

# **Official Transcript of Proceedings**

## **NUCLEAR REGULATORY COMMISSION**

Title:                   Advisory Committee on Reactor Safeguards  
                              Open Session

Docket Number:     (n/a)

Location:             Rockville, Maryland

Date:                  Thursday, November 3, 2016

Work Order No.:     NRC-2708

Pages 1-273

NEAL R. GROSS AND CO., INC.  
Court Reporters and Transcribers  
1323 Rhode Island Avenue, N.W.  
Washington, D.C. 20005  
(202) 234-4433

## DISCLAIMER

UNITED STATES NUCLEAR REGULATORY  
COMMISSION'S  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, as reported herein, is a record of the discussions recorded at the meeting.

This transcript has not been reviewed, corrected, and edited, and it may contain inaccuracies.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

+ + + + +

638TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

OPEN SESSION

+ + + + +

THURSDAY

NOVEMBER 3, 2016

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Advisory Committee met at the  
Nuclear Regulatory Commission, Two White Flint  
North, Room T2B1, 11545 Rockville Pike, at 8:29  
a.m., Dennis C. Bley, Chairman, presiding.

COMMITTEE MEMBERS:

DENNIS C. BLEY, Chairman

MICHAEL L. CORRADINI, Vice Chairman

PETER RICCARDELLA, Member-at-Large

CHARLES H. BROWN, JR., Member

MARGARET CHU, Member

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

WALTER KIRCHNER, Member

JOSE A. MARCH-LEUBA, Member

DANA A. POWERS, Member

HAROLD B. RAY, Member

JOY REMPE, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Chairman

MATTHEW W. SUNSERI, Member

DESIGNATED FEDERAL OFFICIAL:

GIRIJASHUKLA

ZENA ABDULLAHI

DEREK WIDMAYER

ALSO PRESENT:

GLENN ADAMS, Xcel Energy

GINA BORSH, Dominion

GARY COMFORT, NMSS

JOSEPH DONOGHUE, NRO

DAVID ESH, NMSS

YOUSEF FARAWILA, AREVA

JOSEPH GIACINTO, NRO

ERICA GRAY, Public Participant\*

CHRISTOPHER J. GROSSMAN, NMSS\*

JOE HEGNER, Dominion

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

PAKSIS KALTA, Public Participant\*

DOUG KEMP, Bechtel

ROB KUNTZ, NRR

TAMARA MALANEY, Xcel Energy

CHRIS MCKENNEY, NMSS

TIM MCGINTY, NRR

MATTHEW PANICKER, ORNL

GARY PETERS, Xcel Energy

DIEGO SAENZ, NRR

JAMES SHEA, NRO

RICK STADTLANDER, Xcel Energy

RAO TAMMARA, NRO

DAN TINKLER, AREVA

DOUGLAS TONKAY, DOE

ANDREA D. VEIL, Executive Director, ACRS

STEVE WILLIAMS, NRO

ANDREW WYSOCKI, ORNL

PRIYA YADAV, NMSS

\*Present via telephone

## C-O-N-T-E-N-T-S

Welcome and Introduction.....	5
North Anna 3 Combined License Application.....	7
AREVA Extended Flow Window/Monticello.....	72
Recess	
10 CFR Part 61 Rulemaking.....	93
Adjourn.....	273

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

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

(8:29 a.m.)

MEMBER CORRADINI: Okay. The meeting will now come to order. This is the first day of the 638th Meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following: North Anna 3 Combined License Application, the AREVA Extended Flow Window for Monticello, 10 CFR Part 61 Rulemaking and preparation of ACRS Reports.

This meeting is being conducted in accordance with the Provisions of the Federal Advisory Committee Act. Mr. Girija Shukla is the designated Federal official for the initial portion of the meeting.

Portions of the session on AREVA Extended Flow Window for Monticello may be closed in order to discuss and protect information designated as proprietary. We have received no comments or requests to make oral statements from members of the public regarding today's session.

There will be a phone bridge line and to preclude interruption of the meeting, the phone will be placed in a listen-in mode during the presentations and Committee discussion.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1 A transcript of portions of the meeting  
2 is being kept and it's requested that the speakers  
3 use one of the microphones, please identify  
4 themselves and speak with sufficient clarity and  
5 volume so that they can be readily heard. I will  
6 remind members of the Committee and Attendees to  
7 turn off all your electronic devices so we don't  
8 hear any sort of strange noises.

