide predate the ACRS? Is that correct?

MR. LEE: These comments were post-ACRS.

MR. WIDMAYER: So, post-ACRS would have been pre-December --

MR. LEE: These are the comments we got

last summer subsequent to the receipt of the Committee's letter.

MR. WIDMAYER: Okay.

MR. LEE: And these comments, the material that I'm speaking to on slide three and four, are with respect to the four additions that the Commission asked us to seek public input on, in the context of its earlier direction.

As a result of that second request for comment, if you will, we received 200 individual comments, questions, and suggestions. So this is basically what we heard last summer after we received your letter.

Turning the slide five.

The intent of this slide is to give the Committee and others a sense for how the public's comments were tracked out. We kind of pinned them, for the purposes of review, in some categories. These are ranked-ordered. The bold type with the asterisks refer to the four Commission questions that came out of the January 2012 SRM. We received additional comments from the public and other interested stakeholders on other matters bearing on the rulemaking.

We applied some simple statistics your to

give everyone a sense for where most of the comments fell. The other comments, if you will, the second-highest rank bin was basically miscellaneous comments.

As you can see from the slide, most of the comments we've received are on the period of performance and time of compliance, themes that you've expressed some interest in already this morning. Our second and third rank ends were miscellaneous comments. We received a lot of comments on the waste classification tables found at 61.55. And then, in decreasing order, are the other themes that we heard from our stick was on.

And just for the record, the total is not exactly 100 because of rounding errors.

On slide six, what we tried to do is, have two populations of comments: comments received at the public meetings and available in the transcripts, and the written comments. I think we could fairly see that there was generally no disputing the need for the rulemaking. By and far, most commenters felt that there was a need to freshen up Part 61. However, they were disparate views on how we should freshen up the rule and what the rulemaking should include.

With respect to comments from the agreement states, the staff were very proactive in

contacting the agreement states. Not all agreement states chose to express that you on the rulemaking at this time, which is understandable because we're only in the drafting of proposal rule text.

Later on, when the rule goes out for public comment, we expect to solicit additional comments from our --

CHAIRMAN RYAN: Mike, do you think this will be focused mainly on the sited states as opposed to states that don't have and probably think they will never have a low-level waste site?

MR. LEE: We went to sited as well as unsited states.

CHAIRMAN RYAN: And what was the response from each?

MR. WIDMAYER: What does the -- obviously, not all agreement states express an opinion -- what does the slide mean?

MR. LEE: Well, I'm trying to communicate, first of all, that we directly targeted agreement states. And in particular, to put a finer point on Dr. Ryan's question, we made direct calls to the four sited agreement states. Not all four sited agreement states chose to express a view on what we're doing right now.

CHAIRMAN RYAN: How many didn't?

MR. LEE: I think between -- two, three, maybe. I mean we contacted South Carolina Washington, Texas, Colorado -- Utah; excuse me. We also contacted Washington state, Tennessee, and Pennsylvania by virtue of their arrangements in terms of waste processing and other interest, historically.

CHAIRMAN RYAN: Okay. Thank you.

MR. LEE: I mean we can get back to you with that detail if you'd like to see it.

CHAIRMAN RYAN: I guess what I'm reaching for a little bit -- and I don't expect an answer this minute -- is, what were the tone and tenor of comments from the various constituencies?

MR. LEE: We're going to get to that in a little bit --

CHAIRMAN RYAN: Okay. That's fine.

MR. LEE: -- in the remaining slides. What I've tried to do is, with respect to the four comments or questions that the Commission asked us to take to the public, I do have some details on that. But for future reference, if you go to Chapter 5 of the regulatory basis document, there are tables that address specific agreement states comments.

CHAIRMAN RYAN: Yes, okay. All right.

Thanks.

MR. LEE: But to kind of put a flavor on this particular issue if you will, in terms of what the agreement states had to say, they noted that like many state governments, the agreement states have budget challenges, and these challenges, you know, are -- there are other things besides implementation of new NRC regulations that the states have to balance in terms of their budget priorities.

Of course, some of the states' comments that we received are very limited. To the extent that we did receive comments, there were comments to the effect that the duration of institutional control should be extended from 100 to 300 years. And other comments were that states were wary of adding new requirements to the regulations that might oblige them to receive large quantities of depleted uranium.

MEMBER SCHULTZ: So the bullet, "Budget Constraints" means we just don't have the resources to look at this now, not that they have budget constraints and can't implement what you're proposing.

MR. LEE: No, I think they were sensitizing the staff to the fact that given competing priorities at state levels, if the Commission were to go ahead and issue new regulations in the area of Part

61, this would impose another challenge to their --

MEMBER SCHULTZ: -- budget line. So it's a regulatory burden issue.

MR. SUBER: Mike, how are you doing?

This is Gregory Suber. I'd just like to put a finer point on some of the things that Mike's talking about because he participated in some of the outreach but not all of it.

CHAIRMAN RYAN: Could you introduce yourself, please?

MR. SUBER: I'm sorry; my name is Gregory Suber. I am the Chief of the Low-Level Waste Branch.

We did contact each sited state. In fact, we had meetings in various locations. We had a meeting in Texas at which we invited Texas to participate. They wanted to observe, but they not actively participate.

We also went to OAS, and at the OAS conference, we had a meeting with all of the sited states that chose to attend at those meetings. They did come to us with a variety of concerns, and one of them was a resource concern.

The state of Texas was having a high degree of turnover in their program, and that was one of the reasons that their participation was limited.

And one of the constraints that they mentioned as far as actively participating in the process and being able to simultaneously complete the licensing of WCS and actively participate in a Part 61 limited ruling.

South Carolina also expressed concern about their ability to manage the Barnwell site and simultaneously participate actively in the number of Part 61 activities that we had ongoing because we had the rulemaking going on at the same time we had the revision of the Branch Technical Position on concentration averaging.

So the staff have a lot of stuff going on, and several sites said it was a challenge. They didn't say they couldn't do it, but they did recognize that they had the same kind of fiscal constraints that the federal government has and that it was becoming increasingly challenging for them to actively participate in all of the Commission activities as well as to manage the sites that they were responsible for.

MR. LEE: Okay. So again, just for additional details, I would refer you to Chapter 5 of the regulatory basis document, which is publicly available. I believe there's a table or two in there that summarizes what we heard from the agreement states.

All right. Turning to slide seven, the next series of slides, I again kind of followed the same format here. In the left-hand column, you see the Commission proposal from January 2012. The stakeholder response, response from the agreement states, and then some preliminary staff observations. Again, this was high-graded from Chapter 5 in the regulatory basis document.

The first direction received from the Commission in January 2012 was to allow licensees the flexibility to use the latest ICRP does methodologies.

The stakeholder response was generally in favor of this topic by this proposal. The agreement states, to the extent that we heard from them, were mostly in support of this proposal. And in terms of implementation, allowing the staff to use or allowing licensees the flexibility to use the up-to-date ICRP recommendations would align with past agency practice generally in this area.

Slide eight.

Same format again -- the Commission proposal to implement a two-tiered approach to performance assessment that establishes a compliance period that covers the reasonably foreseeable future, and a longer period of performance that is not defined

a priori.

Again, the stakeholders expressing a view on this topic were generally in support of the Commission's proposal. The agreement states -- again, not all agreement states expressed a view on the merits of the two-tiered approach at this time, and the comments that we did receive from agreement states were mixed.

The preliminary staff observation is the staff had previously advocated the adoption of a two-tiered approach to the conduct of PA both in 2011 and the current rulemaking package that's in concurrence.

MR. WIDMAYER: Mike, I've got a question.

MR. LEE: Sure.

MR. WIDMAYER: The staff interpretation of this, that the performance assessment should be done this way, did you guys assume that they also meant the intruder assessment?

MR. LEE: No.

MR. WIDMAYER: You did not.

MR. LEE: No.

MR. WIDMAYER: So that intruder assessment does not have to be done in a two-tiered approach.

MR. LEE: I don't believe so.

MR. WIDMAYER: Okay.

MR. LEE: Chris Grossman's here, I think, if he wants to make any additional response.

MR. GROSSMAN: The December package that we put out at the compliance period and period of performance for both performance objectives, both 61.41 and 61.42, 61.41 being the PA, essentially, and 61.42 then being the intruder assessment.

(Pause.)

MR. LEE: Okay.

MR. WIDMAYER: Yeah, but it sounds like it's been okayed by the Commission if you took two separate purchase.

MR. LEE: Help me out here.

MR. WIDMAYER: The Commission did not say, do an intruder assessment with a two-tiered approach; so, therefore, you could have done some other approach it. Am I missing something, or?

MR. LEE: Yes -- I -- yes.

MR. GROSSMAN: The Commission wasn't explicit about intruder assessment.

MR. WIDMAYER: Okay.

MR. GROSSMAN: There could have been a different approach, yes.

MR. WIDMAYER: Okay.

MR. LEE: And we'd be happy to talk to you

about the current approach that's in the rulemaking package later on this morning.

MEMBER ARMIJO: Let me ask you a question.

MR. LEE: Sure.

MEMBER ARMIJO: Is the intruder assessment still a central driver for this new rulemaking?

You know, it seemed to me, in the earlier version that I read, that so many of the things we're doing were all driven by this hypothetical intrusion sometime in the future. And I thought that if it just disappeared, there wouldn't be much left to this rulemaking.

Is that way out of line, or is the intruder assessment still central to this rulemaking?

MR. LEE: Well, I think, to put a historic perspective on this, you'll recall that the waste classification tables were designed around an acute exposure to an intruder. So, for the purposes of the development of the waste classification system under 61.55, the staff historically relied on the intruder, the acute does to an intruder.

CHAIRMAN RYAN: I think the key point is that probability of intrusion has always been one.

MR. LEE: Yes. Yes.

CHAIRMAN RYAN: It's one. That's what the

assumption is; there will be intrusion. At some point, there might be a different structure to the ways people look at it, but there are dose scenarios where the intrusion is less than one or 100 percent. So that's something to think about a little bit, I think.

Is there it been where protections or designs or other features could make the probability of intrusion less than one?

MR. LEE: Yeah, well, the tension in the philosophy underlying Part 61 generally is that, at some point, you maintain a period of institutional controls for about a hundred years. There's some feeling that you'd have some additional duration of time for which institutional knowledge is maintained. Society is aware that this site exists, and folks would generally avoid it.

Today, if you want to drill a well, you have to get a permit, you have to go to the local government center, maybe the county seat, and go through records, look through land affidavits and things like that, to get permission stick do certain things.

But the Commission recognized at some point, there would be a loss of institutional

knowledge of the site, and there was a potential for an inadvertent intruder to go in there and to get exposed. And that's how the tables were arrived at. That's the assumption, that you can't protect that site in perpetuity, at some point there was the potential for --

MEMBER ARMIJO: Can you regulate and perpetuity? That's the thing that bothers me. You know, there's no way to prove that you're actually accomplishing anything except adding burden to the siting of a new low-level waste site and discouraging the creation of more low-level waste sites, which the country needs.

I just don't see how you're getting around that, particularly if you make the intrusion a probability of one.

MR. LEE: Well, unless Kenny or Grossman has something to say, I prefer defer to them. It's a point as well noted, but --

MR. GROSSMAN: This is Chris Grossman of the staff.

To get to your first question, Dr. Armijo, yes, we believe inadvertent intrusion protection for intruders is still an essential component of Part 61.

MEMBER ARMIJO: Okay.

MR. GROSSMAN: We'll discuss a little bit of the probability more and our presentations later on.

MEMBER ARMIJO: Okay. You know, different people on the Committee will have different views on that, but I just think this whole intrusion requirement is just so arbitrary and so difficult to prove that you've taken into account short of not building any low-level waste sites that it's really an impediment to a good regulation --

MR. LEE: Well, I --

MEMBER ARMIJO: -- that says let's concentrate on protecting the people, here and now, and maybe for a couple of hundred years. What is it Mike? Five hundred years? This is still low-level waste site, so after that, forget about it. You know, if the country is still in existence, people in the future will deal with the problem.

MR. LEE: Right.

MEMBER ARMIJO: Why do we have to deal with it now? Where do licensees have to deal with all these hypothetical things so far into the future?

It just seems to me it's -- I struggle with how you can do reasonable regulation without --

MR. LEE: Well, the original framers of

the Part 61 regulation found that by limiting concentrations of waste in the ground, you could protect future generations to an intrusion event. That's how the concentration tables came up. They viewed this as an issue of, at some point, there was not going to be any control of the site, so how do you protect future generations?

MEMBER ARMIJO: It seems to me that made a lot of sense.

MR. LEE: Right, and one of the things you do is limit concentrations of what you put in the ground because of decay factors and certain engineering features for different classes of waste. And that's a burial. The original framers of the regulation found that there was some level of protection that could be afforded.

CHAIRMAN RYAN: There were some accepted constraints on this thought process. One is, for example, uranium, which has a half-life that's way longer than most of the universe, is in play in low-level waste. Take that out and you've got a whole new ballgame in terms of what's in play.

MR. LEE: Sure.

CHAIRMAN RYAN: And if you look at inventories of existing sites, the fraction of the

inventory that's going to be there in 100 years of 300 years is quite thoroughly small.

So, you know, I think we're trying to wrestle with the long term and the short term of what's there and what's not there. And, you know, is there some way to address that? Correct me if I'm wrong.

MR. LEE: Yes. I mean these points are very good to discuss, but again, going back to the Commission's direction, we were given a set of instructions to do some limited changes to the rulemaking and not to undertake a wholesale revision.

CHAIRMAN RYAN: And I do appreciate that, I think, very much. So I'm not --

MR. LEE: Yes.

(Simultaneous speaking.)

MEMBER ARMIJO: We understand you have a history of different instructions. Some of them are in conflict. And you have other people, including ourselves, giving you other input.

MR. LEE: Sure.

CHAIRMAN RYAN: But as you beyond the scope of our discussion today.

We also have the conundrum of depleted uranium, which is basically piled up; we put a little

topsoil on it, and grass, and that's the end of that. So, you know, I wonder where the risk management analysis is for that --

MR. LEE: Chris McKenney.

CHAIRMAN RYAN: -- analysis on -- sorry.

MR. McKENNEY: This is Chris McKenney of the Performance Assessment Branch.

Just to manage expectations for a second, while we'll be getting into some of the intruder assessment, a lot of the discussions of how much that can possibly drive and analysis and some of the stuff, especially with the WAC, a lot of those details will likely be more in June when we can talk about the guidance and everything else, and how guidances differed for different in some stuff, just so that, just my reminder that we can get into a bit more detail on the management of some of these activities.

CHAIRMAN RYAN: That's great. I will look forward to that very much, Chris.

I think what Dr. Armijo and the other folks who have spoken are trying to say is that we're just trying to share with you what the thoughts are, that we're thinking about, how we can somehow come to alignment, so we're all on the same page.

MR. McKENNEY: And that's what I'm saying;

right. But for most of the facilities, so far, they have actually done site-specific intruder analyses. That's not the driving risk. Even using generic scenarios, those are not the driving risks for the facilities that have been developed for the analyses we do for waste-incidental processing. In both cases, the site-specific analyses no longer drive the risk. It becomes --

CHAIRMAN RYAN: And getting insights into what does drive the risk there would be helpful.

MR. McKENNEY: It would be the off-site dose, the off-site dose level.

CHAIRMAN RYAN: Okay, then I guess we'll hear from you either way. Okay.

MR. LEE: Slide nine.

In this slide, what we wanted to do is provide the Committee with a little additional detail on what we've heard relative to the Commission's proposal regarding a tiered approach to the conduct low-level waste PA.

Just to summarize, again, we found that there was general support. With respect to the time of compliance concept, we received mixed responses.

In the Commission's SRM, they use the term "foreseeable future," which heretofore was an

undefined term. It's a new term of art, if you will.

We received comments to the effect that 1,000 years was an acceptable duration for that calculation of any dose under the first tier. We received comments that 1,000 to 10,000 years was an acceptable duration for the time of compliance. We also received comments to the effect that 10,000 years was a number that was easily achievable in terms of arriving at a meaningful number.

Again --

MEMBER ARMIJO: Easily achievable -- it's easy to calculate anything, Mike, but I can't understand how anybody could --

MR. LEE: I'm playing the tape and telling you what we heard from stakeholders.

MEMBER ARMIJO: Okay.

MR. LEE: Whether or not it means it's meaningful is really up to the eye of the beholder, I guess.

In terms of the period of performance concept, stakeholders told us that it should not be defined in the regulation. They argued that it was technically challenging as well as questionable in terms of its decision-making value.

And we also received comments to the

effect that you really shouldn't have a dose associated with any performance, longer-term performance period.

CHAIRMAN RYAN: When you're dealing with receptor as the --

MEMBER ARMIJO: The 500.

CHAIRMAN RYAN: Yes.

MR. LEE: Yes.

Slide 10.

In terms of comments on the flexibility of disposal sites to establish a site-specific WAC, the majority of stakeholders commenting on this were in favor of it.

To the extent that we heard from the agreement states, they were also in favor of it. In fact, many several of the agreement states have WAC-like features in their regulations licensing conditions today.

However, one of the comments we received under this particular topic was the caveat that, again, some agreement states didn't want to be forced to receive large quantities of depleted uranium.

A preliminary staff observation is that many is that any many states in fact already have a WAC, if not in name, then certainly in practice.

Slide 11.

Moving along, the compatibility issue is one that we received a lot of comments on. I guess the short version, for the purposes of time, is that many of the agreement states are interested in maintaining maximum flexibility in terms of how any new amendments to Part 61 might be implemented.

We noted that comment. This is an issue the staff will make a recommendation on, for the purposes of the rulemaking, and later on, as the rulemaking package proceeds, there's a compatibility committee that evaluates this in more detail.

My last slide is slide 12.

In addition to comments on the Commission's four rulemaking proposals, we received other comments, and these comments in some respects fall into that miscellaneous category that I referred to earlier on slide 5.

Some of the key comments we received were that the tables at 61.55 should be updated with the latest ICRP dose conversion factors and methodologies. I've already made reference that the duration for the institutional control period should be revisited.

We also received comments with respect to the so-called Phantom 4 isotopes, which were found to

be the limiting isotopes for the purposes of the groundwater dose in the earlier Part 61 EISs put out --

CHAIRMAN RYAN: Just to complete our record, would you mind listing those four?

MR. LEE: Okay. This is a test on the Phantom 4.

(Laughter.)

MR. LEE: Chlorine-36 --

CHAIRMAN RYAN: No.

MR. LEE: No? I'll let McKenney answer. I'm sure he's --

MR. McKENNEY: He's gets it wrong on the first one.

(Laughter.)

MR. McKENNEY: Chris McKenney from the Performance Assessment Branch.

The four radionuclides in the hard-to-detects considered to be tritium, which of course is a short-term mobile radionuclide present in most of the issues that we've had in the past disposal sites; iodine-129; technetium-99; and -- now I'm in the --

MR. LEE: oh, man.

MR. GROSSMAN: Carbon-14.

MR. McKENNEY: Carbon-14, yes.

CHAIRMAN RYAN: The reason I asked that -- and thanks for getting us the right list among you all -- is that those are interesting in that, in terms of dose consequence in the performance assessment, are they really that important? Are they hard to detect? Are they of relative low importance in terms of importance in terms of an overall PA?

MR. ESH: This is Dave Esh from the Performance Assessment Branch.

There's an interesting issue with those, in that many times, they do show up in the performance assessments. But is that a real effect, or is that due to the fact that the inventories are over-reported due to limitations in the detection technology?

CHAIRMAN RYAN: In the detection.

MR. ESH: Yes. I'm not at liberty to say which is the answer for that, but they do show up, and a number of times they will show up in the output of the performance assessments.

CHAIRMAN RYAN: Okay. I think that kind of raises a general question, which may be not for today but sometime in the future. What is the real relative certainty or uncertainty of some of the assessments that make assumptions used limited data on those kinds of issues?

MR. ESH: Yeah.

CHAIRMAN RYAN: You know, in other words, how do we propagate a range of uncertainty in any conclusions for the revised view of a performance assessment? We'll be looking ahead to maybe hearing a little bit about your insights in that area.