9 I also want to make sure that everybody  
10 here is aware that this meeting is being Webcast  
11 with the ability to view our presentation slides on  
12 the Web. Those of you who are out on the bridge  
13 line, you may want to do that and dial into the  
14 Webcast versus dialing into the bridge line, as  
15 that will probably be a much clearer connection.  
16 If there's an issue relative to the Webcast or the  
17 bridge line, please call our office.

18 So with that, I'll turn it over to Dr.  
19 Riccardella for our first topic.

20 MEMBER RICCARDELLA: Thank you Mike.  
21 The first topic is the Application for a Combined  
22 License for North Anna 3 and ESPWR. We had  
23 Subcommittee meetings on the North Anna application  
24 in September and October of this year. Prior to  
25 that, the ESPWR Subcommittee reviewed and approved

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the generic ESPWR design in October of 2010. There  
2 was a subsequent discussion of steam dryer issues  
3 and another letter issued by the Committee in April  
4 2014.

5 And finally, since North Anna is a  
6 subsequent COLA, a Combined Operating License has  
7 already been issued for Fermi, and we reviewed that  
8 and agreed with the staff on that in September of  
9 2014. So with that brief introduction, I'll turn  
10 the meeting over to Joe Donoghue from NRO.

11 MR. DONOGHUE: Good morning. I'm the,  
12 I'm Joe Donoghue, the Grants Chief in Licensing  
13 Branch 3, as of this week. The staff presentation,  
14 when we get to it, will be led by our new Project  
15 Manager, James Shea. Some of the faces in the  
16 Committee are new. So I wanted to introduce  
17 myself, since I was last here a couple of years  
18 ago. I believe we're starting with the Licensee's  
19 presentation, the Applicant presentation. I think  
20 that's you, Gina.

21 MS. BORSH: It is. Good morning. I'm  
22 Gina Borsh from North Anna 3 Dominion. On behalf  
23 of Dominion, I'd like to thank you all for having  
24 us today. We look forward to making our  
25 presentation following up from our Subcommittee

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 meeting. With me is Joe Hegner, who is our  
2 Licensing Manager for North Anna 3.

3 What I'd like to do today is cover with  
4 you an overview of the North Anna 3 site and talk  
5 with you about the licensing history, give you a  
6 summary of that. And then I'll talk about some of  
7 the COLA changes that we've made since we were last  
8 here in 2009 and then I'll conclude our  
9 presentation.

10 This, Slide 3, is an overview of the  
11 North Anna location, the North Anna site location.  
12 You'll see the star here in the Northeast section  
13 of Virginia. The North Anna 3 site is about 40  
14 miles northwest of Richmond and it's about 22 miles  
15 southwest of Fredericksburg, just to give you a  
16 sense of the location of the site.

17 This next slide, Slide 4, is an artist  
18 rendering of what the site will look like when the  
19 ESPWR is built at North Anna but you'll see here is  
20 the existing units, 1 and 2, are over here and  
21 then, over here, is the power block for North Anna,  
22 Unit 3 and on this far right side, are the cooling  
23 towers.

24 MEMBER RICCARDELLA: Which, which  
25 direction is north on that?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MS. BORSH: We're kind of looking north  
2 -- north is about this way, so we're kind of  
3 looking from the north a little bit west.

4 MR. DONAGHUE: Right. Looking  
5 generally from the north.

6 MEMBER RICCARDELLA: Yes. Okay. So  
7 north is down.

8 MS. BORSH: Correct. Okay? Slide 5 is  
9 the planned view of the North Anna 3 site and  
10 you'll see, here is the turbine building, reactor  
11 building, control building. Over here are the  
12 cooling towers. And then, switchyard is over here  
13 and you saw where, in the previous slide, in  
14 relation to units 1 and 2.

15 If there aren't any other questions about that,  
16 I'll just give you a brief overview of the North  
17 Anna 3 history. We are a plant that started with  
18 an Early Site Permit.

19 So we submitted our Early Permit  
20 Application back in September of 2003. The NRC  
21 issued the Environmental Impact Statement in  
22 December of 2006 and then the permit was issued in  
23 November of 2007. We submitted our COLA as an  
24 ESPWR COLA -- we were the R-COLA at that time, in  
25 November of 2007. We had Subcommittee meetings

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 with the ACRS in June, July, in August of 2009.  
2 And then we had the Full Committee meeting in  
3 October of 2009 and a letter was written by the  
4 Committee at that point.