MR. ESH: Yes, and I can talk about uncertainties during my presentation.

CHAIRMAN RYAN: Okay.

MR. ESH: And if want to talk about it further --

CHAIRMAN RYAN: Okay. Fine. And I'm not looking to get the whole story today, but I just kind of want to have a placeholder. Maybe that's a more detailed discussion for our follow-up meeting.

MEMBER SCHULTZ: Dave, are you -- excuse me.

Are you going to talk about the uncertainties as well as other treated?

MR. ESH: Yes.

MEMBER SCHULTZ: How the uncertainties are treated?

MR. ESH: Yes, I can.

MEMBER SCHULTZ: I would appreciate that. Thank you.

MEMBER ESH: I mean, there are a lot of different methods to manage uncertainties, and there are lots of different types of uncertainties in these assessments. So there's not necessarily one way to treat the problem, and we allow people to do different types of analyses, but they have different implications, how you treat them.

One of the biggest issues for me in the whole rulemaking process and moving forward is, if you're going to rely more on site-specific technical analyses, then that requires that those analyses are credible, and it requires that they undergo a sufficient review by an independent entity to ensure that they're credible. Those are the two main pillars.

Everything else -- talk about requirements; what they are, time of compliance, intruders -- all that's in the wash if you don't do good analyses, if you don't have a good independent review of those analyses.

So those are the two things. If you really want to get them right and make sure your process is truly effective in terms of public health and safety, that's where you really want your energy.

CHAIRMAN RYAN: Tell me if I'm summarizing

this well in terms of what you just said, David.

To me, that says that you have to have a credible representation of the geohydrologic environment at which a site sets. By "geohydrologic environment," I mean all the parts and pieces and how they all interact and over what time frames, you know, at what ranges and interaction and all of that, to say, yeah, I understand how the system works.

MR. ESH: One way that a true risk purist gets upset about things is when people try to manage risk with conservatism. But from a regulator's standpoint, that is a valid approach to manage uncertainties and, therefore, manage risk. When you have limited information or you're faced with uncertainties of different types, you can choose conservative representation or conservative approach to evaluate that problem, so that comes into play in these analyses and the review of the analyses.

Like I said, there's multiple ways you could handle this problem.

And by analogy, saying the XLPR program for the Extremely Low Probability of Rupture in reactor piping systems, you could take a conservative approach there and try to estimate what's the impact to the systems, how you need to redesign the systems

and enhance them, what not. You could also do something similar to what they're doing, which is basically do a nested Monte Carlo analysis with an epistemic globe and an aleatory loop to try to fully assess the uncertainty and make estimates of probability and, therefore, decisions about what you what you need to do the system.

We don't necessarily dictate in these sites and for these analyses that somebody must use one approach or another. Our objective is to lay out the requirements that allow them to succeed with whatever approach they choose, especially in the area of uncertainty.

CHAIRMAN RYAN: Thank you.

MR. LEE: So, to finish up this slide, we also received comments that if you're going to go ahead and amend Part 61, you should introduce requirements for the disposal of greater-than-Class-C low-level waste, and lastly, we should introduce criteria for clearance, a la low activity waste.

The staff put together a paper designated SECY-13-001 that described what its views were, relative to these issues. We received direction from the Commission previously that if anything came up that would potentially affect the timetable for the

completion of the rule, we were to inform the Commission accordingly.

In that paper, we lay out some proposals for the Commission to consider relative to these five recommendations. First, relative to the ICRP update, we currently have direction from the Commission to proceed with an update of the 61.55 waste classification tables. That's currently scheduled to begin in Fiscal Year 2015.

In reference to the duration of institutional controls, as part of any update to the 61.55 tables, we could look at that issue in that context.

In terms of the so-called Phantom 4 plus chlorine-36, which was offered up by our friends at Waste Control Specialists in Texas -- I get partial credit for that -- the staff has begun that initiative. We had a meeting earlier this year in Phoenix following the waste management meeting. And Don Lowman of the staff is leading up that initiative, and we're going to have a number of interactions over the next several months to address how the guidance document in NUREG/DR-0204 would be updated to address that stakeholder recommendations.

In reference to greater-than-class-C

waste, the ball is currently in DOE's court. They have an EIS to prepare. They have to get congressional approval on the preferred approach. So right now, the staff doesn't believe it has any obligations other than to letting that process run its course relative to that decision-making.

And lastly, in reference to low-activity waste, that issue was addressed previously a rulemaking to Part 20, and in 2005, the Commission decided to defer any decision-making on any amendments to Part 20, including consideration of clearance.

So, with that, unless there are any questions, we'll just segue right into Dave Esh's and Chris Grossman's presentations.

CHAIRMAN RYAN: We're going to take one break this morning, and I would suggest that you be the place where it's good to do that. We'll be happy to have you guide that decision.

MR. LEE: What time is it?

MR. ESH: We have 42 slides. So, if we did Mike five minutes per slide, we're going to eat up four hours.

MR. LEE: I tried to go as fast as I could go.

CHAIRMAN RYAN: Let's go ahead and get

started David. Are you next? Yes. And we'll take a break at a good point when you point it out to us. Okay?

MR. ESH: We're going to share the presentation, and we're going to cover three elements and he's going to cover two. So maybe I can cover three and we can break and then Chris can start off with the second part.

CHAIRMAN RYAN: That's fine. Whatever suits you all.

STAFF EFFORTS TO REVISE PART 61: KEY CONCEPTS

DAVID ESH, PERFORMANCE ASSESSMENT BRANCH

MR. ESH: It's my pleasure to be here today and talk with you about our efforts on the Part 61 rulemaking. Fortunately, I do not have to sing Hail to the Victors before I start this morning. I'm going to talk about our efforts to revise Part 61.

Next slide, please.

The main topics we're going to cover is, I'm going to cover some key concepts, site-specific low-level waste technical analyses and analysis time frames and then Chris Grossman is going to cover the second two topics.

For key concepts, it's important to understand basically the problem context. So what is

the risk? How do these systems perform? How are the disposal systems anticipated to perform? And what, especially, are the waste characteristics that we're dealing with?

I'm basically going to cover the what, how, and why of site-specific low-level waste technical analyses. And then everybody's favorite topic -- analysis time frames, which is kind of like having a political debate at Thanksgiving dinner, but we will have it nonetheless.

(Laughter.)

MR. ESH: Basically, we're going to outline for you what we think the requirements should be, why we think the requirements should be that, and how with somebody satisfy these requirements. Part of that is going to be, I think Chris McKenney tried to indicate earlier, in our guidance document. We put a lot of effort into developing our guidance document and outline.

If NRC was doing a review, here's how we would go about it, here's how we would go about it, the types information we would look for, and how we would interpret that information.

It's important understand -- I think, this is one of the things you asked right from the get go,

Dr. Ryan -- you start off with something that's quantitative, and at some point, you move to something that's qualitative. What I'm going to try to express to you here is that the information is quantitative. The decision-making might move from something that is valuing it as quantitative and then values it more as qualitative. But ultimately, these models or analyses are not going to make the decision for you. They provide input to the decision-makers.

The way the low-level waste regulations are constructed, there's a whole bunch of things to go into determining safety of that action. One of them is the technical analyses, but there are all sorts of other requirements that go and, I think, have been very effective.

So I'll talk about hazard and risk, and I think is a big difference between hazard and risk in this problem. That's a good thing because that means, from when Part 61 was developed, hazard, especially from the short-lived activity, is being managed very well. And you know, whether the long-lived activities being managed well, I think probably is, too. Our requirements that we're putting forth provide a common metric for everybody. I'm going talk about those things.

So, key concepts on slide three, "Low-Level Waste Hazard Versus Risk," I'm going to talk in detail about the inventory a little bit and then some delays in these systems from a barriers and transport perspective. I have a slide on the generic waste qualification system -- I'm not sure how familiar all the Committee members are with it -- and then the inadvertent intruder issue, which we've talked about some.

Slide four, please.

"Low-Level Waste Hazard Versus Risk." Basically, a large percentage, whether it's 90 or some other higher number, of the hazard comes from the short-lived isotopes. We've heard that discussion a lot: all the inventory is gone at 500 years. A lot of the inventory is gone at 500 years. That's the way the system was constructed, to make sure that the system could contain all the short-lived activity because the short-lived activity is such that it has a high specific activity. If you lose a little bit of it, it can cause a risk, so you have to be pretty certain that you keep that material in the system in order to protect public health and safety.

Then, in the analyses, especially for 61.41, what you see is, most of the risk is driven

from the long-lived isotopes. So that's what comes out in the ground water, or if you have a erosion concerns, or maybe corrosion followed by air pathway. What you see is that the long-lived isotopes are what drives the wrist, specifically in 61.41.

So when we're talking about a technical requirements in, say, 61.42 and 43, those are kind of driven by the first bullet, the short-lived isotopes, whereas 61.41 and 44 are driven more by the risks of long-lived isotopes.

So you have to understand, there are different things that drive risk in these problems. Therefore, the low-level waste requirements have different requirements to tackle each of those risks.

Next slide, please.

MEMBER SKILLMAN: Before you go on, Dave,

MR. ESH: Yes?

MEMBER SKILLMAN: For the portion that is a hazard, cobalt 60 is, what, 5.2 years? Cesium, strontium, and tritium are all approximately 30. Were those isotopes chosen because that is their half-life, or were they chosen for different reason?

MR. ESH: That I listed them here?

MEMBER SKILLMAN: Yes. What set those

four apart, that you have them --

MR. ESH: They're on the slide as just examples of the short-lived isotopes that we see in the different analyses of driving the risks from the short-lived isotopes.

MEMBER SKILLMAN: So these are the prominent species that come forward when you do this analysis.

MR. ESH: Yes, and basically, when the regulation developed, they made their best guess about the inventory that they expected was going to be in the facilities.

They made these different waste streams and different isotopic lists for each of those streams and then did estimates of volume, and they basically did a summation over all those streams and all those isotopes and came up with kind of a generic inventory that they thought would be in a low-level waste disposal facility, "they," meaning NRC, so, us.

So then NRC took that inventory and did an analysis in the FEIS in the draft EIS and the final EIS, in the early 1980s, to develop basically the structure of her regulatory reporting requirements. So they considered short-lived isotopes and long-lived isotopes. They analyzed them somewhat differently to

try to provide protection from the short-lived isotopes, and try to provide protection from long-lived isotopes.

I'm not sure if I answered your question fully.

MEMBER SKILLMAN: Well, I think you did; just one other follow-up.

MR. ESH: Okay.

MEMBER SKILLMAN: These were the hazard come basically from the fission process from a light water reactor.

Is there another set that comes from a different process?

MR. ESH: Well, part of the reason we're doing the rulemaking is, when the initial regulation was developed, there were estimates about what the inventory would be, and that's kind of hard-wired into the whole regulatory structure and other requirements.

Now, as we move forward, other waste streams have come into being that people want to disposal of as low-level waste, so depleted uranium, blended waste, and some of the new medical technology, of developing isotopes for medical procedures. You can envision that you might generate special amounts and quantities of certain isotopes in those processes.

And then, also, if in fact they went to reprocessing fuel cycle, you'd generate different isotopes from that type of waste than you would from what comes out of the traditional light-water reactor operation.

CHAIRMAN RYAN: I think it's a fair thing to say there's got to be some kind of balance between -- well, cobalt is not a fission product, of course; it's an activation product.

MR. ESH: It's irradiated, yes.

CHAIRMAN RYAN: It's screaming hot for a relatively short period of time, so it's an operational/management question. And once you get it "in the ground" or in its disposal configuration, it's probably not a huge long time you're really worried about it. In 50 years, it's pretty much done.

MR. ESH: Yes, in my experience, I can't remember ever seeing technical analyses were cobalt-60 was the driver of the risk.

CHAIRMAN RYAN: So I think it's not only does a little bit of -- you know, there's a little bit of how you got to handle it in an operating circumstance at a licensee's facilities to get it ready to be an honorable. Those tend to be buried based on the operational risks of physically handling those materials.

And the forward-looking part is, how do I have requirements for waste form, waste packaging, disposal technology, and transportation technology? As David said, all of that has to be balanced into some kind of program that addresses all those component risks in sequence, if you will, to the endpoint.

And I appreciate David's thoughtful way of trying to explain that the metrics of thinking about risk. It certainly evolves as the material goes through a process to ultimate disposal.

Is that a fair summary?

MR. ESH: Yeah, sure.

Chris, did you have a comment?

MEMBER McKENNEY: I just wanted to also add that along with the operational, there's an institutional control period, again, and the short-term waste form in the interior varies because, like the cobalt-60 that can disposed of in Class C, at Class C levels, an irradiated hardware can be up to like 20,000- to 60,000 r per hour at the point of disposal. So making sure it's isolated is important because you still need almost 500 years to get that down to where it's fairly innocuous.

CHAIRMAN RYAN: Cobalt-60?

MEMBER McKENNEY: Well, at 20,000- to 60,000, that's half -- yeah -- half is 10,000 r per hour, then half again. And at 20,000- to 60,000 r per hour, you need a little bit more time than 50 years.

MR. ESH: But at 500 years, you're at 100 half-lives. That's a lot.

MEMBER McKENNEY: Right. It's very innocuous, dealt with. But I'm just saying that it's a combination of operations and the institutional control, which is why the system does work for short-lived.

MR. ESH: Yeah.

So let's go on to slide five --

MEMBER SKILLMAN: You answered my question.

MR. ESH: Okay.

MEMBER SKILLMAN: Thank you.

MR. ESH: Let's go on to slide five.

We showed some of the Committee members this slide before, about the low-level waste inventory analysis.

Basically, we took some information that we had on inventories in low-level waste facilities, and we did a hypothetical calculation of, if you wanted to get that inventory down to a level where

you'd meet, say, a 25 millirem standard, how much reduction do you need in that material? So it's trying to address this issue of, is the material inherently riskless? Okay?

Some of the isotopes are disposed of below the level you already need to meet.

CHAIRMAN RYAN: Just for everybody's benefit, the dashed line across the page, kind of below that is 'low risk'.

MR. ESH: Yes, or it would already meet the standard.

CHAIRMAN RYAN: That would meet the standard, okay.

MR. ESH: As disposed, it automatically would meet the standard because it's at such concentrations.

But in most facilities and for many isotopes, you need some reduction out of the system in order to meet the standard. So our approach is about what analyses you need to do to ensure you achieve that reduction.

As you can see, on the X-axis here, it's going out in half-lives. There are a lot of isotopes disposed of, in our four operating facilities, that are long-lived and aren't inherently riskless. So, at

500 years, you aren't automatically going to meet standard. You have to do an analysis what is the risk from that inventory that you put into your system.

So the main point of our rulemaking is, then: What analyses or requirements you need to ensure to achieve this? Conceptually, I think that's a good point for the Committee to understand.

So, if we move on the slide six, then, "All existing low-level waste facilities contain sufficient inventory that could result in unacceptable radiological risk." This is for 61.41, primarily. In some cases, you need many orders of magnitude of reduction.

The Commission direction, which we talked about earlier, was to perform a limited-scope rulemaking so it would operate within the framework we have, then, what you would need to do within that framework to specify additional technical requirements and develop guidance. As I indicated, we spent an awful lot of time developing the guidance, and we look forward to talking with you about that in the future. I'm proud of the work that my coworkers have done on that.

So, if I look at the Commission direction, it's, change what you need to what don't go crazy, and

provide the requirements to determine if public health and safety is protected. Like I said, we really put a lot of effort into the guidance because some of these things are not amenable to specifying words in a regulation. They're too detailed and too complicated to write regulatory requirements that would necessarily get people to do what you think they need to do.

You need to put the principle or the main idea in the regulatory requirement and then, in the guidance, specify the various approaches that somebody could do to achieve that requirement, and that's one of the approaches we take.

MEMBER SCHULTZ: David, just a quick question. There's another step that goes past the guidance, and that is, how do you get it into a license condition?

MR. ESH: Yes.

MEMBER SCHULTZ: And then, the operator's use of that licensing condition. So have you thought about that or addressed that the guidance?

MR. ESH: No. I don't think we've addressed that in any detail in the guidance. That's a good point.

MEMBER SCHULTZ: You know, if you get

guidance that says, if you use these kinds of words to describe this implementation, which is what the guidance should help people do, it might be helpful to think about whether or not you can point agreement states or whoever the regulator is to -- this should be addressed in the license condition.

MR. ESH: Yes, sure.

MEMBER SCHULTZ: Or it could be crafted using something like that, just to point folks in the right direction.

MR. ESH: And I think that is a very useful and worthwhile avenue for the agreement states to impose what they see fit in their systems and for their stakeholders, and it gives them some flexibility. But it is a mechanism that they can ensure, if there's something important to them, that it happens for their particular facility in the licensing.

MEMBER SCHULTZ: Yeah, or it could be something that's very particular to a given site for some reason.

MR. ESH: Yes.

MEMBER SCHULTZ: So, you know, that gives him a lot of flexibility. But if you recognize that in the guidance, that probably would be helpful to

everybody.

MR. ESH: Yes. A lot of the challenges with this problem is because you're dealing with things that are in multiple dimensions, and you're trying to make requirements that are one-dimensional.

So we have variability in inventories and site characteristics and half-lives and a variety of things. And then you're trying to make a requirement that applies to all of those, but it's really maybe unfair to ask that. So you can't necessarily do the reduction and make that simple requirement that's going to apply to all the cases.

That's why, if we look at the low-level waste regulation overall, my personal opinion is, if we weren't limited in this limited-scope rulemaking, I would have loved to change the waste classification system to separate out long-lived waste from short-lived waste. And you could make special requirements for short-lived waste that are different than the requirements for long-lived waste.

So, if you have a waste stream like depleted uranium, which is not necessarily a short-lived concern at all but poses a pretty large long-lived concern, you could make special requirements for that waste stream. But in the low-level waste

classification system as it exists right now, all the waste classes, the short- and long-lived, are mixed together throughout the classes, so it makes it really cumbersome to try to do that. We still tried to do that in our revised language, which we'll talk to you about in the next meeting, for how we handle the need for someone to do the performance analyses. So was still tried to do that. But it's not easy; it's a little bit messy, how you do it.

We did have an extensive stakeholder interaction, and they basically said don't limit the technical requirements to the particular waste streams initiated it best, meaning depleted uranium and blended low-level waste.

We have had some stakeholders after that express that opinion though: Do we limit it just to those waste streams? But the majority was, don't limit it to the waste streams. We think that's smart because, number one, the majority of our stakeholders didn't want it. It's very difficult to do, as I was trying to express in a technically sensible way. And we end up at the same place we are now, potentially. So, if there's a new waste stream we aren't anticipating right now in this rulemaking, then we have to go back, and the new waste stream that has

somewhat different characteristics, well, we now have to add it into the rulemaking process. My personal opinion is I would like to get out of the regulatory business and move on with other regulatory business.

So let's move on to slide --

MEMBER SCHULTZ: Dave, before you move on --

MR. ESH: Yes?

MEMBER SCHULTZ: The discussion you had on the second bullet suggested to me that you wouldn't be able to achieve the request of the stakeholders in the third bullet. In other words, the prescriptive waste forms that currently exist may prevent the proposed analysis process to achieve not limiting the requirements of waste streams.

MR. ESH: Yeah, it's definitely a balancing act of how we develop requirements that we think are going to work for the waste streams that came into being that initiated the process, and future waste streams, while still operating within the structure of the existing regulation without modifying it substantially. And that's where this intruder issue comes into play.

MEMBER SCHULTZ: Right.

MR. ESH: Now, the "intruder" part of the

whole analyses is one of the four Subpart C performance objectives. It's fundamental to the regulation. We felt, we don't have the ability to remove one of the legs of the chair, so to speak. We can change the length of the leg or maybe change the size of the leg, but we can't remove it completely.

So, that's conceptually what we were doing in the rulemaking process. And I think we've achieved that, but you'll have to see some of the details and tell us whether you think we've achieved that or not.

So, on slide seven, "Delays, Barriers, and Transport," this is just to communicate that in these systems, there are different types of barriers, and there are different types of functions for those barriers. We have both engineered and natural barriers, and they can reduce and delay risk.

So, on the left-hand side, I listed some things that act as risk reduction in these problems, and then on the right-hand side, things that delay risk. The technical requirements must account for both of these types of processes in the system.

Barriers that reduce risk are generally preferred over things that delay risk because, if you're just shifting risk and time, eventually, the risk is realized. Whereas, if you achieve a true

reduction, then you can have more confidence the public health and safety will be protected regardless of when that risk may be realized.

Slide eight, please -- the generic waste classification system.

The generic waste classification systems serves a variety of functions, and I think it was a good system for its desired purpose. So, when the regulation was developed, they said, we think we're going to have a lot of low-level waste sites, and do we want to have everybody analyzing this kind of hypothetical, subjective process of what we think people are going to be doing and how they might disturb the system? They decided, well, we think that it's better done by the regulator, and the regulator will do that analyses and develop limits on concentrations that can be disposed, and that will be imposed on everybody. So those limits provide some sort of limit on the suitable concentrations for near-surface disposal.

It also constrains this issue of the societal uncertainty. So, you know, we have different types of uncertainties in the problem. There are technical uncertainties associated with the natural system for performance of engineer, those sorts of

things. We also have the societal uncertainty of what people are going to be doing. What do they do now, what are they going to be doing in the future, and how does that impact the regulatory analyses?

The societal uncertainties, I think, is an area where I think it's prudent to choose a conservative approach based on what people do today, and I think that's what the Commission did. They said, look, generally, people, regardless of what may happen in the future, they're going to be trying to seek shelter and use resources. And if we design our scenarios around that sort of philosophy, that should apply in the future as well as it does today.

What technologies they may have a billable, whether the solve cancer or whether they have better protection systems to know they're exposed to radioactivity, all those sorts of things are beyond our capability today to say what impact they are going to be in the future.

So this approach limits speculation about the component of the problem. It goes both ways. If you open up the part of the problem, I've dealt with stakeholders who have very specific and extreme views about future land use and activities that may be based on personal experience. You know, one of their

relatives does such and such, and they live within X of the facility. And it's hard to dispute that sort of activity.

Of course, you have to put in context. Well, how many people do that? This is where you're driving up the probability. What's the probability of that particular behavior in action? I don't think it's fruitful to open up that area of analysis because it's very subjective and people have very strong and different opinions.

The regulatory approach that NRC has come up with is, let's choose something that we think is reasonable, conservative, and is robust for regulatory decision-making. Ultimately, I think some of the confusion is derived from, this is not a prediction of the future; it's a regulatory analysis to justify that a decision from a safety standpoint. And those two things can be divergent.

So risk in the future might be quite different than the regulatory safety decision and the information that goes into it. That's what we want to try to communicate the Committee here, is the purpose of this type of analysis. It's a regulatory analysis. It's not a prediction protection of the future.

CHAIRMAN RYAN: Yes, I think that's a very

important point. Thank you for articulating it well.

MR. ESH: As I said, there's a `combined long- and short-lived isotopes' in the waste classification system that causes some challenges now for how we would develop requirements.

The downside using the generic waste classification approach is there are embedded assumptions in the system. So there are embedded assumptions about inventory; there are embedded assumptions about future activity of the people.

If you read the comments on the original draft EIS and FEIS -- I don't remember which national lab it was -- one of the national labs basically said, we see that you've developed classification tables for the humid site. People say, it's very conservative to use a humid site and apply it to all. It is for some pathways and some behavior; it's not, for other pathways and other behavior.

So, if you're talking about resuspension of plutonium in a dry climate, that's a lot higher than it is in a humid climate. And so that issue comes into play when you try to reduce something complicated into something more simple. I think the system that's been done is very effective for the inventory, but that's the issue of why we're doing the

rulemaking, that the inventory that was analyzed then is now different.

So our approach is, well, how would we do that today? NRC could have done an analysis and came up with new tables, but then it's still being constrained by our assessment of a generic representation for all sites.

Instead, we go with the ability to do the WAC approach, or this site specific analysis for the intruder, more specifically, which is, take into account your actual conditions at that site, and land use and behaviors and everything else, and develop what you think is representative of your specific site, instead of being driven by the decisions that we make in some sort of generic scenario by the regulator.

I think that is a good approach and it will work very well, but as I said, it requires you to have good oversight of the evaluation and the analysis and that appropriate detail went into that analysis to begin with.

CHAIRMAN RYAN: One part of that I think is very important, too, David -- correct me if you disagree -- I think it's fair to put in the regulation somewhere along the line -- all right, let's say we've

got a new segment. There's got to be a modeling effort that will get the regulator, whether it's through an agreement state, to say, yes, this is okay; we can proceed.

What about the ongoing requirement that as a site continues to do monitoring and all that sort of stuff, they can build the body of evidence that can become decades long in terms of the ability to better protect what they first thought, and say, we're on track to being where we thought we'd be, or, we need to make these adjustments based on these new findings from the data that we now have.

Is that something you've built in?

MR. ESH: Yes, that's part of the process right now. If you look at Part 61, at closure, it basically says, considerable all those things that you've learned, whether it's monitoring data or technical analyses or whatever, and factor those into your closure, design, and decision, basically.

CHAIRMAN RYAN: Yeah. I think the real option for the guidance to do that in the guidance document might be to make sure you've captured the depth of what you just said and all the things that back it up.

MR. ESH: Yes, in our guidance document,

we are much more focused on the front-end regulatory analysis than on the back-end parts of the process. That was driven by, what do we need to put on the front end, based on the new waste streams, to ensure that the appropriate analysis done? Rather than, on the back end of the process, what could be done better to improve the back end of the process?

We did change a few things there, like requiring the analysis at the end --

Right, Chris?

MR. McKENNEY: Okay.

Chris McKenney -- as we'll discuss in June, there is more of an emphasis, even in our previous NUREG-1573, which is a performance assessment rule on waste.

In 2000, we did note that this is an iterative process, meaning that as you get through, you need to review the program, review your assessments and say, are you still within the envelope? Can you make a better estimation? And there would be an expectation that they could, if they got better data, make a new performance assessment, which, the way the ruling is, they could take more waste, take more inventory, either concentration or inventory, and take advantage of that. Or, if other

information becomes available, they need to reassess their performance assessment because something isn't working as it should.

That also should be triggered by their -- one is the fact that in Part 20, of course, there's an annual review in the radiation protection, and the envelope which your performance assessment as part of, should be part of the review of saying, do we have new information that says we need to either question or we can come in for amendment to do a revisal.

CHAIRMAN RYAN: Thanks.

MR. ESH: So the most important part of the slide, though, are the last two bullets. So, if there's anything that you remember from what I say today, it's the last two bullets that I want people to remember.

The generic waste classification system doesn't, and was never intended to, ensure that you will meet 61.41. And not all isotopes important for 61.41 are necessarily reflected in these tables of 61.55. Because it was driven by the analysis of the intruder for 61.42, that concept is important to understand.

There's always been the expectation in Part 61 that you will do an analysis to demonstrate

that you can meet 61.41. That's an analysis that's basically a modeling or a projection or whatever you want to call it, but it's some sort of forward-looking assessment of what radioactivity can you take in your facility? How is it going to be transported through the system? And what's the potential dose to receptors to result from the transport of that material?

Okay, so inadvertent intruders -- slide nine.

This is the concept that the Commission used when the intruders were put into play in the regulation. Some of our stakeholders and made various comments on this area, and I wanted to just talk about it at a high level conceptually. so the Committee understands what is assumed and what's not. It is not based on the assumption of failure of society. It is based on the assumption of error of the government.

As somebody was talking about earlier today -- I think it was Mike -- it's basically, you have 100-year institutional control period, which is an active institutional control. At the end of that hundred-year period, you have a passive institutional control period.

NRC expects that that passive system is

1 going to be effective, but not 100-percent effective,
2 because governments make mistakes. And they'll make
3 mistakes in ways like inappropriately looking at the
4 zoning plan or, you know, something about land-use, is
5 basically what it boils down to, and managing future
6 land use. And over long periods of time, you have
7 records that are destroyed, you have all sorts of
8 things like that, that can happen, so there can't be
9 assurance that that sort of passive system, where you
10 don't have a fence and people patrolling is going to
11 keep people out of that area.
12 There was also the assumption that the
13 intruder, as 61.42 is written, is protected, it says,
14 at all times. There's no limited to time of when that
15 person is protected in the system. But conceptually,
16 they expected that low-level waste is going to have
17 limited quantities of long-lived waste and that the
18 decay hazard, as Dr. Ryan has said, is reduced
19 tremendously over the 500-year period. New waste
20 streams might not necessarily meet that description.
21 In particular, the depleted uranium stream waste
22 stream, more waste streams that are generated from
23 some of the other processes, might not necessarily be
24 waste streams with low amounts of long-lived waste.
25 So the issue becomes, how do you assess

that part of the problem? That's where the inadvertent intruder comes into play in the site-specific intruder analysis. The inadvertent intruder concept, and the way it goes about, it relieves licensees of financial responsibility after the institutional control period. So they develop a fund, as you're well aware, and they use that fund to do closure activities. But then, ultimately, the site is given to state and federal ownership, and license are off the hook.

If you want to go to an approach of longer institutional control, then I think that has financial impacts for your assurance fund and things like that. Or, if you wanted to go to a perpetuity-type approach, which is the Commission in the past has said does not support or isn't reasonable in developing the approach that they did here originally in Part 61.

That isn't to say that the necessarily change that position now, but those are alternatives that we can considered in the process. That is because there wasn't at the time, and I don't think there is still is, an adequate basis for long-term robustness of passive control issues.

This should say "passive," I think, not "active," on the fourth bullet down.

The concept for the intruders was that the intruders were on unlikely, albeit possible. Not expected; unlikely, albeit possible. So, while you're right that there is a conditional probability of one, we're going to assume, for intrusion, the fact that we are applying the 500-millirem dose limit the NRC did in developing the classification tables, and which we're proposing in the rulemaking process, implies a probability of five percent.

If you draw an imaginary line at the edge of the buffer zone and you put a public receptor at one side of the buffer and you move the receptor to the other side of the buffer zone, if you think the probability is one that they're going to be inside the buffer zone, there's no reason to set the dose limit at 25 on one side of the line and 500 on the other. The limits should be the same if, in fact, you think that than expected behavior.

So, conceptually, that what's done with the intruder, and we're not moving far away from that, except, as I indicated, we want to allow people to do that in a site-specific way now that takes into account things like the depth of the waste, the barriers that are present, the materials that they have, the site-specific environmental conditions. And

all those things that go into that type of evaluation.

It is still a regulatory analysis. It's not projection of the expected future. It's a regulatory analysis to make a safety decision, and that's an important distinction that I think needs to be understood.

So, slide 10, please.

The low-level waste technical analyses -- the requirements must apply -- and there are a couple of important points here. They must apply to all sites and inventories.

The low-level waste disposal sites have vastly different inventories, engineered barriers, natural barriers, and environmental conditions. The approach that we took is that the technical requirements have to be established for the most challenging inventories and site conditions or else we can't ensure that health and safety will be protected.

So, if you said, well, I have a site that has all short-lived waste and, therefore, they should only analyze for 500,000 years, I would agree with that. Technically, that makes sense. Why wouldn't you do that? But, if we put 500 or 1,000 years into the regulatory requirement and somebody comes along with large quantities of long-lived waste, well,

there's no bets at all that the dose results, in these types of analyses, that they get in 500 or 1,000 years will in any way be representative of what they get in the period after 1,000 years and, say, 10,000 years.

Generally, the engineered system and the radionuclide transport in the groundwater system can get you delays of at least 1,000 years in many cases. But for a lot of for a lot of systems, and especially for a humid site, they don't get delays past 10,000 years. So, if you want to see what the risk is, the risk usually occurs after a thousand, not before a thousand, for 61.41 in particular.

The approach we took was to specify the requirements that would ensure that the challenging sites in inventories are, that public health and safety is protected for them, but in the guidance document and the analysis, allow somebody to do something that's simpler and more straightforward when they have a low-risk condition. So, if they have a low-risk inventory at long times, sure, the requirement says analyze for 10,000 years.

But if I was a licensee, I'd go in there and say, look, my inventory is gone; what's the point of me estimated that? And as a regulator, I would say, there's really no point in that. But there's no

pain to projecting the numbers at that point if the risk is low or zero. The risk is going to come out of the analysis based on there being no inventory there.

So it's like a nuclear version of Occam's razor. So, when we have this issue of having two competing decisions, and one is not necessarily much different than the other, we'll err on the side of protectiveness or safety, and that's what we're attempting to do with these regulatory requirements. So we think the best approach is to risk-inform the technical analyses.

So, if we could go to slide 11, and this is what I want to convey to you -- I know the Committee probably don't like the fact that I'm saying what we're doing is risk-informed, but that's the argument that I'm going to try to make. But we do a lot of things in this revision that I believe are risk-informed.

Now, we aren't abandoning the intruder performance objective, which I think is one of the hang-ups of the Committee with the whole approach.

MEMBER ARMIJO: It's mine, yes.

(Laughter.)

MR. ESH: We aren't abandoning that because, as I said, we were given direction for a

limited scope. We think it's one of the fundamental components that they put in their analysis originally, and we don't feel like we have the ability to move away from that. There are a diversity of opinions, and some people understand or agree with why it's there in the approach that it serves, including many of the staff.

But putting that to the side, the rest of it, I would say, are examples of how we are trying to be risk-informed in this process. So the tiered approach to the analysis time frames, it's trying to work with the uncertainties and the problems while still trying to ensure that appropriate analysis that appropriate analyses of done for the more risky waste, especially for 61.41.

We are, in the proposed revisions, allowing for site-specific technical analysis rather than generic waste classification. We're trying to still avoid what I would call unnecessary speculation about the societal uncertainty component. Maybe it's a lot like the rulemaking; you go around and around and around and you end up at the same place anyway.

But the higher dose limit for the intruder scenario, if we weren't being risk-informed, we would set the probability of one to the intruder and say,

use the same dose limit for the intruder.

The site stability is based on the impacts to 61.41 and 42 not and some abstract concept about, like, dimensional change at the facility, or structural change, because we don't think it is reasonable for somebody not to tie changes in the stability and structure of the system to how it may impact the public health and safety. So, as we wrote the requirements, that's how we tie it in, and we explain it in the guidance.

And then one area of the regulation that the Committee probably hasn't talked a lot about, but we've gotten some good comments from stakeholders on it, was 61.50, Site Suitability Characteristics. What we decided to do there was to say the site suitability characteristics are only exclusionary, the hydrological ones, for 500 years because, basically, if you're having hydrological problems within the first 500 years of your facility, you're likely to have very big problems after 500 years from those processes.

But the other things --

CHAIRMAN RYAN: What would be the limits of those? I can understand a meandering stream or river or something that's --

MR. ESH: Well, to put it more simply, the issue is this: The site suitability characteristics have something like, the facility may not be in the location of the 100-year floodplain. How would somebody demonstrate that over thousands of years, whether you're in a 100-year floodplain or not? It's based on things like you just sited, how rivers move and all the geomorphology that goes on. I think that would be almost impossible to demonstrate.

You should be able to demonstrate it for 500-year period. I think that's credible to demonstrate based on all the science I know about geomorphology and the programs available and what not. But after that, if it doesn't impact public health and safety, it shouldn't be exclusionary.

That's the approach we took, and an example for you of what we decided to do there.

CHAIRMAN RYAN: I guess what I'm reaching for is, would that kind of analysis suggest that engineered barriers or engineered aspects of the disposal system would be credited?

MR. ESH: Yes. Certainly after, for hydrological characteristics, after 500 years. We intend for this to be smart and performance-based. If you can credit any engineered barrier for whatever

period of time, you're free to credit that in your analysis.

CHAIRMAN RYAN: Okay. That's the answer to my question.

MR. ESH: Yes.

And then also, as you are well aware, in the dose modeling area, we recommend moving away from something that's quite dated at this point and doing something that we said people can do any way in other analogous programs.

So, Analysis Time Frames -- I have, I guess, three --

CHAIRMAN RYAN: So just to make sure everybody is on the same page right now one, that's basically using the more updated ICRP models for internal radiation protection analysis.

MR. ESH: Yes. That's right.

CHAIRMAN RYAN: That's really very focused on the internal part because all the radionuclide stuff has been updated.

MR. ESH: Yes.

CHAIRMAN RYAN: Okay.

MR. ESH: Slide 12 -- Chris?

MR. McKENNEY: Actually, because of the way we're writing the rule, if there were to be a

change in the external assessment process, they could be able to take advantage of that as soon as the new federal guidance report came out.

CHAIRMAN RYAN: Okay.

MR. McKENNEY: So, the way the rule is set up, it's not stuck on a specific federal guidance report anymore.

CHAIRMAN RYAN: Ah, okay, so that's the tie.

MR. McKENNEY: They can update their assessments to take account of the latest science.

CHAIRMAN RYAN: Thanks. That's great.

MR. ESH: So slide 12 -- Analysis Time Frames -- is a summary of the international experience.

We went out and tried to find as much literature as we could on the subject. And the bottom line, as you can imagine, is there is a variety of different approaches, but they have a common theme to them. They usually do one of the things I've listed on the subtexts under "approaches included."

Some countries will do long-term analyses. Some countries will just say, go to peak, whenever that is. And others will set regulatory defined limits on the near-surface disposal of long-lived

alpha, especially. So they say we're going to limit how much long-lived you can take, and once we do that, then you can analyze for a short period of time because we've placed a limit on what the risk may be for the long-lived component.

If you're not going to place a limit on what the risks can be for the long-lived component, then my opinion is you at least have to do an analysis looking out sufficiently long to see what the risk is, from that component.

Some --

MR. WIDMAYER: Hey, Dave?

MR. ESH: Yes?

MR. WIDMAYER: Sorry. Can you tell us what the bases are for those countries placing a limit on the long-lived alpha? I mean they must have done some sort of analysis to come up with a --

MR. ESH: I don't know how detailed the analyses are, because it's very difficult --

MR. WIDMAYER: Do they have ranges all over the place, or are they --

MR. ESH: They're kind of condensed in, like, the 4 E to the -5, 4 E to the -6 Becquerels per kilogram, I think; I forget the units. It's in the paper; we can talk about it. But basically, it's not

clear how they derive those values.

You know, is it a case of herding behavior, where somebody came up with one and then the next guy is doing his regulations, and he says, they have that, so let's make it about that. So I don't know. We couldn't find sufficient detail to see specifically how those numbers were derived. But the fact of the matter is that they do set them, and some people, instead of setting the number like that, they just say, no near-surface disposal.

So some countries put all their waste, even the most benign waste, deep because what's the primary mechanism for people who are trying to manage risk from different types of waste? It's disposal depths. High-level waste, geologic repository; intermediate waste, intermediate depth; more benign waste, near-surface.

So, if you have waste that you think is kind of intermediate-level waste or kind of pushing towards there, I would search for a site where I can bury it deeper and mitigate a lot of these concerns about changes to the environment, what people are doing, all those sorts of things. It's a really simple and effective way to properly mitigate those risks.

Many of our existing facilities, though, do not have sufficient depth in their locations that they can take that approach. So that would be a problem to use that for some existing facilities. Or if we were to say, you know, if NRC was to derive, you should put this type of waste at least this depth, that also, then, adds a problem, just like the generic waste classification system, in that value based on some analyses that may not be representative for another site or another condition, and we're going to impose that on all.

So, while it's smart from a policy and technical perspective, it could also not necessarily be risk-informed from a site-to-site variation and inventory perspective. Our approach for analysis time frames, we think, is consistent with this international experience, which is kind of congealed around some of these main elements.

Now, the domestic experience in low-level waste, as summarized of slide 13, as you know, all currently operational low-level waste disposal facilities are in agreement states. There are different interpretations of our regulations because our regulations are silent on time frame for the analyses.

It does mention time frames were slow the things -- say, the Class-C intruder barrier, for instance, or site characteristics that says `consider for at least 500 years.' The institutional control period is 100 years. By putting some of those numbers in that are conditional for specific parts of the analyses and then being silent on this other part, it has led to some various, quite diverse interpretations of what we expect.