5 Then the NRC issued the Supplemental  
6 EIS in February of 2010 and last month, as Dr.  
7 Riccardella said, we met with the Subcommittee to  
8 present the ESPWR changes that have occurred since  
9 our last NCR visit in 2009. And part of the reason  
10 for this, I think you all know, is because we did  
11 change technologies for a time. We went with the  
12 APWR technology in May 2010 and ended up reverting  
13 back to the ESPR technology in 2013.

14 So, are there any questions on that  
15 before we talk about COLA changes? So we reverted  
16 back to the ESPWR design in 2013 and when we made  
17 that decision to revert back, we followed two  
18 strategies, two basic, the strategy used two basic  
19 principles to make the changes to revert back to  
20 the ESPWR design.

21 One was, we wanted to standardize the  
22 content that was in the COLA as much as possible  
23 with the ESPWR DCD, and with Fermi-3's R-COLA. And  
24 we used the design centered working group approach  
25 to do that, which was endorsed essentially, or

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 described originally by the NRC in a RIS, I think.

2 And then the second piece was that we  
3 wanted to rely as much as possible on the  
4 site-specific COLA information that we had provided  
5 previously, that was in the ESPWR COLA before we  
6 switched to the APWR. So as a result of that, most  
7 of the COLA content that you see before you today  
8 is consistent with the information that we  
9 previously provided in 2009. Okay?

10 If there aren't any questions about the approach,  
11 I'll start going through, give you an overview of  
12 some of the changes.

13 The first change that I'd like to talk  
14 with you about is hazardous chemical analyses. So  
15 what we did was, we looked at the potential  
16 accidents -- that's described in Section 2.2 of our  
17 FSAR and two of the accidents, the categories that  
18 we had to consider were explosions and delayed  
19 ignition of a flammable vapor cloud.

20 When we did these analyses, we found  
21 that the blast effects would not exceed the peak  
22 over pressure of 1 PSI at any of the safety-related  
23 structures, except for storage of and transport of  
24 liquid hydrogen. So we had to do further analysis  
25 there.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER SKILLMAN: Excuse me, the use of  
2                   the hydrogen. Are the primary uses static cooling  
3                   and reactor coolant system chemistry?

4                   MS. BORSH: That, mostly reactor  
5                   cooling system chemistry, yes.

6                   MEMBER SKILLMAN: Thank you.

7                   MS. BORSH: So, for liquid hydrogen, we  
8                   did our analysis and what we found -- we had two  
9                   6000-gallon capacity tanks that we analyzed for the  
10                  storage -- and what we did find when we did this  
11                  more detailed analysis is that the actual distance,  
12                  distances between the tanks and the nearest  
13                  safety-related structure exceed the calculated  
14                  minimum safe distance. So we were okay there.

15                  MEMBER CORRADINI: Just a reminder,  
16                  what is the minimum safe distance?

17                  MS. BORSH: Oh gosh, we have it, it's  
18                  7, we talked about it last time,

19                  MEMBER CORRADINI: Sorry, I wasn't at  
20                  the Subcommittee meeting --

21                  MS. BORSH: No, yes, that's okay. But  
22                  what I'm saying is I know we have the number. It's  
23                  in the FSAR and we'll pull that up for you.

24                  MEMBER CORRADINI: That's fine. That's  
25                  fine. Just -

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MS. BORSH: Yes, it's around 700 feet.

2 MEMBER CORRADINI: Okay.

3 MR. DONOGHUE: 750.

4 MEMBER CORRADINI: Thank you.

5 MS. BORSH: Okay.

6 MEMBER CORRADINI: Thank you.

7 MS. BORSH: Sure. For transporting  
8 liquid hydrogen, we assumed that we had a  
9 13,000-gallon capacity tank and we did a PRA,  
10 probabilistic analysis, and we concluded that the  
11 probability of an accident involving the delivery  
12 truck is less than  $10^{-6}$  per year, which is  
13 acceptable per the NRC guidance.

14 So we didn't have to assume that there  
15 would be any missiles from that sort of event. So  
16 as a result, we didn't have any design-basis  
17 events, with respect to storage or transport of  
18 chemicals.

19 MR. MARCH-LEUBA: Yes. I was at the  
20 Subcommittee meeting. Is this is because you  
21 design the parking lot so that the truck doesn't  
22 have to back, backtrack, I mean, this is low  
23 probability of a truck having an accident. Is  
24 because you design the approach to the tank  
25 properly, right?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MS. BORSH: Yes, it is designed  
2 properly. MR. MARCH-LEUBA: Yes.