But for different interpretations in the various agreement states, Washington used 10,000 years and they looked longer in their EIS. Texas went out to 50,000 years in their analyses. Both of those licensed operating facilities. Utah had 500 years, and now they're currently reviewing a performance assessment that goes to 10,000 years. And then they do something that they call a deep-time analysis after that, which will look at very long-term effects at that site. And then South Carolina did 2,000 years, have I understand it.

In 2000, the NRC staff performed a detailed technical analysis for low-level waste disposal, looking at this and other issues in the development of NUREG-1573. They basically said, look, you need 10,000 years because, otherwise, you can have

situations where you design a facility and you put in an engineered barrier and you defer the risk for some period of time, especially 500 years or maybe slightly more than 1000, but then you have a big risk pop up for certain inventories and designs, and that's not something we want.

We want to ensure that the criteria are met for a reasonable time frame due to the reduction to the system, and not necessarily the delays in the system. Delays are good; don't get me wrong. You definitely want delays.

So, if I'm worried about my family or future generations of my family, it's really important for people to understand that even hundreds of years is are very long periods of time. But from a regulatory analysis standpoint, the reductions in risk are much more powerful, and this is about ensuring that the analysis communicates what those reductions are or are not.

In addition to the international and domestic experience, we also considered some technical things on slide 14.

As I discussed earlier, we have this traditional waste. The traditional waste, all of it in all of the operating facilities has a long-lived

component to it, and the long-lived component is the driver of the projected doses for 61.41. In fact, for three of the four facilities that went out longer, all of their peak doses occur after 1,000 years, so the peaks are larger.

So, if you want to talk about risk, based on what they know today and their analyses, the risk is larger in the longer-term period than it is in the shorter-term.

Now, depleted uranium is a different beast. It's a much more extreme case of what I just described, and it's due to the fact that it's, as currently envisioned, essentially pure powdered uranium, where the daughters then grow in over long periods of time.

The problem with it is, at 1,000 years, your only capturing one one-thousandth of the impact of where it ends up as those daughters build in over time. At 10,000 years, you are roughly in an order of magnitude. It depends on the isotopic ratio U-234 and U-238, but you're roughly within an order of magnitude.

So our concept was, if we're dealing with a system that has a lot of different types of uncertainties, whether they're from performance of

natural or engineered barriers, or the waste characteristics themselves, we should at least be able to get within an order of magnitude.

We realize that there are a lot of uncertainties as you go out in time, and that causes challenges to the value of information, but for regulatory decision-making, if we look at what's done internationally and domestically, there are decisions that are made using information from those time frames. It's not that that information is valueless; it has been used, and those facilities are licensed. We think it's prudent to continue with that approach, considering some of the waste streams that we were told to do this rulemaking for.

Another example I would use for the traditional waste that's interesting is, I think, the ILAW facility at Hanford. Although DOE uses 1,000 years under DOE Order 435.1, at Hanford, they present results usually that they communicate a 1,000-year impact and then the 10,000-year impact. And what you see is that in many cases, a 1,000-year impact is only a five-hundredth or a thousandth of what you see that in a period of 1,000 years to 10,000 years.

So that system does a good job in pushing risk out. But the magnitude of it, and whether you

need to evaluate that magnitude to assure that public health and safety is protected, is quite different for those different time frames. We think that the analysis should be done to communicate what that is, and the decision should be based off that.

So the guidance that we got from ACNW in slide 15, or ACNW and then ACRS, was to use a two-tiered approach, so the time at which the more mobile radionuclides produce doses, and then, avoid catastrophic impacts after. Consider things like teal hydrology, the waste isolation technology, and other controls.

And we really appreciated this recommendation -- I appreciated it when it was first generated and 1997 and then again in 2011, and I said, yeah, that looks great; okay, how do we do that.

So then we move to slide 16.

Well, when we tried to say, how do we do that? What requirements will be right for this? Well, when we tried to say, well, how will we do that, to try to make the requirement be flexible to adjust with the problem, we ran into all sorts of challenges of what these things would mean. So we said, okay, what are the more mobile radionuclides? How would you define that?

The challenges are listed in these subtexts, like, "Radionuclide A maybe more mobile at one site and less mobile at the next; Radionuclide A may be less mobile than Radionuclide B at one site and more mobile at another. So how do you define more mobile?

Then, in addition --

MEMBER ARMIJO: Dave?

MR. ESH: Yes?

MEMBER ARMIJO: Could you give a specific example of that mobility difference from one site to another?

MR. ESH: Yeah, any isotopes. So, if you look at the distribution of most of the -- usually, the engineers condense the geochemistry of transport down into a single parameter called the Distribution Coefficient, which is kind of a linear absorption isotherm for the partitioning of the material between a solid and a liquid phase. It's a crude representation all the complicated geochemistry that can go on in some of the systems, but it's --

MEMBER ARMIJO: Is it a water-soluble element --

MR. ESH: Yes --

MEMBER ARMIJO: -- in a dry site versus a

wet site. The example would be, say, take uranium. Uranium, if you look at the observed values and say there's generic references of compiled KD values. The one that we'll look at is the Shepherd and Thibodeaux reference. The uranium KDs have been measured from like 0.02 milliliters per gram up to like 20,000 milliliters per gram.

So, at one site, uranium would be effectively immobile, and at another site, it could be quite mobile. It would depend on the geochemistry and mineralogy and all the sorts of things.

MR. GROSSMAN: An example there might be if you have like a carbonated groundwater source, for the uranium case.

MEMBER ARMIJO: Sure, pH changes.

MR. GROSSMAN: Yes.

MR. ESH: Yes.

So the challenge becomes, then, you're dealing with these distributions of quite variable information that you're trying to evaluate. And if we can't get people, just from a fundamental standpoint, to do a similar analysis in this area, if we were really specific about how you might go about doing this, I can see we'd get even more diverse results in terms of the types of analyses that were done.

And then you run into additional challenges like, say, you have a site where tritium comes out first, then a little bit later iodine-129 come so and then maybe technetium-99, then carbon-14. Where do you draw the line? Which ones do you call more mobile, and which ones are less mobile? And I don't know.

If the Committee can give us insights on that as what you intended -- I think that's a challenge for finding the more mobile radionuclides in using this sort of approach.

CHAIRMAN RYAN: That's a really complicated question because, for sample, you could have tritium in physical forms in waste that are relatively immobile, where tritium is obviously, you know, mobile in a liquid form --

MR. ESH: Yeah.

CHAIRMAN RYAN: -- or a not-absorbed form, or something like that.

So I guess maybe we're hitting on the idea that that has to be site-specific.

MR. ESH: Yeah, the problem --

CHAIRMAN RYAN: So the guidance you offer should be, you need to these things for any specific kind of determination of the questions you just asked.

MR. ESH: Yeah. My problem is I don't see that, even in guidance phase, that we could put something down that would lead people to interpret it the same way or come up to a similar conclusion. So it would be --

CHAIRMAN RYAN: Well, maybe it's not the same way, but maybe it's within some range of, you know, high, medium, or low sorts of thinking for mobility, for example.

MR. ESH: Yeah.

CHAIRMAN RYAN: Come up with some qualitative decision-making that would allow you to say, okay, in this bracket, we're going to do this, and in this bracket, we're going to do that. So -- I'm sort of thinking a lot.

MR. ESH: Yeah, it's even worse, though, because we focus on groundwater, but there are multiple pathways. So, you know, an air pathway or suspension or surface water or something else.

CHAIRMAN RYAN: And combinations of them, yeah.

MR. ESH: And then colloids -- what does that mean? You know, colloids have the ability to move things that really don't move, quite some distance in a short amount of time. And so, exactly

how would that impact whether you determine something is more mobile? You know, it can impact the whole inventory, not just a specific isotope, or the ones that are prone to form colloids. So that's the first part of it.

The second part, the catastrophic impacts, you know, what would that be? What sort of impact does the Committee feel is a catastrophic impact?

MEMBER ARMIJO: Well, it certainly isn't an exposure of individual to some, even fatal dose; it's thousands of people, large numbers of people.

That's where I get hung up on the intruder assessment. It's certainly not catastrophic in any sense of the word "catastrophe."

MR. ESH: Yes, and I would like to have you with me whenever I'm getting challenged by stakeholders that 25 millirem is not protective, for you to explain that line of thinking that thousands of people exposed to very large doses is what you mean as catastrophic, and that that's consistent with the Agency's mission of protecting public health and safety. That seems like a very difficult discussion --

MEMBER ARMIJO: Well, it is for people will really moping about any kind of radiation

exposure. What I'm talking about, as a regulator, is, you say, what is a catastrophic exposure and impact, and it's certainly not a hypothetical intruder at 1,000 years or 10,000 years, 20,000 years. Clearly, that doesn't meet any definition of "catastrophic."

So that's what we were trying to say, you know, that when you do this analysis, what could possibly go wrong way out in time for low-level waste that could even come close to being catastrophic?

You don't have a burden to protect against some individual exposure of one individual. We don't have a moral or an ethical or legal burden unless we impose it on ourselves for our particular reasons, and I don't think that's of value from a public health and safety perspective.

MR. ESH: Yes, I understand what you're saying there, but also remember, we're talking about more so, 61.41 here, for the protection through the 61.41 performance objective, not necessarily the 61.42, the intruder performance objective --

So would your same line of thought apply to 61.41?

MEMBER ARMIJO: For you --

MR. ESH: -- because, because we didn't get direction from the Committee to limit this to the

intruder. This is just basically, for the time frame for the analyses, this two-tiered approach, with the first phase being the more mobile, and the second phase, catastrophic, was to all analyses of time frames. It wasn't limited to just the intruder.

MEMBER ARMIJO: I think it was in the intrusion, the long-term intrusion. That was my thinking when we were working on this letter.

But I can't envision a low-level waste facility ever leading to a catastrophic impact, even in 100 years or 50 years or 300 years. We'd really have to be poor engineers and regulators to ever have that happen.

MR. ESH: Well, I think the issue is, if you have requirements where you could potentially, based on what allowed by the definition of low-level wastes, put in large concentrations of long-lived isotopes into the facility, and you'd only analyze for a short period of time, you can in fact have something that I think some of our stakeholders would call a catastrophe because you end up with very large groundwater impacts over a very large area, potentially.

So it's a difference of opinion. I'm just trying to communicate that we have stakeholders who

feel that the obligation to protect is not limited. The obligation to protect is what it is. So, whether you take the strong anthropocentric approach to the protection of future generations, or a weak approach, the NRC has some obligation to protect.

If you go back and look at the congressional testimony around the time when Part 61 was developed, they talk about protecting for as long as it's hazardous. They don't talk about limiting it to some period of time based on the fact that future generations can solve those problems.

So it gets us in a little bit of an uncomfortable position if we try to take that approach because I don't think it's consistent with the international experience. It's certainly not consistent with the domestic low-level waste experience, but of course, we may have driven that, so that point is understood. And the technical characteristics of the problem, I think, challenge that approach.

So that's kind of where we're coming from. We're more comfortable with being where we are than taking that approach. We certainly understand the opinion, and we understand where you're coming from.

I tried to express this in some of the

early meetings about, if we're going to talk about risk, let's really talk about risk. What's the risk that I hit a deer on the way home and I'm killed, compared to my risk from 25 millirem in groundwater from a low-level waste site? We deal with real risks all the time, in our own lives and in our families, that are much more significant than these radiation risks. But that discussion went nowhere, when I tried to take it.

MEMBER ARMIJO: Well, it's still valid. And the point is that, you know, unless we keep raising that issue and saying, we really want to be based on a real health and real risk, you can't live in two worlds where, in one case, we deal with reality, and in the other case, we elevate radiation exposure in low-level waste to an extreme, when there is no basis for it.

MR. ESH: Yes.

MEMBER ARMIJO: So the idea behind this letter was just, hey, try to get it into a real-world situation; what is the obligation for the regulator?

MR. ESH: Yes, I understand.

MEMBER ARMIJO: Obviously, you know, there are some people who say, hey, look, we have a duty to protect any individual as far out into the future, as

long as there's a miniscule possibility of any health risk, and I don't believe that.

MR. ESH: Well, it should be clear that --

MEMBER ARMIJO: I just don't that's at all reasonable.

MR. ESH: I mean it would be helpful if, whenever you eventually write on this subject, you communicate on the difference between technically what you think should be done, and then the more fundamental issue of, say, the policy of what NRC should be doing with respect to protection of future generations.

On one hand, you know, we can deal with the technical things at our level, but to make a fundamental decision about protection of future generations and, you know, the policy of that approach is something that, if we got direction on it, certainly, we'll implement it. But we don't feel comfortable charging ahead was trying to make that sort of change.

CHAIRMAN RYAN: That's a very important point, David. I appreciate Sam's comments, but to me, you can build a mountain so high in all of this thinking, you could never climb it. I think that's what we're trying to avoid.

MR. ESH: Yeah.

CHAIRMAN RYAN: What is technically sound? What is technically reasonable? What are the kinds of materials to try to manage and get some envelope around it? You've described that pretty well this morning so far.

MR. ESH: My opinion boils down to this: You know, we have operating facilities that have been licensed using requirements that are similar to what we've propose, so it's not a hurdle that's impossible to get over. Whether the hurdle should be in place to begin with is a different story. But the fact is that it's not something that's going to prevent licensing and regulation of low-level waste sites.

MEMBER ARMIJO: Dave, that's very important to me because, I'll tell you, the regulation seems to be getting bigger and more complicated. And maybe because I'm far from being a next work in this area, but there is in the in this country for low-level waste facilities to be signed.

If we make the regulations so difficult to meet and we prevent the signing of these low-level waste facilities, then a lot of other benefits to society will not be available.

MR. ESH: Yes, I understand.

MEMBER ARMIJO: So, you know, the question is, if this is just some calculational method that you can use to assure yourself, that's not a big problem.

But if it creates an impossible barrier that you can't get over, and it can be easily challenged in court or by intervenors -- like, for example, I can say, I don't believe any analysis you made for 50,000 years, and I will take you to court on that. You can't defend that. If two different people make up 50,000-your analyses, they're going to get very different results.

So, if you set up some hurdles that can't overcome or are easily challenged by someone who simply wants to stop a low-level waste facility, you're not doing a service to the country.

MR. ESH: Yeah, I understand that. That's --

MEMBER ARMIJO: That's where I'm at.

CHAIRMAN RYAN: Sam, just to be fair to David's presentation this morning, I think several times, we talked about how this leads into decision-making.

MR. ESH: Yes.

CHAIRMAN RYAN: I think that's the real tough part of this, which is, how does the technical

analysis you laid out and will be in the guidance and the documents that will come out, how does that get translated into non-science and non-regulatory decision-making about "yes" or "no" on facilities, and that kind of thing?

MR. ESH: Yes.

CHAIRMAN RYAN: So I think there's certainly something to think about there. But having you all think about you can discuss that, at least in part, in your work would be -- or value work. You know, here's the technical part, and here's what we think its best use is -- that's something to think a little bit more about.

MR. ESH: I mean our standard is a reasonable assurance that we use in evaluating those sorts of things. So it's not actually --

(Simultaneous speaking.)

CHAIRMAN RYAN: So what you're saying is it's reasonable assurance in the context of all these things we just talked about.

MR. ESH: It's not absolute proof. There are lots of things that go into it. You know, I could envision as a regulator that somebody gives me an analysis that way below the limit, and I can't find a reasonable assurance with it because of technical

things one through 72 step into that were deficient in the analysis that they did.

CHAIRMAN RYAN: Right.

MR. ESH: Likewise, I could find that somebody that might estimate something right at the limit, or maybe the above, that I can say, all things considered, they have a lot of conservatism in their analysis for this, that, and the other thing that I could easily argue for and justify that maybe supports a decision-making.

CHAIRMAN RYAN: Well, that kind of presence of certainty or uncertainty and how you deal with it as a regulator in getting it into the documentation would be very, very helpful.

MR. ESH: Decision-makers are really uncomfortable with uncertainty. So they do not like it and they don't want it. `Tell me what the number is.' For fans of The Office, it's it's like --

CHAIRMAN RYAN: Well, no, I'm not saying, in the regulation or requirement. I'm saying that when you make a decision about it, the decision might have an analysis or a thought process about uncertainty, but you're going to say yes or no at the end of the day, and you're going to base it on this kind of thinking and analysis.

I think that getting insights as to how the material will be used and judged is a helpful thing to try to figure out how to write it down.

MR. ESH: The modeling and analysis provides input to the decision, but it does not make the decision.

CHAIRMAN RYAN: Right.

MR. ESH: There's a whole bunch of things that go into the decision, especially in low-level waste regulation. There is defense-in-depth there.

So all the waste characteristics of limiting certain things that can go into the facility, that's a defense in depth. You know, is it smart to put chelating agents in the disposal facility? Probably not. Is it smart to put a lot of liquids in the facility? Probably not. So there's all these things that go into providing a defense in depth, of which the analysis is one of them.

But the analysis, in our opinion, has to look at the problem. In some cases, based on done changes to the inventory over time, that problem is different than when it was in 1982. So the requirements need to be aligned with the types of materials that are going to be disposed of.

And on the bottom part of slide 16 -- just

a couple more points -- for the WCS facility and the projected time of the peak dose for the more mobile radionuclides, the first radionuclide to the show up was at 30,000 years or greater than 30,000 years. So based on the direction in your letter, should they be doing a 30,000-year analysis? And should some other facility, if their first isotope shows up at 50 years, be doing a 50-year analysis?

And if, in fact, you did that, what sort of unintended consequences and disincentives would result in the system?

And that's what I'm going to talk about on the next slide.

CHAIRMAN RYAN: Okay.

MR. ESH: Slide 17, Site-Specific Analysis Time Frames, the disposal practices and selection of sites -- so licensees are for-profit entities. And of course, they're stewards of the environment. People laugh at me for saying that, but I think most people have good intentions. They want to do the right thing. They have people that live in those communities. They aren't out just to make a buck. But they are for-profit entities.

So, if you're going to maintain to me that it's much more difficult and expensive to do this

longer analysis as opposed to a shorter analysis, then why wouldn't they pick a site and design that would allow them to do the short analysis?

Then likewise, how does that ensure, from a national standpoint, that our regulations and policies are having people do the right thing from a waste management perspective? I don't think the Committee would disagree with us that they should pick as good of sites as possible and do as good of engineering as possible.

Some of those may have very long time frames that they are able to defer the risk to, to and reduce the risk to, and some may have less. But the overall requirement should make sure that people are trying to operate with that mindset of, have I demonstrated that I picked a good site? Have I put in as much engineering as practical, not being overly burdensome and expensive, and show that I met the criteria? That's kind of a fundamental policy approach that we have in our mind that probably we'd run into with doing the site-specific approach.

We think that defining a number and having everybody work from that number, allowing them to scale their analyses or the sophistication of their analyses, based on the risk of their problem, is a

much cleaner, smarter way to go, all things considered. Because, we have some people, licensees, in agreement states that are much more sophisticated than others, and we have to take that into consideration when we develop our requirements.

We do think that the Commission policy regarding stability in waste isolation, you know, they basically say, keep the material stable for as long as you need to. And if you went to the site-specific approach, then why would people have an incentive to try to do that?

The reality is, if you said, I put my material in a site which was very unstable, which allows me to analyze for shorter period of time -- say, as a practical example, the state-licensed and NRC-licensed disposal areas at West Valley is not an ideal location for a disposal facility.

But in fact, that was a decision that was made many decades ago, and now it's considered as part of the scope of the decommissioning process of that site. Who knows what the eventual disposition will be. But why wouldn't you pick a site like that as opposed to, you know, the NTS in Nevada, which might be stable for hundreds of thousands or millions of years from a geomorphic standpoint? There would be a

disincentive to maybe not doing the right thing from the requirements.

I'm not necessarily saying it would happen, but we think the requirements should be aligned with the incentives we want people to choose, and those would be things like choosing to the sites, having stability for as long as possible, consistency with the international approaches, and so on and so forth.

So that's pretty much it for me if we want a break time.

CHAIRMAN RYAN: Yes.

Let's go ahead and take a 15-minute break and come back at 11:00 for the last hour.

(Whereupon, the above-titled meeting went off the record at 10:41 a.m. and reconvened at 11:00 a.m.)

CHAIRMAN RYAN: Okay, we'll come back to order, please.

I've been advised that sometimes, from the table, it's hard for folks in the back to hear us. So maybe it's just us facing you that it's hard. So we'll speak a little louder. Maybe we can be mindful to speak up a little bit.

So, back to you, David. Or, Christopher?

MR. GROSSMAN: I've got this one.

STAFF EFFORTS TO REVISE PART 61:

SITE-SPECIFIC LOW-LEVEL

WASTE TECHNICAL ANALYSES

CHRIS GROSSMAN, NRC STAFF

MR. GROSSMAN: I'm Chris Grossman, with the NRC staff, so I'll be covering the rest of this presentation on the technical topics.

The Commission's direction last year gave us or items, which Mike previewed earlier today and Dave has covered, the time frame part of that direction, and so I'll cover two of the remaining three. The compatibility, we don't plan to talk to in great detail today. It's a fairly simple issue.

So the two that I'll be talking about our flexibility to use the latest ICRP dose methodologies in the PA and then flexibility for site-specific waste acceptance criteria. So we'll start with the dosimetry part.

Slide 19.

Just to reiterate, the Commission directed the staff to weigh the pros and cons of allowing the licensees the flexibility to use ICRP does methodologies in a site-specific PA. We won't spend a lot of time on that flight.

Slide 20.

Just to give you a little context, that we weren't sure of the familiarity level with Part 61 and the different methodologies, so just to kind of set the stage, NRC regulations are based on or derived from varying ICRP methodologies over years. Part 61, I think, may be the oldest methodology that draws. And then it draws from ICRP 2, which is from the late 1950s, early 1960s. That was an organ dose approach.

ICRP's recommendations have been updated significantly since then. There was a major revision in the 1970s for 26.30, which largely formed the basis for Part 20 as well as Part 60, which some of those were pulled forward into Part 20 as well.

And then the most recent recommendations were issued in 2007 in ICRP 103.

So, again, you --

CHAIRMAN RYAN: Again, which have not been adopted in any regulation at this point; correct?

MR. GROSSMAN: That's correct. That's correct.

And ICRP 103, it's my understanding -- and I haven't gotten the most up-to-date -- but in terms of what we would use in the analyses, the dose conversion factors, those numbers have not been

developed for that yet. So ICRP 68/72 are the latest dose conversion factors that would be available.

The other thing to note on this slide is that Commission policy in SRM SECY-01-0148 allows for exemptions for current models on a case-by-case basis. So that is a possibility.

MEMBER ARMIJO: So somebody could use the ICRP 103.

MR. GROSSMAN: Well, practically, no, because the conversion factors have not been developed yet. So the latest that would be available would be 68/72. When must become available, we anticipate roughly a 2014, 2015 timeframe for those numbers. Then that possibility would be available on a case-by-case basis.

CHAIRMAN RYAN: Just so it's clear to everybody, you're not showing that fancy bullet for 72 in the picture.

MR. GROSSMAN: No. The reason for that is the bullets for the recommendations.

CHAIRMAN RYAN: Yeah.

MR. GROSSMAN: The parameters and so forth come in under other ICRP guidance.

MEMBER ARMIJO: In between --

(Simultaneous speaking.)

CHAIRMAN RYAN: -- Document 72 actually augments 60.

MR. GROSSMAN: Thank you, Mike. I appreciate that.

MEMBER ARMIJO: Okay, and that is what can be used under the --

CHAIRMAN RYAN: This is where the dose factors are. That's the basis for the dose factors.

MEMBER ARMIJO: Okay, got it.

CHAIRMAN RYAN: So that's correct.

MR. GROSSMAN: Sorry about that. Okay.

Slide 21, then.

In analyzing this to present a proposal to the Commission, we considered, obviously, Commission direction. We also looked at the different methodologies and how the updates had provided a more realistic evaluation of radiation risks from what is currently used in Part 61, which would be the organ doses.

The methodologies account for the radio sensitivity of the organ. That's something that wasn't incorporated and ICRP 2, and thus, Part 61. And they consider a wider range of organ and issues.

The other thing that we considered was public feedback, and I'll go into some of that in a

little more detail in the following slides.

MEMBER SKILLMAN: Chris?

MR. GROSSMAN: Yes?

MEMBER SKILLMAN: When you identify in the first bullet, under the second big bullet, "holistic," do you mean thorough?

MR. GROSSMAN: Holistic in the sense that you're looking at kind of the whole body, so the different organs are weighted in that system. And then you take an aggregation of that risk.

The methodology used in Part 61 would be more, if you look at target organs in each case and there's no weighting by the radio sensitivity of the organ and so forth.

MR. McKENNEY: Basically, it's from a holistic point of view. For optimization in ALARA, you can make a consideration of comparing because one radionuclide would focus on certain organs and another radionuclide would focus on other organs. So what is a 20-millirem dose to the lung versus 30 to the kidneys? What is more important?

The ICRP methodologies, from 26 on, were able to take the radio sensitivity of each organ and say, what is 20 millirem to that organ, and associate it into cancer risks long term, versus being fully

exposed to the whole body the same amount of those?

So, each organ has a different radio sensitivity, so that gets taken into account. Therefore, you're allowed to holistically evaluate. When you have a mix of different radionuclides, you can look at different things. If you were to control these radionuclides, would you reduce the risk, or would you just have an exchange because a different radionuclide is now being realized.

MEMBER ARMIJO: Is it fair to say that the new ICRP dose recommendations would be, are more restrictive in that the --

MR. McKENNEY: No. No, it is not.

MEMBER ARMIJO: That is not correct.

MR. McKENNEY: No, because they take into account the latest understandings of how the elements move through the body, and with the latest age-based models associated with it, and include the latest updates on the risk associated with all that stuff. So actually, they tend to get better.

Now, on a radionuclide-by-radionuclide basis, the allowable intake in picocuries per year to a certain dose may change, and some go up and some go down as the science changes, but it's not getting more restrictive. In the old system, it actually was that

way. It was whatever organ got 25 millirem first --

MEMBER ARMIJO: That was the end of the line.

MR. McKENNEY: -- was its stop.

In the new system, because they are all -- almost every organ is, first of all, subfractioned. So you multiply by a fraction for every organ because there is no organ that is as radio sensitive as the entire body. The lung is a multiplier of 12 percent. The breast is 25 percent in the current model. And it's not necessarily as limiting in the system.

MR. GROSSMAN: Okay.

Slide 22, then.

The options that we considered were specifying a specific methodology in the regulation for adopting a neutral stance where we wouldn't specify, and the licensees could elect to use a different methodology or the latest methodology, or to address this in guidance and for the rule to be silent on it.

Slide 23.

I'll talk a little bit about the public views that were received for the technical basis to the develop the rule.

MEMBER ARMIJO: Just to make sure I

understand --

MR. GROSSMAN: Sure.

MEMBER ARMIJO: -- currently, we don't specify a methodology, or we do?

MR. GROSSMAN: Well, it's implicit through the dose requirements in 61.41. And so, because of the way -- the dose currently is not a 25-millirem TEDE, although it can be implemented that way if the dose is actually -- I don't remember the specifics from the regulation. It's 25-75-25.

MR. McKENNEY: It's 25 millirem, full body; 25 millirem, any other organ; and 75 millirem for thyroid.

MR. GROSSMAN: Right.

MR. McKENNEY: And because it's listed out by organ, that tells you that it's an ICRP-2 methodology system and that you should be using that methodology with those dose limits.

There's a similar issue in Appendix I of Part 50. It has similar language, and of course, the Commission just ruled, told the staff this last year that they should go forward with updating Appendix I, and also Part 20, to the latest recommendations to that.

MEMBER ARMIJO: Okay.

MR. GROSSMAN: So back on slide 23, we received both supportive and critical views. I think, in this case, most of the views were supportive of the approach, reflecting that it would be using the latest science.

Specifically, some of the views were mixed between whether we should allow flexibility for the licensees to elect the latest methodology versus directly citing it in the regulation, which would tie it then to a methodology. We received comments, I think, on both sides of that.

And then there was also a comment to periodically revisit this in the PAs, and this was all the DOE's approach for PA maintenance, where they come back, and if new information becomes available, say, on a five- to ten-year basis, they would reconsider the analyses using the latest methodology.

The critical comment we received largely was around the safety significance in removing the critical organ limits. They thought that was more conservative approach and, therefore, should be retained, than some of the more modern methodologies.

Slide 24.

The staff's proposal was to adopt a neutral approach. We felt this was consistent with

Commission direction through some of the policies. It allowed exemption on a case-by-case basis. It allowed for use of current science. There is a precedent in Part 63 to using more recent methodology.

Part 63, for those of you who may not be familiar, is the regulation for the disposal at Yucca Mountain. And also, we felt it would help minimize future revisions to Part 61. So, by not tying it to a specific methodology, there was flexibility for the future. One of the underlying goals in all of these changes was, how do we avoid tinkering with the rule nonstop in the future?

So that's all I have on the dosimetry part. If there any questions, we can take them at this time, or I can move forward to the waste acceptance.

MEMBER ARMIJO: Just on the issue of the public view that the safety significance of removing the critical organ limits was in the wrong direction and being less conservative, how much merit does that argument have? It will be less conservative, but the question is, is it safe?

MR. GROSSMAN: Right. I think, in some cases, it would be more conservative; in some cases, it wouldn't be as conservative. So that argument is

a little mixed, in reality.

And I think, as a society, we've learned quite a bit about how radionuclides move through the body, and I think the staff's position is that to ignore that information and to use some of the more modern methodologies would be bad science.

CHAIRMAN RYAN: Okay.

MR. GROSSMAN: So that's all we would move forward with, the neutral approach as a proposal.

The next topic then is waste acceptance, and it will be a similar format to the last one. The Commission's direction was to weigh the pros and cons of allowing flexibility for disposal facilities to establish site-specific waste acceptance criteria based on the results of the PA and intruder assessment.

Slide 27.

I'll walk through a little bit of what Part 61 is today in terms of waste acceptance. We don't use that terminology in Part 61 explicitly, but it's there through the requirements. So I'll kind of point out how the waste acceptance is in the regulation today, to bring everyone kind of up to the same page.

You'll see it largely through three

sections of regulation -- 61.55 deals with classification scheme, or system; 61.56 are the requirements on waste characteristics and waste forms, and then 61.68 is a provision that allows, on case-by-case basis, alternative classification and characteristic requirements. So licensees could come in and request an alternative scheme to what is in 61.55 and 56.

Fifty-five lays out the concentration limits for the different classes of low-level waste. So there are three classes and then, by default, because low-level waste is defined by what it is not -- there's also actually a fourth class that would be a greater than Class C, which falls into low-level waste but is generally not acceptable for near-surface disposal.

As Dave mentioned, one thing to note with the waste classification system is that it does not ensure protection of the public via the 61.13 analysis for 61.41, which is the offsite releases, so there needs to be an analysis, and the rule recognizes an analysis to evaluate that.

On slide 28, this is just a snippet from 61.55. We have two tables there. There's a long-lived table, Table 1, and a short-lived table, so they

consider both long-lived and short-lived radionuclides. And I'll talk a little bit more about how these numbers were derived from the environmental impact statement in the early 1980s.

The thing that's not on this slide is there is what I'll term an escape hatch. There's section of the rule or a statement in the rule that says, basically, if they're not in the tables, they're Class A by default, and this is kind of a tie back to the estimate of the inventories that were assumed for the original analysis. And you can begin seeing how those assumptions are hardwired into the regulation in some instances.

CHAIRMAN RYAN: Chris, tell me if I'm wrong, but my recollection is that reactor waste was really where everybody was thinking, or at least fuel fabrication reactor waste. And some of the other uses of radioactive material really were -- I don't want to say "offhandedly assumed," -- but they were assumed to be covered by this blanket. And these are really based on reactor considerations.

MR. GROSSMAN: Yeah, there were 36 or 37 waste streams.

MR. ESH: Thirty-seven.

MR. GROSSMAN: Thirty-seven in the end.

And they covered the gamut of BWR- and PWR-type wastes, but they also covered institutional wastes from large and small facilities. So I would say those are probably -- I don't know the volume off the top of my head -- but for each of those. They probably dominated the waste streams.

CHAIRMAN RYAN: Yeah.

MR. GROSSMAN: But there were considerations of other waste streams, as well, that were expected.

CHAIRMAN RYAN: There was not a lot of detail analysis as I recall, just sort of, these are covered because these are more important.

Okay, thanks.

MR. GROSSMAN: Okay.

On Slide 29, we'll talk about a little bit about how those tables were derived.

They essentially did a reverse calculation using three scenarios.

The intruder construction scenario, which is an inadvertent intruder comes on site to build a residence of some sort and begin excavating into the site and removes or exhumes waste, and it's deposited on the surface, and so, during those construction activities, they would be exposed to the waste.

There is a variant to that, which is called intruder discovery scenario in which the construction crew, because the waste is in a stable form and it maintains that stability, it's recognizable to the crew, so, as soon as the crew discovers it, they back off and so your exposure durations are much shorter in that case. And that largely, then, forms the limits for Class B waste, which is the first category of stable waste.

So Class A would be kind of your unstable waste and then Class B and C would be stable waste. And then C takes it one step further with intruder protections.

So they looked at layering of the waste and waste that needed to be placed deeper than was assumed to have some intruder protections, so those wastes then were deemed Class C wastes.

The third scenario is called with intruder agriculture.

So these three scenarios were used to evaluate radionuclides in those waste streams that were considered and then to come back and calculate what sort of limits we're looking at to meet a 500-millirem dose limit for the intruder.

Another big assumption in this, and this,

I think, gets to one of the questions we had earlier about the institutional control period. Dave mentioned this and I'll follow up on it.

The intent of the rule is that there will be permanent system control, but there's a recognition that after 100 years, we can't guarantee that. So the assumption in the analysis is that after 100 years, the institutional controls are deemed ineffective at limiting access.

Then the analysis also recognized a need for certain radionuclides that were likely to be driven by site-specific analysis for water-dependent pathways. That, then, formed the basis for the requirement for 61.13(a) analysis, which is the pathways analysis for an outside receptor.

MEMBER SKILLMAN: If the institutional controls were changed from 100 to 200 years or 300 years, would that make much of a difference?

MR. GROSSMAN: Yes, I think it would, mostly for your short-lived nuclides. So, depending on which way you went, it could have an influence. Like, some comments were on the order of 300 years for an institutional control period. I think at that point, you're probably looking different cesium levels certainly than what we have in the tables today.

MEMBER SKILLMAN: Okay.

MR. GROSSMAN: So that would be an influence there.

CHAIRMAN RYAN: You've got cesium and strontium at 300 years that will pretty much decay a pretty small amounts.

MR. GROSSMAN: Yes. Intruder, yes.

CHAIRMAN RYAN: And they capture a few more radionuclides with that 300 years.

MEMBER SKILLMAN: The reason that I ask is --

CHAIRMAN RYAN: It doesn't solve the problem; it makes it smaller.

MEMBER SKILLMAN: Yes, that's what I was pointing to when Dave was talking earlier.

If there is isn't a case for challenging that 100 years from the perspective of requiring for a site a re-up every 30 years for 60 years something that's in our conscious lifetimes -- you do your driver's license every two years or five years; if you have a concealed weapons permit, I think it's every five years, depending on what state you're in. There are other portions of our existence that require us to show up, sign a paper, have our picture taken, and re-up, whatever it is.

If we think we just let this go for 100 years and then all is forgotten, doesn't that make the case for a periodic re-do? One says, I applied for this site use permit, and about every 10 years, I've got to certify I'm still on watch or I've transferred the title for this to this gentleman, something that makes it necessary to keep the institutional memory alive. It seems to me that that's not difficult.

CHAIRMAN RYAN: I think the site, at least the sites that I'm familiar with, most of them have an institutional monitoring program that's going to answer your question, I think, over time. It's closed, and then the institutional maintenance and monitoring effort kicks and that's sort of site-specific in the sense that it's tailing that site. But I don't think there's any period during that institutional control where people would just not be knowledgeable about what's going on. At least that's the current scheme I'm familiar with.

MR. GROSSMAN: The idea isn't that all is forgotten on purpose after 100 years. This is an assumption that is made for the purposes of establishing concentration limits.

MEMBER SKILLMAN: I understand that.

CHAIRMAN RYAN: Well, one concept we

thought about -- "we," meaning when I was at a site -- is that there's no reason to assume that at the end of that first institutional control period, you have to walk away. There may be information that says, well, there's plenty of money in the institutional control fund, and we want to watch these three little things that are going on, and there's no reason you couldn't continue.

The way I've always looked at it, and maybe it's wrong, is that the institutional control period is set as the first period. Then, you know, there can be a regulatory decision to decide, well, that's enough or that's not enough, or what do we need to do going forward?

MR. WIDMAYER: frankly, the notion was that the maintenance or whatever it is that you were talking about wouldn't be necessary. I was the thinking, was that --

MEMBER SKILLMAN: Well, I kind of got back, except if you say that there is a hazard that is not too far after 100 years, whether it's 200 or 300 because you want to let the cesium AND the strontium die out, one might say the time to let go of institutional controls is after that time period.

CHAIRMAN RYAN: Well, but don't forget,

you've got the power of groundwater monitoring, surface water monitoring, erosion monitoring, and every other kind of cutting the grass and everything else under the sun, for a very long period of time.

You can make whatever decision you want to make about what to do moving forward from year 100 plus zero days into that next period. And it can be everything from nothing to continuing doing the same thing to ramping up and doing something different or any combination thereof.

The point is, you would be informed of the information that's been gathered to make a decision that makes sense.

MEMBER SKILLMAN: Well, they can establish a comfort level at that time with doing an analysis of 100 years with the expectation that the institutional controls would not be lost. That was their thinking.

MR. GROSSMAN: I think Chris McKenney wants to add something to this discussion.

MR. McKENNEY: I think we're going off Derek, off Derek, but this is sort of like a defense-in-depth sort of thing, from the concept from the calculation of, you're putting waste in the ground someplace for it to be there over time. And if you do the analysis first, it doesn't give full credit for

these management processes, then again, your decay risk is finite. And in case something actually were to occur, you'd still have some buffer on the risk/

There is no intention for somebody to say, it's 100 years; you've got to leave. It's that we wouldn't mind that continuing for a long time, but you don't want to make a decision where, because of what you put in the site, you have to have perfect institutional controls for 300 years.

Remember, when we talked about institutional controls in Part 61, we were saying that that has absolutely zero chance for an intrusion event because that is part of the analysis. We don't do a PRA, an analysis of any risk level to the public for intruding onto the site or anything like that during the institutional control period. So, when we talked about action on that, it's all there.

This is a completely different assumption, which the Commission had in front of it at the same time, which was versus the standard, do assume perpetual institutional controls. But the Commission chose at the time to go an assumption of being conservative in the first place when you license a facility so that you don't cause the site that you are required to have perfect institutional controls for

very long time.

MEMBER SKILLMAN: I understand. Thank you.

MR. GROSSMAN: Okay, moving on the slide 30.

We're still talking about Part 61 today. And so 61.56 deals with waste characteristics and what would be acceptable waste to be received. It defines two large classes, a minimum requirement for all waste that facilitate handling and then afford protection of public health and safety. These would be things like no cardboard boxes; minimize water. I think the chelating agents is on that list. There's a list of best practices, of these kinds of forms should not be accepted for any waste.

And then the second class are what I call stability requirements. These are for wastes that need to be stable, so the B and C wasted. They're designed to minimize the water infiltration, which was some of the initial problems that pushed the Part 61 forward in the first place is that some of the sites were having trouble with that. And then also, to limit the intruder exposures in the form of recognizable and non-dispersible waste forms.

CHAIRMAN RYAN: I think there's one part

that we haven't touched on very much, Chris, that fits well in there, and that's engineered features of the disposal system. I mean what comes to my mind is Byerhoff, for example, has very thick slabs of the class B and C cells that have brass plates that say "Radioactive material: do not dig every" -- I forget how many feet.