3 MS. BORSH: That's your question.

4 MR. MARCH-LEUBA: So the probability  
5 was reduced by taking proactive action and  
6 designing it properly?

7 MS. BORSH: Yes. That's correct.

8 MEMBER STETKAR: That's not, just for  
9 the record, so we're clear for the meeting. That's  
10 not the frequency of a truck accident. That's the  
11 frequency of a truck accident resulting in an  
12 explosion.

13 MS. BORSH: That's right. That's  
14 right.

15 MEMBER STETKAR: Trucks have accidents  
16 more frequently than once in a million years.

17 MR. BORSH: But before we leave this  
18 topic, I think Doug, from Bechtel, has a comment.  
19 Yes. This is Doug Kemp, from Bechtel.

20 MR. KEMP: Hello. It's on?

21 MEMBER CORRADINI: It's on Doug.

22 MR. KEMP: Oh. Doug Kemp from Bechtel.  
23 The question was on the safe stand-off distance,  
24 yes. The calculated safe stand-off distance from  
25 the source, analysis was 495 feet and for the vapor

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 cloud, analysis was 777 feet.

2 MS. BORSH: Thank you Doug. Okay. Any  
3 other questions about hazardous chemicals before we  
4 go on? Right. We also performed additional  
5 analyses for our local intense precipitation work,  
6 which was documented in Section 2.4.2 and our  
7 analyses of the maximum inundation flood levels  
8 that result from probable, from local probable  
9 maximum precipitation found that these potential  
10 flood levels are bounded by the DCD. The DCD set  
11 parameter is 1 foot below grade. And we were, we  
12 found that our results were acceptable there.

13 We did further analysis looking at the  
14 sheet flow, because of an RAI that we received and  
15 in the analysis, we assumed the, what is stipulated  
16 in the FSAR, which were certain flow directions  
17 from the rooftops for the runoff. As a result of  
18 the flow analysis that we did, we found that there  
19 were three locations that, where the sheet flow  
20 depths are above the floor elevations at the  
21 entrances to some safety-related buildings.

22 So in the FSAR we committed to place  
23 curbs at these entrances or to raise their  
24 thresholds to prevent water from entering these  
25 buildings.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 So as a result of the analysis work we did and the  
2 commitments that we've made, we found that the site  
3 grading and structure configuration precludes  
4 flooding in safety-related buildings during a local  
5 intense precipitation event. Questions on that?

6 All right. Another accident that we  
7 had, that we reviewed again, was the accident on  
8 release of liquid effluence to the environment.  
9 This is documented in Section 2.4.13 of the FSAR.  
10 The design of the ESBWR does include mitigating  
11 features to preclude any accidental releases of  
12 effluence. However, per the SRP 11.2, we do have  
13 to do an accidental release analysis and we  
14 performed that analysis.

15 We used the condensate storage tank to  
16 be, as the source of our release, based on ranking  
17 of the tanks and looking at the mitigating features  
18 that we have for each of the tanks. And, as a  
19 result of this analysis, we found that the release  
20 from the condensate storage tank to the environment  
21 would result in concentrations and doses that are  
22 well below the 10 CFR 20 limits.

23 MEMBER SKILLMAN: Gina, would you  
24 explain what ranking of tanks means in that  
25 context, please?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MS. BORSH: Yes. What we looked at was  
2 the concentrations of radioactive material in each  
3 of the tanks. So previously, our -- we had used a  
4 different tank for -- when we were here in 2009, we  
5 used a different tank for doing the analysis but,  
6 because it had a higher radioactive nuclei  
7 concentration. But because of revisions to the NRC  
8 Guidance, we were able to switch over to the  
9 condensate storage tank this time. But it's  
10 looking at the amount of radioactive material  
11 that's in the tank, each tank.

12 MEMBER SKILLMAN: Okay. And what would  
13 be the isotopic burden in the condensate storage  
14 tank? This would be from condensate if you had a  
15 steam generator tube leak or if you had a, if you  
16 had fuel preparation and you're carrying that  
17 isotopic inventory over into another condensate  
18 storage tank?

19 MS. BORSH: Let me ask our, ESPWR  
20 experts, if that's okay with you?

21 MEMBER SKILLMAN: What I'm really  
22 wondering is what is the source term upon which you  
23 would make the statement, we've ranked this tank,  
24 thus and so?

25 MS. BORSH: And I don't have, that

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 information is in our COLA. Do you want me to  
2 pull that up for you? In our FSAR?