But there's ways to at least push back an intruder.

MR. GROSSMAN: You're exactly right.

MEMBER ARMIJO: It assumes an intruder can read.

MR. GROSSMAN: That's a great segue into slide 31. So, thank you.

(Laughter.)

MR. GROSSMAN: So one of the things I hope you get out of this -- and this kind of guided our thinking in this waste acceptance area -- is that the classification system is integral to the regulation as it is today, and this graphic here kind of illustrates that, and it gets to one of Dr. Ryan's points: You have ties from classification to -- it's not directly, it's implied throughout the other parts of the regulation through a lot of the other parts of the regulation, and I've listed some of the direct ties

here.

Once you define the class of waste, then you have certain characteristics that you need to meet in 61.56. Once you define the classification of the waste, then you have certain segregation requirements. So unstable A waste can't be put in with B and C waste, which needs stability, and so you won't get the infiltration issues or you minimize those. Same thing with intruder barriers.

As you'll see with our proposal, this influenced our thinking quite a bit. We tried to minimize tinkering too much with the existing regulation to meet the Commission's direction. We felt that if you did too much with waste classification now, you've blown up a whole rule, and you're maybe starting over from ground zero. So we didn't want do that, and we didn't feel the Commission was directed has to do that.

Just to finish out today, there's also waste acceptance guidance, predominantly, in two guidance documents. There's a guidance document on waste form from the early 1980s and then also guidance on concentration averaging, which deals with how you identify what class it's in, and encapsulation. That is currently undergoing revision. I think it may be

Jim Kennedy who's working on that, and Christian Ridge.

Is that this summer that we're looking at?

MR. KENNEDY: Later this year.

MR. GROSSMAN: Later this year, okay. Thank you.

Sorry to put him on the spot.

Okay, slide 33, then.

To analyze the Commission's direction, we looked at the direction and also some domestic and international regulatory approaches as well as the public feedback we received, to derive from options.

And on 34, then, I lay out those options for waste acceptance. One was to continue with just the existing waste classification system. One of the things I didn't talk about is 61.58. I mentioned early on as part of the waste acceptance requirements of Part 61. That allows the use of alternative classifications and characteristic requirements. That could be used on a site-by-site basis and so we thought this could be an option, under the Commission's direction still, to allow that flexibility but do it with the existing system unchanged. We looked at that. We received comments to that and as well.

The second option was to replace the classification system with site-specific waste acceptance criteria; so, to abandon the classification system, essentially, and just go site-specific WAG.

And the third one was kind of a hybrid approach, which was to maintain the classification system alongside flexibility for site-specific waste acceptance criteria.

MEMBER SKILLMAN: From your stakeholders, is there any preference among the three?

MR. GROSSMAN: Well, you'll see in the comments -- I'll talk a little bit about that -- there's kind of mixed opinion about why and there's lots of reasons why one versus the other, and so forth. And so, if I don't answer your question there --

MEMBER SKILLMAN: Okay. Thank you. That's all right. Thank you.

MR. GROSSMAN: Bring it back up please.

MEMBER ARMIJO: But you kind of keep everybody happy with the third bullet; right?

MR. GROSSMAN: Yeah, it's the Three Bears briefing, yeah.

(Simultaneous speaking.)

MEMBER ARMIJO: Well, hold it. Is there

anything technically deficient with option three?

MR. GROSSMAN: We don't believe so. That's our proposal to the Commission.

MEMBER ARMIJO: Okay.

MR. GROSSMAN: You'll see it come forward. Based on our analysis, we don't see anything at this point, but we won't say it isn't.

MEMBER ARMIJO: Thank you.

MR. GROSSMAN: Some of our goals, then, in selecting one of the options or proposing one of the options to the Commission -- it's theirs to select, ultimately -- was to ensure protection of public health and safety consistent with the mission, look at risk-informed, performance-based regulatory processes to the extent that we can incorporate those, provide flexibility for the WAC, per the Commission's direction -- that's obviously a prime goal here -- and minimize disruptions to the existing framework so that we're not "blowing up" Part 61 and starting over.

MEMBER ARMIJO: I just want to make sure that I -- let's assume that the rule gets written and it's got a number of new things in it. Do the existing sites that are currently operational, will they have to comply with this? Will they have to do a re-analysis to be in compliance with the new rule?

Or is there something equivalent to --

MR. GROSSMAN: There is, in fact, that, in Part 61. And so the intent is that but all licensees, existing and prospective, would be doing the analyses. They would all have to do them eventually anyway through the closure analysis, but that's the intent of the way our proposal is set forth.

MEMBER ARMIJO: So it would impact the existing operating low-level waste facilities, whether they were through an agreement state or under direct NRC control.

MR. GROSSMAN: Yes, so the way that would work is, assuming the Commission went forward with the proposal and implemented it, the agreement states would have three years to write conforming regulations. Then there would be some time for the licensees to develop their WAC or whatever, whatever approach they took, as you'll see. I haven't gotten to the approach yet, exactly.

But there would be some time for that to happen.

CHAIRMAN RYAN: Mike?

MR. MCKENNEY: Let the record recognize Larry Camper.

MR. CAMPER: Larry Camper, Director of

Division Waste Management and Environmental Protection.

The simple answer to your question is yes, and it's one year after the state has its implementing regulations in place, but they'll have three years to do that, in terms of our compatibility requirements. But yes, it impacts them all.

MR. GROSSMAN: Now, along that line, Mr. Armijo, as we mentioned -- I think Mike may have mentioned earlier in his talk -- most of these sites are actually developing waste acceptance plans, which you'll see -- well, we don't talk to those examples, but we certainly look at those, and we feel they align pretty well with the requirements. So most of the sites would be are going to be a long way to meeting that. And again, some of it depends on which option they select.

Okay, moving on to slide 36, here's where I talk about the viewpoints. I've got a slide of viewpoints that are generally supportive of the flexibility for site-specific waste acceptance criteria. And the next slide then talks about critical viewpoints.

Stakeholders who were supportive believe that this would allow a recognition of the

improvements that have been made in the engineering and site selection and facility design from the environmental impact statement and its assumptions that originally developed the rule.

There were some mixed views on the types of scenarios that the public felt should be considered. Some felt that they should be limited to hypothetical scenarios, all of the intruder scenarios that were used in Part 61. And others argued that it should be only site-specific scenarios. So we heard both sides of that -- even if they were supportive of site-specific WAC.

There was some concern about abandoning the classification system, and this is a little quirk maybe with US legislation. That long, garbled acronym is the Low-Level Radioactive Policy Amendments Act of 1985, and it lays out federal and state responsibilities low-level waste.

The quirk here is that it ties the dividing line between federal and state to Part 61.55. It ties it back to a regulation, and that created a little bit of a wrinkle, not necessarily insurmountable if you wanted to move away from the classification system. But we thought it certainly would create confusion if you abandoned the

classification system, about whose responsibility is the waste then?

We don't think that banning it in the regulation would change the legislation because that's not how things work. But it could lead to some confusion among generators on this, among the disposal sites about that, unless there was some clarity. So we received a lot of comment on that, as a concern about abandoning classification in that option.

There were some comments about 61.58 and the case-by-case allowance for alternative requirements. Some of the concerns that we had in that regard were that they may create some transboundary issues, so you might have some different sites operating on different requirements and the implication that might have at a national level for commerce, so to speak, in terms of the movement waste and so forth in the country.

And there were some mixed views on the waste acceptability requirements. Some were happy with some of the requirements currently in Part 61, which tend to be a little more prescriptive, like you shall not have waste with a certain amount of liquids, and so forth. And some thought they should be performance-based, where, whatever I can demonstrate,

I'm allowed to do, essentially.

So we heard both sides, even if they were supportive, that, in some cases, you might need to keep some of that prescriptiveness, and in some cases, you may need -- some people don't, but that should be opened up for consideration.

MEMBER SKILLMAN: Chris, at the next to last bullet, 61.50, transboundary concerns, you mentioned movement of waste in the country. Does that suggest that could be 49 CFR impact, transportation regulations or 10 CFR 71, which is fuel?

MR. GROSSMAN: I don't foresee anything to the transportation issue. It's more of you have a kind of a different playing field for different states in terms of -- and the generators in those states -- and what can I do with my waste? And so that was kind of the issue, versus having a kind of stable national framework of, I have a consistent requirement across the country, and I know by generate this waste that there is a disposal option at some point for it.

MEMBER SKILLMAN: Thank you.

MR. GROSSMAN: That's more what the transboundary deals with.

MEMBER SKILLMAN: Thank you.

MR. GROSSMAN: That's jargon from our

compatibility criteria. I apologize for using that.

MEMBER SKILLMAN: Okay.

MR. GROSSMAN: So slide 37, then, we get into some of the critical viewpoints from people who were generally not supportive. Or, in some cases, they were supportive, but they had some major concerns beyond what I identified previously.

Dr. Schultz had a question earlier with Mike about the agreement state comments, and this is an example that I can point to. The first two bullets were specifically agreement state comments.

The first bullet was also made by people who were parties outside the agreement states. Basically, this would create a resource burden on the agreement states in the sense that they would have to then evaluate the waste acceptance criteria. It's maybe a more complicated process and involved more resources on their part. That being said, I think, overall, the agreement states were generally supportive of that flexibility, but they wanted to note these concerns.

The second was the potential impact on state laws. The example I can give there is from the state of Utah. The state of Utah was concerned about, they have a law on the books about limiting disposal

of Class A waste in the state, and they were concerned that this might be an end run around that legislation, so they expressed those concerns as kind of a critical viewpoint here.

Some of the other stakeholders expressed concern about the negative effects on public confidence, and this was largely, you know, the public was kind of invested in Part 61. They went through the rulemaking and began to understand how it was developed and so forth. And there's some acceptance of the limits that have been imposed by it and that they were afraid -- I think the sentiment was there was some fear that if you're doing this in each state, it's hard to follow and keep up with, and maybe the amount of public would be not as high as it might have when it's done at the federal level.

Some stakeholders expressed viewpoints which have emphasized conservatism rather than maximizing capacity, in their words, and they felt that this was an attempt to maximize the capacity.

There were some concerns about perverse economic incentives to maximize capacity at the expense of safety.

And then the complexity and lack transparency of the analyses was another comment that

we received, and this is related back to that negative effect on public confidence.

Some stakeholders viewed these analyses as black boxes, and very complicated and hard to for the average member of the public to follow.

Slide 38.

Then we get our proposal, so ta-dah.

What we've done in the proposal is we replaced 6158, which was the option for alternative classification and characteristic requirements with a waste acceptance criteria section. We felt this would basically obviate a need for those alternatives because it allows the licensee to do this through the rule.

There are three components of waste acceptance, the primary one being the criteria -- so, what's acceptable at this disposal facility and how you develop that -- and the second being characterization methods the facilities would need to identify what parameters and what level of uncertainty in characterization would be needed to demonstrate that the criteria are met. A third would be a certification program, basically someone to certify an administrative process that this waste meets the acceptance criteria. The idea would be that this

would apply to all licensees, this we mentioned earlier.

We adapted this approach heavily from the Department of Energy's approach in DOE Order 435.1. I think it's a good example of the approach that's been used domestically, so we adopted it where we thought it would be useful and relevant for Part 61. And generally, it's consistent with the international approaches, which vary quite a bit from the current Part 61, where you specify concentration limits to fully site-specific. So it's kind of a Three Bears approach. It certainly fits in that range.

Slide 39, I'll go through it quickly. I don't want to take too much time, I've gone on too long already.

We reach those three legs of the stool.

CHAIRMAN RYAN: I would ask you to just --

MR. GROSSMAN: Okay.

So, you've got -- this is where flexibility comes in. You've got to approaches. You can rely on the 61.55 concentration limits, or you can develop your WAC from the 61.13 analyses, which are the four analyses, to demonstrate the four performance objectives. You also need to specify acceptable waste form characteristics, container specifications and

restrictions, and prohibitions.

Slide 40 gets into the characterization methods, and again, here, identifying parameters and what's the acceptable uncertainty. That section of the regulation also specifies minimum characterization information, such as the dates samples were taken, the weights of samples, those basic things that you have to have.

Slide 41, then, talks about the certification program, and these are administrative procedures to ensure that the waste is acceptable. So you're looking at who are the appropriate authorities to certify the waste is acceptable for disposal, identifying any documentation that need to be developed and maintained to support that decision, and then approaches for maintaining certification once the waste has been certified; how do you ensure that, from the time it's shipped to receipt at the disposal facility, that that certification is still intact.

Quickly, on slide 42 -- this is my last slide -- this will result in some accommodating changes because we've essentially taken with classification as central to the ruling and made waste acceptance now central to the ruling. Waste classification is a subset of waste exceptions if you

can visualize that.

So waste classification has ties around the rules. We needed to generalize those ties, and that's what these largely revolve around, is making it more for the waste acceptance; so, if you chose the 61.13 route of developing site-specific WAC, how these parts of the regulation would apply to you in that case.

CHAIRMAN RYAN: Any thoughts about moving Appendix G to Part 61?

MR. GROSSMAN: Yeah --

(Simultaneous speaking.)

CHAIRMAN RYAN: -- Part 20.

MR. GROSSMAN: We didn't think about that specifically, but there was some thought above, for the approach of abandoning the waste classification system, of potentially putting it there if we too were to abandon, but the proposal wasn't something we were moving forward with necessarily.

CHAIRMAN RYAN: It just seems odd that that requirement is holding up our --

MR. McKENNEY: The real reason is that Part 61 applies to the land disposal facility, and that's why it starts, for the purposes as that applies to Part 61, the Part 61 facility, while Appendix G

applies to all people who produce waste.

CHAIRMAN RYAN: Right.

MR. McKENNEY: So, because Part 20 applies to all licensees. That's why -- and it's all about shipping.

So, unless it go put in transportation, it could be put there, but it wouldn't belong in Part 61.

CHAIRMAN RYAN: So it really doesn't belong and 61 or 20. Is that what you're telling me?

(Laughter.)

CHAIRMAN RYAN: It's fine where it is, but it's just kind of a --

MR. GROSSMAN: We figured that was beyond the scope of limited --

CHAIRMAN RYAN: Okay.

MR. GROSSMAN: So that's all I have.

Are there any questions?

CHAIRMAN RYAN: Thanks, Chris. That was a good presentation.

MR. GROSSMAN: Dr. Ryan, in Andrew's presentation, he's actually going to go through those changes in the rulemaking language. Do you want to skip that?

CHAIRMAN RYAN: I want to let Andrew to have some time to make his comments.

MR. CARRERA: I can make a really quick.

STAFF EFFORTS TO REVISE PART 61:

TIME LINE

ANDREW CARRERA, NRC STAFF

MR. CARRERA: Thank you, Dr. Ryan, ACRS members. My name is Andrew Carrera, and I'm the project manager for the Part 61 rulemaking. And naturally, as a PM, none of my team members likes me, so they only gave me five minutes to cover what is here.

(Laughter.)

MR. GROSSMAN: I tried to give you zero.

(Laughter.)

MR. CARRERA: And, you know, the committee asked me to cover my materials up to December 2012. So my goal is to provide you with a high level of awareness of the proposed ruling which will be put out. And in June's meeting, will go into the weeds of how we adjusted this language based on stakeholders' comments.

So we received the request from the Commission to proceed forward with the proposed rulemaking, and the staff revised the regulatory basis document to support the rulemaking. A team of multidisciplinary staff was assembled, composed of

representatives, obviously, from across the NRC as well as the representative from the agreement states, Mark Yeager, who is from South Carolina.

The rulemaking team developed the purpose of the rule, and that's to specify site-specific technical analysis requirements, permit development of criteria of waste disposal, as Chris just covered, and better align the requirements with current health and safety standards.

We developed the preliminary proposed rule, which was published on regulations.gov for public comments in December 2012.

And slide number four is a summary of the centerpiece of this language. It contains site-specific analysis of requirements for performance assessment, intruder assessment, long-term analysis, but it's also performance period analysis and updated technical analysis.

The staff is also proposing waste acceptance, which Chris just covered.

The staff also proposed other supporting changes to facilitate the implementation of proposed requirement, adding new definitions in concept to Appendix G, which is 10 CFR Part 20, and also allow the use of up-to-date ICRP recommendations.

So I'll quickly go over the actual ruling, which is offered as 61.41. This is a current regulation, and we're proposing to revise it to incorporate the time components into this layer of this section, the compliance period and the performance period. The compliance period would be covered in revised 61.40 1(a), which points back to the performance assessment requirement and 61.13(a) instead of (b).

The second part of 61.41 is proposed to be (b), which we added, a long-term performance analysis which has -- we proposed ALARA's lowest achievable metrics to dose analysis.

Section 61.42, protection of inadvertent intruder -- similarly, we proposed, we wanted to incorporate the time components into this section.

Section 61.42(a), we've pulled the 500-millirem dose limit out of the table and we put it into this section.

Section 61.42(b) -- similarly, we have a performance assessment requirement with an ALARA metric associated to it.

The long-term analysis or performance period analysis -- this analysis applies only to land disposal facilities that have long-lived wastes that

contain alpha-emitting radionuclides with average concentrations exceeding 10 per gram, a radionuclide with average concentration exceeding one tenth value, at table 1, as necessitated by site-specific conditions.

Slide number eight, waste acceptance -- I'll skip that. It was covered in greater detail previously.

Slide number nine, contents of application for closure -- well, currently, we don't have the requirement to do all these internal analysis of exposure, and we'd like to have that incorporated into the revised analysis, into application proposal.

Slide nine -- this is my last slide. We also proposed other changes, supporting changes, and new definition, concentrated intruder assessment, low-risk waste, et cetera. And also, in Appendix G for 10 CFR Part 20, we also propose a revision to Section 2 and Section 3 of that appendix.

And that's all I have.

CHAIRMAN RYAN: Good.

Any questions for Andy?

(No response.)

MR. CARRERA: The final piece -- I hope so far, we've answered some of your questions that you

had earlier.

CHAIRMAN RYAN: Yes. You have.

MR. CARRERA: Good. It's been a very informative discussion. We appreciate your time.

Looking forward, we're scheduled to have one more subcommittee discussion in June.

CHAIRMAN RYAN: Yes.

MR. CARRERA: And we'll close the loop with you on the remaining, the rest of the story as votes have developed, and then full committee of ACRS in July.

CHAIRMAN RYAN: Okay. ACRS.

MR. CARRERA: Maybe it leads to a letter. That's up to you guys to decide.

CHAIRMAN RYAN: I would say --

(Simultaneous speaking.)

MR. CARRERA: Okay. And in July, same month, we'll probably submit to the Commission the proposed rule for its consideration.

If the Commission approves, we will issue for public comment, in the Federal Register notice and all that, later in calendar year 2013. Early in 2014, we'll have public interactions on receiving comments, which will finally lead, finally, to a final rulemaking by end of 2014.

CHAIRMAN RYAN: Just so you're familiar with our procedure -- I'm sure you are -- we have a meeting in July. We will be preparing the letter at that July full committee meeting.

MR. CARRERA: Yes.

CHAIRMAN RYAN: So that will be concurrent with that week.

MR. CARRERA: Yes. Right.

Well, thank you very much.

CHAIRMAN RYAN: Thank you.

Thank you all. Look at a few minutes for any questions.

Steve?

MEMBER SCHULTZ: No questions, just a comment. From what I've heard today, the work was done to try to get engagement with, with the agreement states, especially the sited agreement states, but there was not a huge response to date, in 2012 at least. Perhaps there's been more information that's been developed in 2013 that we can talk about in June.

Silence doesn't mean agreement to the proposals. I still feel there might be a lot of concern among the agreement states related to the proposal, so I hope that engagement is continuing to see how that information might be developed.

Then again, maybe we'll hear it. Maybe you've got more information that your present in June, and we'll look forward to hearing that.

MR. LEE: This is Mike Lee of the staff.

We understand from past experience, the agreement states usually wind up becoming more vocal, the closer we get to issuing rulemaking for public comment.

MEMBER SCHULTZ: That's what I expect.

MR. LEE: We've already begun to hear from some of them. So silence is not intended as implied consent, and we expect to hear a lot from them in the near future.

MR. ESH: And I would even say -- this is Dave Esh -- I would even say that silence is a mischaracterization.

MR. LEE: Yes.

MR. ESH: So we have received feedback from agreement states. The problem is this process has been pretty long with lots of steps. So we've heard from them at different steps, so it depends on which step of the process, what we may have heard.

In the areas I'm responsible for, they've given some very good feedback that in some cases has caused us to change rule language and things like

that. So with the agreement-state regulators, it's not like they've been unresponsive, but they are selectively responsive. But their feedback has been good.

MEMBER SCHULTZ: That's important.

CHAIRMAN RYAN: Real quickly, I'd add, Steve, just as an example of the low-level waste forum, which met in Charleston, South Carolina just a week ago, and had a very good participation by the NRC staff. And that's, you know, really the state representatives who were there at that meeting. So that was a very positive interaction.

MEMBER SCHULTZ: Okay.

CHAIRMAN RYAN: It's right along the lines that you were asking about.

MEMBER SCHULTZ: For this year's meting.

CHAIRMAN RYAN: Low-Level Waste Forum Meeting.

MEMBER SCHULTZ: Good. That's important, especially in the area that you've described, that you're getting feedback specifically on that, and I appreciate this. That, I'm sure, has been helpful for you.

That's all I have.

CHAIRMAN RYAN: Okay.

Let's see; Sam?

MEMBER ARMIJO: Yes. I just wanted to ask -- and maybe it's in the rule the way you've got it structured -- is there any way to separate depleted uranium from low-level waste in this rule in such a way that -- it seems to me it's confusing everything, and it appears to put requirements on the whole community when it's a very special type of waste, especially for this long-life issue.

Is there, in the regulations that you're currently writing, is there a way to separate that and make that a special case? And if you don't have, do you -- or if you have it in just one location in your facility, you could treat it in a very different way and assess it in a very different way and the rest? Is that built into your regulations, or is that your intent?

MR. ESH: This is Dave Esh.

At this point in time, we didn't intend that. As I explained in our presentation, we considered it. The feedback from stakeholders was, don't do that.

MEMBER ARMIJO: Why?

MR. ESH: Because, they basically said, you may have new waste streams in the future that look

and smell similar to this waste stream, that if you want to get some stability to the regulatory environment with requirements that are going to be able to take any waste stream that may have those sorts of characteristics, and have the analysis done for them.

And as I sat in my talk, sure, depleted uranium is a much bigger step technically than traditional low-level waste, but you still have this issue with traditional low-level waste as to how much long-lived radioactivity is in it, and is it safe or not? That still applies, whether it's traditional low-level waste or depleted uranium.

MEMBER ARMIJO: Right.

MR. ESH: The other issue that you'd run into if you tried to specify something for depleted uranium is something Dr. Ryan has talked about many times in the past, and I agree with him wholeheartedly, which is quantity matters.

People focus on concentrations. But, say, I want to take 1,000 pounds of DU counterweights. Well, I'd have to be really careful about how I wrote that DU rule, so to speak, or DU requirements that from a risk perspective, I wasn't drawing people into it that I don't intend.

MEMBER ARMIJO: Yeah.

MR. ESH: And all those things considered, we reviewed it and said, look, the issue is probably better handled by putting in the requirements that apply for the traditional low-level waste that might have long-lived radioactivity for the depleted uranium and then explain very clearly in our guidance document how people should be smart about how they do these analyses and justify their analyses.

It's not like in some cases, you might need a primary school analysis for your site. And in other cases, you might need the equivalent of the PhD analysis. You know, you have to structure what you need for the problem, and we think specifying the requirements that capture all of those but then allowing some people the flexibility in what they do to show how they meet them is probably the right way to go.

MEMBER ARMIJO: And quantity being one of the things that would scream out.

MR. ESH: Quantity being one of those things. So, if I'm a licensee and I say, look, I have long-lived isotopes, but I only have this amount, and it's limited to these quantities and concentrations, my problem is much problem is much simpler than the

guy over here who really wants to take a lot of long-lived waste.

CHAIRMAN RYAN: And I guess, David, I may have put words in your mouth. It's much easier to revise guidance or amend guidance than it is to revise or amend a rule. We can handle those case issues, I think, more straightforwardly than you could by trying to make a comprehensive rule. Is that right?

MR. ESH: Yes. And I'm excited that we did not even intend to -- we need to make requirements that we believe are adequately protective for any low-level waste that people want to dispose of. But if you made a special rule for depleted uranium, you might do some things different than we have in this regulation because we can be more specific for that particular problem. So depleted uranium is unique in that you get this radon problem over time, and the radon problem can be pretty lard.

So, in our home, many of us deal with radon in our homes, and it's driven by concentrations in the environment surrounding our homes. It's many, many orders of magnitude lower than what you have here.

Mike likes to bring up the example of the Fernald facility, where they disposed of some radium-

and thorium-based waste in the silos there. And they're estimated to have created some pretty large doses some pretty large distances away from the facilities before remedial action were put into place. We have to deal with those sorts in the rulemaking process, too.

I understand the comment. We did think it through thoroughly, and we think this is the best approach to go with.

CHAIRMAN RYAN: Dick.

MEMBER SKILLMAN: Four comments:

First, excellent presentation -- thank you for a very thorough and comprehensive presentation today.

Second, I'm with Dr. Armijo on DU. I've spent time at two field plants, and I see that forest of exit containers setting on the back lot. And I'm not talking hundreds; I'm talking thousands. And I know that for the LES application, the greatest concern by the public was, what's going to happen to all that stuff? That's what we're talking about here.

So it seems to me that the magnitude, in terms of kilograms of waste and curies of waste, deserves its own treatment. And if that were extracted from 61 through its own rule or its own

portion, then maybe some of the other issues that you're dealing with would not be as complex. So it seems to me that there may be some value to considering that.

I have a difficult time grasping an intruder at 10,000 or 5,000 years. I really don't know what I'll be doing the day after tomorrow, or I think I know. I'm not trying to be facetious. It just seems like that is such an extension of our thinking that we may be on thin ice, and I don't know how to resolve that really, but it certainly causes me pause.

And finally, I want to thank Derek for doing a very good job in dealing with SR homework packages and reading materials.

MR. WIDMAYER: I'm going to write that down.

(Laughter.)

MEMBER SKILLMAN: Because you really did get us prepared.

MR. WIDMAYER: Thank you.

MEMBER SKILLMAN: And I thank you.

MEMBER ARMIJO: I just want to go back. I may have --

(Simultaneous speaking.)

MEMBER ARMIJO: -- bridge line.

MEMBER SKILLMAN: I really thought you guys did a really good job.

MEMBER ARMIJO: I did, too. I think intruders as archeologists or grave robbers. That's what got to the pyramids. This is sort of our pyramid. And I really couldn't care less about what happens to those guys. But I don't have a problem with an assessment of an intrusion event, albeit unlikely.

But to kind of put flesh and bones on an intruder, a human being or group of human beings, far out into the future, it gets so artificial that I just can't accept it. Whereas, in today's world, we say this is how we're going to assess this site, we're going to just assume there's an intrusion event, and what would happen? A what-if. That, I could live with. I mean, you put in some conservatisms, and you're done with it.

And I got the impression that's what you actually are thinking about; I'm not sure. Maybe it's semantics.

CHAIRMAN RYAN: Maybe it's a recommendation.

MEMBER ARMIJO: Maybe the label is

intrusion assessment rather than intruder protection. It gets across the reality of what you're doing as opposed to someone in the public saying, this stuff is so dangerous that we have to worry about human beings somehow wandering onto this area and getting harmed, and it's so unrealistic, so unlikely, and everything else.

But as a conservative engineer, you do an assessment of a what-if in the licensing process, you put it to bed, and you're done with it.

MR. LEE: The NRC deserves credit for first introducing the intruder analysis to the waste management community, so I think it would be hard for us to walk away from it right now because, again, it represents an acute situation.

We're looking at way to try to make it more realistic. With that being said, we were kind of --

MEMBER ARMIJO: But it's clearly a policy issue. I just think it's language in your rule that will make a big difference in the way that it's perceive, even though you do nothing different.

MR. LEE: Yeah, and segueing into the policy issue, again, the direction from the staff was to try to come up -- the staff was to develop a

regulation that is a one-size-fits-all. We weren't given a direction to develop a DU-specific rule, even though that might in some quarters be viewed as a better way of dividing and conquering the issue.

But given the limitations we have right now, we're trying to make it fit within the Part 61 context. You're certainly free to make that recommendation to the Commission.

CHAIRMAN RYAN: All right, I'd like to open the bridge line from any participants on the bridge line.

Are there any questions or comments from participants? I assume the bridge line is open.

(No response.)

CHAIRMAN RYAN: Okay, hearing none, we will move to adjourn.

Thank you very much.

(Whereupon, the Subcommittee was adjourned at 12:07 p.m.)

Low-Level Radioactive Waste Disposal (10 CFR Part 61)

Deborah Jackson, Deputy Director

Division of Intergovernmental Liaison and Rulemaking

Office of Federal and State Materials and Environmental Management Programs

Advisory Committee on Reactor Safeguards Meeting of the Radiation Protection and Nuclear Materials Subcommittee

April 9, 2013

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Why are we here today:

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- Provide update of Part 61 rulemaking

- ACRS briefing
  - Subcommittee (December 2009, June 2011, and August 2011)
  - Full Committee (March 2010, July 2011, and September 2011)

- ACRS 2011 Comment Letter
  - Four recommendations
  - Staff's responses

Commission Directions:

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- SRM-SECY-08-0147 and SRM-SECY-10-0043

  Require site-specific analysis for disposal of large quantities of DU, specify criteria needed for analysis, develop supporting guidance, and incorporate blending issue into the existing rulemaking for DU.

- SRM-COMWDM-11-0002/COMGEA-11-0002

  1. Allowing licensees the flexibility to use ICRP dose methodology;
  2. A two tiered approach that establishes a compliance period that covers the reasonably foreseeable future and a longer period of performance that is not a priori;
  3. Flexibility for disposal facilities to establish site-specific waste acceptance criteria based on the results of the site's performance assessment and intruder assessment;
  4. A compatibility category…that ensures alignment between the States and Federal government on safety fundamentals, while providing the States with the flexibility to determine how to implement these safety requirements.

Today's topics and presenters:

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Topic	Presenter
Disposition of Earlier ACRS 2011 Comment	Mike Lee, DWMEP
2012 Public Outreach Initiative	
2012 Regulatory Basis Document: *Options Considered and Staff's Proposed Approach*	Dave Esh and Chris Grossman, DWMEP
2012 Preliminary Proposed Rule: *Summary of Preliminary Proposed Rule Language*	Andrew Carrera, DILR
Current Status and Next Steps	Aby Mohseni, DWMEP

Disposition of Earlier 2011 ACRS Comments

Michael P. Lee

Division of Waste Management and Environmental Protection

Office of Federal and State Materials and Environmental Management Programs

Mike.Lee@NRC.gov, (301) 415-6887

Advisory Committee on Reactor Safeguards

Meeting of the Radiation Protection and Nuclear Materials Subcommittee

April 9, 2013

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Background & Context

- **Rulemaking direction initially provided in SRM-SECY-08-0147 (March 18, 2009)**

- **ACRS letter dated September 22, 2011**
  - Reflects series of earlier 2011 meetings
  - Committee issued four recommendations

- **Staff response dated November 3, 2011**

ACRS 2011 Recommendation #1

Recommendation	**10 CFR Part 61 should not be amended in accordance with the staff's recommendations.**
Staff Response	The staff's draft proposed rule is consistent with Commission direction for a limited scope Part 61 rulemaking in SRM-SECY-08-0147.
Implementation	*Staff proposed new explicit performance assessment and intruder analysis requirements consistent with earlier Commission direction.*

ACRS 2011 Recommendation #2

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Recommendation	**Implementation guidance for 10 CFR Part 61 should not specify an a priori period of performance.**
Staff Response	The staff agrees and did not originally specify a longer-term performance period. However, the staff believes that it is important to specify a compliance period in the rule.
Implementation	*Consistent with earlier stakeholder feedback (and Commission direction), staff originally proposed a requirement for calculation of peak dose within 20,000-years. In the December 2012 version of the draft rule text, the staff is now proposing 10,000 years for the length of the time of compliance.*

ACRS 2011 Recommendation #3

Recommendation	**The approaches in Recommendations 1 and 2 are equally applicable to the disposal of depleted uranium as well as other LLW.**
Staff Response	The staff agrees that development of a risk informed, performance based LLW site assessment methodology using realistic characterizations of disposed radioactive materials; the features, events, and processes that can disrupt disposed waste; natural and engineered barriers; environmental transport mechanisms; and subsequent human exposure scenarios is appropriate for DU and other LLW.
Implementation	*See 2011 edition of proposed rule text.*

ACRS 2011 Recommendation #4

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Recommendation	**Compliance with performance objectives of the disposal system after the institutional control period ends, as well as the possible doses to hypothetical intruders, should be evaluated considering the natural features, events, and processes for a given site for a period of time commensurate with the risk for a specific facility and site.**
Staff Response	The staff agrees. The staff believes that it has developed a proposed rule that considers the natural features, events, and processes for a given site for a period of time commensurate with the risk for a specific facility and site
Implementation	*See 2011 edition of proposed rule text.*

2012 Public Outreach Initiative

Michael P. Lee

Division of Waste Management and Environmental Protection

Office of Federal and State Materials and Environmental Management Programs

Mike.Lee@NRC.gov, (301) 415-6887

Advisory Committee on Reactor Safeguards

Meeting of the Radiation Protection and Nuclear Materials Subcommittee

April 9, 2013

U.S.NRC

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2012 Commission Direction

U.S.NRC
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- **Seek stakeholder feedback on four expanded regulatory requirements**

- **Staff initiatives**
  - **Issued Federal Register notices**
  - **Both participated in and hosted public meetings**
  - **Contacted NRC Agreement States**

2012 Public Outreach Efforts

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LOCATION	DATE	EVENT
Phoenix	March 2	NRC-Sponsored Public Meeting #1* (following WM2012 Meeting)
San Francisco	April 23	LLW Forum Spring Meeting
Orlando	May 7	CRCPD/OAS Annual Meeting
Dallas	May 15	NRC-Sponsored Public Meeting #2*
Tucson	June 22	EPRI Annual LLW Meeting
Rockville	July 19	NRC-Sponsored Public Meeting #3*

Letters …
~200 comments

- Council of Radiation Control Program Directors
- Council on Radionuclides and Radiopharmaceuticals
- EnergySolutions
- Electric Power Research Institute
- Norman Eisenberg
- NSF Environmental
- Heal Utah
- Health Physics Society
- LLW Forum
- Nuclear Energy Institute
- Neptune & Associates
- Howard Pope
- State of Utah
- State of Texas
- State of Washington
- Waste Control Specialists

Written Comment Distribution

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TOC/POP Definition*	***20%***
"Other"	*10%*
Waste Classification Tables	*10%*
Site-Specific Performance Assessment	*9%*
ICRP*	***9%***
Compatibility Issues*	***9%***
Disposition of Depleted Uranium	*8%*
WAC*	***6%***
Human Intrusion	*6%*
Duration of Institutional Controls	*5%*

Approximately 200 comments, questions, and suggestions submitted
Percentages are approximate and do not total 100%

Response Summary

- Generally no disputing need for rulemaking
- Differing views on scope and details
- Not all Agreement States expressed an opinion
  - Budget constraints
  - Some limited comments
    - Extend duration of active institutional control period to 300 years
    - States should not be compelled to receive depleted uranium

Commission Direction
Proposal #1

Commission Proposal	**Allowing licensees the flexibility to use ICRP dose methodologies**
Stakeholder Response	The majority of stakeholders expressing a view on this topic at the 2012 public meetings were mostly in support of this Commission proposal
Agreement State Response	Those Agreement Sates expressing a view on this topic were mostly in support of this Commission proposal.
Preliminary Staff Observation	*Allowing licensees the flexibility to use more up-to-date ICRP recommendations would align with past agency practice*

Commission Direction *Proposal #2*

Commission Proposal	**Implement a two-tiered approach to performance assessment that establishes a compliance period that covers the reasonably foreseeable future and a longer period of performance that is not defined *a priori***
Stakeholder Response	The majority of stakeholders expressing a view on this topic at the 2012 public meetings were mostly in support of this Commission proposal
Agreement State Response	Not all Agreement States expressed an opinion on the merits of a two-tiered approach proposed by the Commission at this time. Comments received thus far are mixed.
Preliminary Staff Observation	*Staff have previously advocated the adoption of a two-tiered approach to the conduct of a LLW performance assessment*

Commission Direction *Question #2 (continued)*

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- **Two-tiered approach …**
  - General support
  - *Time of Compliance* concept
    - Mixed responses
    - "Foreseeable Future" term undefined
    - <1000 yrs; 1000-10,000 yrs; >10,000 yrs
  - *Period of Performance* concept
    - Should not be defined in regulation
    - Technically challenging
    - Questionable decision-making value
    - Shouldn't be based on dose to receptor

Commission Direction *Proposal #3*

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Commission Proposal	**Flexibility for disposal facilities to establish a site-specific WAC based on the results of a site's performance assessment and intruder analysis**
Stakeholder Response	The majority of stakeholders expressing a view on this topic at the 2012 public meetings were mostly in support of this Commission proposal.
Agreement State Response	For those Agreement States expressing a view on this topic, most were in support of this Commission proposal. However, in voicing their support, some States acknowledged the need to verify that the waste generators complied with the disposal sites' WAC (a new burden). Also, some of the Agreement States cautioned against the NRC compelling them to accept large quantities of DU.
Preliminary Staff Observation	*In practice, most Agreement States already impose some form of a site-specific WAC*

Commission Direction *Proposal #4*

Commission Proposal	**A compatibility category for elements of the revised rule that ensures alignment between States and the Federal government on safety fundamentals while providing the States with some flexibility**
Stakeholder Response	The majority of stakeholders expressing a view on this topic at the 2012 public meetings were mostly in support of this Commission proposal so long as it does not introduce some unintentional completive advantage
Agreement State Response	Some Agreement States expressed concerns about maintaining flexibility in implementation of new requirements.
Preliminary Staff Observation	*This comment is noted.*

Miscellaneous Comments See SECY-13-0001

Updating the existing waste concentration tables at §61.55 to reflect the latest ICRP dose conversion factors and methodologies	*Staff has current direction to begin to address in FY2015*
Revisiting the current regulatory basis for the duration of 100-year active institutional control period	*Should revisit this issue in context of any §61.55 table update in FY2015*
Revisit earlier assumptions concerning the minimum reporting requirements for certain isotopes cited in the Part 20 Appendix G LLW shipping manifest	*Staff agrees. Held its first public meeting in March 2013*
Developing criteria for the disposal of greater-than-class C LLW	*DOE must first address GTCC disposition through its NEPA process*
Developing clearance criteria for low-activity radioactive waste	*In 2005, Commission decided to defer any decision on LAW*

10 CFR Part 61: 2012 Regulatory Basis

David Esh

Christopher Grossman

Division of Waste Management and Environmental Protection

Office of Federal and State Materials and Environmental Management Programs

david.esh@nrc.gov, (301) 415-6705

christopher.grossman@nrc.gov, (301) 415-7658

Advisory Committee on Reactor Safeguards
Meeting of the Radiation Protection and Nuclear Materials Subcommittee
April 9, 2013

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Main Topics

- Key concepts
- Site-specific LLW technical analyses
- Analysis timeframes
- Dose assessment – ICRP recommendations
- Waste acceptance

Key Concepts

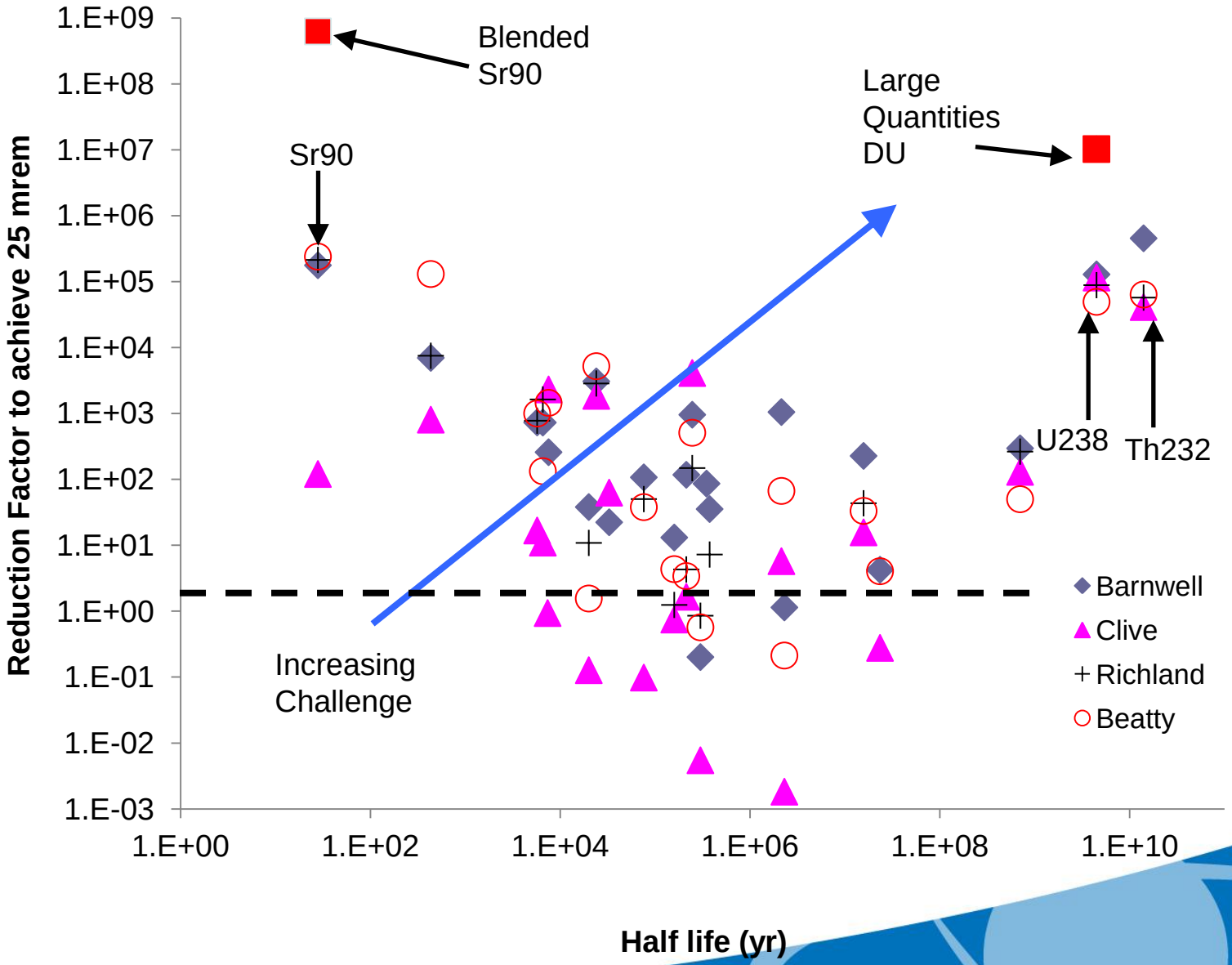
- LLW - hazard vs. risk
- Inventory
- Delays – barriers and transport
- Generic waste classification
- Inadvertent intruders

LLW – Hazard vs. Risk

- > 90% of the hazard from short-lived isotopes:
  - Co-60, Cs-137, Sr-90, H-3
- > 90% of the risk (61.41) from long-lived isotopes:
  - Tc-99, I-129, C-14, Cl-36, U-isotopes, Np-237

Risk ≠ Hazard

LLW Inventory Analysis



Inventory Analysis

- All existing LLW facilities contain sufficient inventory that could result in unacceptable radiological risk (61.41).
  - Many orders of magnitude reduction needed for some isotopes
- Commission directed the staff to:
  - Perform limited rulemaking to require a site-specific analyses prior to the disposal of significant quantities of depleted uranium and blended waste.
  - Identify technical requirements of the site-specific analyses.
  - Develop guidance.
- Extensive stakeholder interaction -> do not limit technical requirements to these waste streams

Delays – Barriers and Transport

- Engineered and natural barriers reduce and delay risk

Reduce	Delay
Release from wasteform	Resistive barrier failure
Solubility limits	Waste package
Dilution during transport	Sorption – transport
Dispersion	Site control

Technical requirements must account for both types.

Generic waste classification

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- Limits concentration suitable for near-surface disposal
- Constrains societal uncertainty
- Embedded assumptions – inventory, waste disposal
- Combined short- and long-lived isotopes
- Focused on inadvertent intruder protection (61.42)
- <u>Does not</u> ensure that 61.41 will be met
- Not all isotopes important for 61.41 are reflected in Tables 1 and 2 of 61.55

Inadvertent Intruders

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- Not based on assumption of failure of society
- Based on the assumption of error of government
- Relieves licensees of financial responsibility after the institutional control period
- No adequate technical basis for the long-term robustness of active controls
- Commission assumed intruders were unlikely albeit possible
- Conditional probability of 1; intruder dose limit implies a probability of 5%.

LLW Technical Analyses

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- Technical requirements must apply to all sites and inventories.
- LLW disposal sites may have vastly different:
  - Inventories
  - Engineered barriers
  - Natural barriers
  - Environmental conditions
- If technical requirements are not established for the most challenging inventory/site, public health and safety will not be protected.
- Best approach is to risk-inform the technical analyses.

Regulatory Requirements - Technical Analyses

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- Tiered approach to analysis timeframe.
- Site-specific technical analyses vs. generic waste classification.
- Avoid unnecessary speculation about societal uncertainties.
- Higher dose limit for intruder scenario.
- Site-stability based on impacts to 61.41 and 61.42 performance objectives.
- Site-suitability characteristics only exclusionary for hydrological characteristics for 500 years.
- Dose modeling (ICRP)

Risk-informed

Analyses Timeframes - International

- Staff performed an extensive review of international experience – different approaches used.
- Approaches included:
  - Long-term analyses (numerical or general (e.g. “peak”))
  - Regulatory-defined limits on near surface disposal of long-lived α
  - Prohibition of near surface disposal
  - Multiple
- The staff recommended approach is consistent with the international experience.

Analyses Timeframes – Domestic LLW

- All currently operational LLW disposal facilities are located in Agreement States.
- Different interpretations of NRC regulations:
  - Washington: 10,000 years (longer in EIS)
  - Texas: Analyses to 50,000 years
  - Utah: 500 years, 10,000 years for uranium (under review)
  - South Carolina: 2,000 years
- In 2000, NRC staff performed a detailed technical analysis of a LLW disposal facility at a humid site and recommended 10,000 years (NUREG-1573).

Analyses Timeframes - Technical

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Traditional Waste

- All current LLW disposal facilities contain long-lived waste.
- Long-lived waste is the driver of projected doses for 61.41.
- Three of four facilities project peak doses to occur after 1,000 years for 61.41.

Depleted Uranium

- At 1,000 years, only 1/1000th of the potential impact would be assessed.
- At 10,000 years, approximately 1/10th of the potential impact would be assessed.
- Second tier captures the other 9/10th.

Site-specific Analyses Timeframes

- ACRS 2011 (based in part on ACNW 1997):
  - Two tiered approach:
    1) Time at which more mobile radionuclides produce peak dose to designated receptor
    2) Avoid catastrophic impacts after
  - Consider geohydrology, waste isolation technology, other controls

Site-specific Analyses Timeframes

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- What are more mobile radionuclides? How to define?
  - Radionuclide A may be more mobile at site 1 and less mobile at site 2
  - Radionuclide A may be less mobile than radionuclide B at one site and more mobile at another site
- What are catastrophic impacts?
- Why not list waste characteristics?
- For WCS the projected time of peak dose from the more mobile radionuclides was > 30,000 years.
- Material can be transported in many different pathways.

Site-specific Analyses Timeframes

- Disposal practices and selection of sites.
- Commission policy regarding stability and waste isolation.
- Consistency with international approaches.
- ALARA – national.
- Obligations to future generations regarding protection from waste disposal.

DOSIMETRY

Commission Direction

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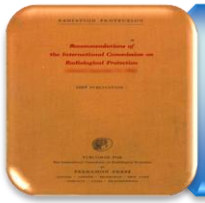
Provide an expanded proposed rule…which includes the following issues, along with staff's analysis of the issues and stakeholder feedback and the pros and cons of the specific revisions:

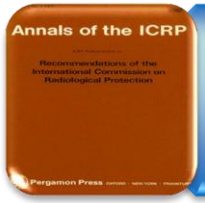
- Allowing licensees the flexibility to use ICRP dose methodologies in a site-specific performance assessment for the disposal of all radioactive waste.

Context



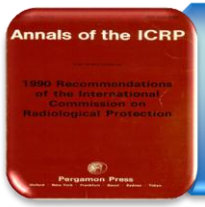
ICRP 2

1959



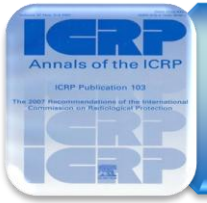
ICRP 26

1977



ICRP 60

1990



ICRP 103

2007

- NRC regulations based on various methodologies
- Commission policy[1] presently allows exemption for current methodology

[1] SRM-SECY-01-0148

Staff Analysis

U.S.NRC
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- Commission direction
- ICRP methodologies
  - Updates provide holistic evaluation of radiation risks
  - Account for radiosensitivity of the organ
  - Consider a wider range of organs and tissues
- Public feedback

Options Considered

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- Specifying ICRP methodology in regulation
- Adopting ICRP methodology-neutral approach
- Address in guidance

Public Views

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- Supportive:
  - Directly cited vs. flexibility
  - Periodically revisit PA dosimetry
- Critical:
  - Safety significance in removing critical organ limits

Proposal

U.S.NRC
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- Adopt ICRP methodology-neutral approach
  - Consistent with Commission direction
  - Current science
  - Precedence: 10 CFR Part 63 approach
  - Minimize future revisions to 10 CFR Part 61

WASTE ACCEPTANCE

Commission Direction

Provide an expanded proposed rule…which includes the following issues, along with staff's analysis of the issues and stakeholder feedback and the pros and cons of the specific revisions:

- Flexibility for disposal facilities to establish site-specific waste acceptance criteria based on the results of the site's performance assessment and intruder assessment.

SRM-COMWDM-11-0002/COMGEA-11-0002

10 CFR 61 Today

U.S.NRC
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- Existing "waste acceptance" requirements include:
  - 61.55 – Waste classification
    - Allowable concentration limits; Class A, B, C.
    - Total activity limits site-specific and derived from 61.13(a)
  - 61.56 – Waste characteristics
  - 61.58 – Alternative classification and characteristics

Waste Classification

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Long-lived

TABLE 1

Radionuclide	Concentration curies per cubic meter
C–14	8
C–14 in activated metal	80
Ni–59 in activated metal	220
Nb–94 in activated metal	0.2
Tc–99	3
I–129	0.08
Alpha emitting transuranic nuclides with half-life greater than 5 years	[1] 100
Pu–241	[1] 3,500
Cm–242	[1] 20,000

[1] Units are nanocuries per gram.

Short-lived

TABLE 2

Radionuclide	Concentration, curies per cubic meter		
	Col. 1	Col. 2	Col. 3
Total of all nuclides with less than 5 year half-life	700	([1])	([1])
H–3	40	([1])	([1])
Co–60	700	([1])	([1])
Ni–63	3.5	70	700
Ni–63 in activated metal	35	700	7000
Sr–90	0.04	150	7000
Cs–137	1	44	4600

[1] There are no limits established for these radionuclides in Class B or C wastes. Practical considerations such as the effects of external radiation and internal heat generation on transportation, handling, and disposal will limit the concentrations for these wastes. These wastes shall be Class B unless the concentrations of other nuclides in Table 2 determine the waste to be Class C independent of these nuclides.

Waste Classification

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- Derived from NUREG-0782 analysis
  - Inadvertent intruder scenarios
    - Intruder-Construction
    - Intruder-Discovery
    - Intruder-Agriculture
  - 500-mrem Dose limit (implies 5% likelihood)
  - Ineffective institutional controls after 100 yr.
  - Recognized need for site-specific analysis for water-dependent pathways
    - 61.13(a) analysis

Waste Characteristics

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- Minimum (all waste)
  - Facilitate handling
  - Protection of public health and safety
- Stability (stable waste)
  - Minimize water infiltration
  - Limit intruder exposures (recognizable, non-dispersible)

Waste Classification is *Central*

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Characteristics
61.56

Classification

Segregation
61.52(a)

Intruder
Barriers
61.52(b)

Waste Acceptance Guidance

- Waste form
- Concentration averaging and encapsulation

Staff Analysis

- Commission direction
- Domestic and international regulatory approaches
- Public feedback

Options Considered

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- Continue with existing waste classification system
- Replace classification system with site-specific WAC
- Maintain classification system with flexibility for site-specific WAC

Goals

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- Ensure protection of public health and safety
- Risk-informed, performance-based regulatory processes
- Provide flexibility for site-specific WAC per Commission direction
- Minimize disruptions to existing Part 61 framework
- Minimize resource burdens

Supportive Viewpoints

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- Recognizes improvements
  - site selection, facility design, and disposal methods
- Mixed views on scenarios
  - hypothetical vs. site-specific
- Some concern about abandoning classification
  - LLRWPAA: Federal-State Responsibilities
- 61.58, case-by-case
  - Transboundary concerns
- Mixed views on waste acceptability requirements
  - Performance-based (not prescriptive)

Critical Viewpoints

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- Additional resource burden on Agreement States
- Impact on State law
- Negative effects on public confidence
- Emphasize conservatism rather than maximizing capacity
- Economic incentives
- Complexity and lack of transparency of analyses

Proposal

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Waste Acceptance

Criteria	Characterization Methods	Certification Program

- Apply to all licensees
- Adapted from U.S. DOE
- Consistent with international approaches

Waste Acceptance Criteria

- Allowable limits
  - 61.55 concentration limits or
  - 61.13 analyses
- Acceptable wasteform characteristics and container specifications
- Restrictions or prohibitions

Waste Characterization Methods

- Identify parameters and acceptable uncertainty
- Minimum characterization information

Waste Certification Program

- Administrative procedures to ensure waste is acceptable for disposal
  - Designate authority
  - Identify documentation and records
    - Characterization
    - Shipment
    - Certification
  - Approaches for maintaining certification

Accommodating Changes

- LLW Manifests – App. G to10 CFR Part 20
- Concepts – 10 CFR 61.7
- Standards – 10 CFR 61.23
- Performance Objectives – 10 CFR 61.42
- Labeling – 10 CFR 61.57
- Operations – 10 CFR 61.52
- Records – 10 CFR 61.80

10 CFR PART 61 Preliminary Proposed Rule Language

Andrew Carrera

Division of Intergovernmental Liaison and Rulemaking

Office of Federal and State Materials and Environmental Management Programs

Advisory Committee on Reactor Safeguards
Meeting of the Radiation Protection and Nuclear Materials Subcommittee

April 9, 2011

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Working group

Office	Working Group Members
FSME/DILR/RB-A	Andrew Carrera, Gary Comfort
FSME/DILR/RB-B	Robert MacDougall
FSME/DWMEP/EPPAD	Priya Yadav, Mike Lee,
FSME/DWMEP/EPPAD	Christopher Grossman, David Esh
FSME/DWMEP/ERB-A	Stephen Lemont
ADM/DAS/RADB	Anthony DeJesus
OGC	Lisa London, Sarah Price, Tison Campbell
NRR	Shawn Harwell
OIS	Kristen Benney
NMSS	Timothy McCartin
Agreement States	Mark Yeager (South Carolina)

Purpose of the Rule

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- Specify site-specific technical analyses requirements.
- Permit development of criteria for waste disposal based on the results of these analyses.
- Better align the requirements with current health and safety standards.

Preliminary Amendments to Part 61 Regulations (Dec. 2012)

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- Site-Specific Analyses:
  1. Performance assessment
  2. Intruder assessment
  3. Performance period analyses
  4. Update technical analyses
- Waste acceptance
- Other Supporting Changes:
  1. Adding new definitions and concepts
  2. Implementing changes to Appendix G to 10 CFR Part 20
  3. Allowing the use of up-to-date ICRP recommendations

Site-Specific Analyses: Performance Assessment

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- § 61.41 Protection of the general population from releases of radioactivity.

  Revised requirements:

  § 61.41(a)—Added requirement to demonstrate compliance through analyses that meet the requirements specified in §61.13(b).

  § 61.41(b)—Added requirement to demonstrate that reasonable effort should be made to maintain releases of radioactivity from a disposal facility to the general environment as low as reasonably achievable at any time during the performance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in §61.13(e).

Site-Specific Analyses: Intruder Assessment

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- § 61.42 Protection of inadvertent intruders.

  Revised requirements:

  § 61.42(a)—Added annual dose of 500 mrem and requirement to demonstrate compliance through analyses that meet the requirements specified in § 61.13(b).

  § 61.42(b)—Added requirement to demonstrate reasonable effort should be made to maintain exposures to any inadvertent intruder as low as reasonably achievable at any time during the performance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(e).

Site-Specific Analyses: Long-Term Analyses

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- § 61.13 Technical analyses.

  New requirements:

  § 61.13(e)—Added requirement for analyses that assess how the disposal facility and site characteristics limit the potential long-term radiological impacts, consistent with available data and current scientific understanding. The analyses shall only be required for land disposal facilities with long-lived waste that contains alpha-emitting radionuclides with average concentrations exceeding 10 nCi/g or radionuclides with average concentrations exceeding one tenth of the values listed in Table 1 of § 61.55, or if necessitated by site-specific factors including engineering design, operational practices, and site characteristics. The analyses must identify and describe the features of the design and site characteristics that will demonstrate that the performance objectives set forth in §§ 61.41(b) and 61.42(b) will be met.

Waste Acceptance:

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- § 61.58 Waste acceptance.

  New requirements:

  § 61.58(a)—Added requirement for waste acceptance criteria to be developed from the technical analyses required by either § 61.13 for any land disposal facility or the waste classification requirements set forth in § 61.55 for a near-surface disposal facility.

  § 61.58(b)—Added requirement for waste characterization.

  § 61.58(c)—Added requirement for waste certification.

Site-Specific Analyses: Updated Analyses

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- § 61.28 Contents of application for closure.

  New requirement:

  § 61.28(a)(2)—Added requirement to submit revised analyses for §61.13 using the details of the final closure plan and waste inventory.

Other Supporting Changes:

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- § 61.2 Definitions and § 61.7 Concepts.

  New definitions and concepts:

  Compliance period, intruder assessment, long-lived waste, performance assessment, waste acceptance, and implementation of dose methodology.

- Appendix G to 10 CFR Part 20.

  Revise requirements:

  Section II, “Certification,” and

  Section III, “Control and Tracking.’

Current Status and Next Steps

Aby Mohseni, Deputy Director

Division of Waste Management and Environmental Protection

Office of Federal and State Materials and Environmental Management Programs

Aby.Mohseni@NRC.gov, (301) 415-6686

Advisory Committee on Reactor Safeguards

Meeting of the Radiation Protection and Nuclear Materials Subcommittee

April 9, 2013

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Current Plans ….

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- **Second ACRS Subcommittee briefing: June 2013**
  - Discuss rule text and guidance document currently in concurrence
  - Changes reflect Commission's 2012 SRM
  - Focus on changes made in response to December 2012 public comments
- **ACRS Committee briefing: July 2013**
  - Anticipating Committee letter report
- **Draft rule text and guidance document due to Commission: July 2013**

Next Steps …

- **If Commission approves of rulemaking package …**
  - Publish in *Federal Register* later in calendar year (Fall/Winter 2013)
  - Conduct public meetings in 2014 (locations and dates yet to be determined)
  - Deliver final rulemaking package to Commission in late calendar year 2014