3 MEMBER SKILLMAN: Sometime in the next  
4 hour, that'd be fine.

5 MS. BORSH: Okay. All right.

6 MEMBER SKILLMAN: Thank you.

7 MS. BORSH: So, we'll get back with you  
8 on that.

9 MEMBER SKILLMAN: Okay.

10 MS. BORSH: Okay. Any other questions  
11 about this one?

12 MEMBER SKILLMAN: No.

13 MS. BORSH: The next change that we  
14 made was actually a departure from the DCD and it  
15 involves a Radwaste discharge typing change that  
16 we made. So overall, Unit 3 is designed to be a  
17 zero liquid release plan. So our goal is to not  
18 release any radioactive material to the site. But  
19 it's designed to recycle all the processed water.

20 If we do have to make a release though,  
21 we will be, at North Anna, we'll be using a  
22 dedicated liquid Radwaste effluent discharge  
23 pipeline and that would discharge to the discharge  
24 canal. We won't be using the circulating water  
25 systems cooling tower blowdown line, which is what

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 is currently described in the DCD. So that's the  
2 departure there.

3 And then in FCR Section 12.3, we  
4 explained that and make a commitment that this  
5 discharge line that we're, we'll be designing, is  
6 going to run underground and it will be run in a  
7 guard pipe or it's going to be accessible via a  
8 trench or a tunnel.

9 And so this discharge line that we're  
10 talking about complies with 10 CFR 20.1406 to  
11 minimize to the extent practicable, contamination  
12 of the facility and the environment. Any questions  
13 on that?

14 This next slide, Slide 13, is about Reg. Guide  
15 1.221, which provides guidance from the NRC on  
16 design-basis hurricane winds and hurricane  
17 missiles.

18 This Reg Guide was not in place, it had not  
19 been issued when the DCD was originally submitted,  
20 so, as part of the rule making for the DCD, we  
21 basically were required to do our evaluation using  
22 this Reg. Guide and the guidance therein.

23 So we did our evaluations and we found  
24 that the seismic Category I structures are going to  
25 be designed to withstand the loads due to the DCD

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       tornado wind speed and missile spectrum, because  
2       the DCD wind and missile demands bound all of the  
3       North Anna 3 sites specific tornado and hurricane  
4       wind and missile demands.

5               For seismic Category II structures, and  
6       those structures that are housing Regulatory  
7       Treatment of Non-Safety Systems, RTNSS structure  
8       systems and components, we're going to be designing  
9       those to withstand both the DCD criteria and the  
10      Reg. Guide 1.221 hurricane and missile demands.

11             So the conclusion here is that the  
12      seismic Category I structures will meet the DCD  
13      wind speed and missile criteria and the Category II  
14      structures and RTNSS structures, or structures  
15      housing RTNSS, will meet the DCD and Reg. Guide  
16      1.221 criteria for hurricane winds and missiles.  
17      Okay?

18             Now we're going to talk about seismic,  
19      that's what the next few slides are about. There  
20      were a number of drivers of, for the seismic  
21      revisions that we made to R-COLA and this is a list  
22      of the major ones. You know, on August 23, 2011,  
23      there was an earthquake that occurred in the  
24      Mineral, Virginia area.

25             Also, EPRI and the NRC issued some new

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 criteria, the new Central and Eastern United  
2 States- Seismic Source Characterization Sources, so  
3 we needed to use that information and then, also,  
4 the ground motion model was updated by EPRI.

5 In addition to that, the NRC revised  
6 several guidance documents, three SRPs and one of  
7 the, and they issued ISG 17. So, as a result of  
8 all these changes, we decided that we had to make  
9 changes, both to the vibratory ground motion that  
10 is used in the seismic analysis and then, of  
11 course, we had to redo the seismic analysis to  
12 incorporate these changes.

13 This next slide, Slide 15, basically  
14 shows us the process that we used to develop our  
15 seismic hazard. So you'll see, we start with the  
16 seismic source which comes from the new CEUS  
17 Seismic Source Characterization data and then, we  
18 move that source through to the ground motion. As  
19 it attenuates, it comes up through the rock site,  
20 amplification occurs here and then we eventually  
21 develop our sites-specific seismic hazard, which is  
22 used in our seismic analysis.

23 This is a summary of what I just showed  
24 you. So what we did was, we updated our seismic  
25 sources using the new CEUS and updated seismicity

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 and it included the 2011 Mineral Earthquake. We  
2 revised our probabilistic seismic hazards analysis  
3 using the updated CEUS-SSC and new ground motion  
4 model that was provided by EPRI.

5 We developed our new site-specific  
6 response factor using the revised PSHA and then we  
7 developed our new ground motion response spectra  
8 and our Foundation Input Response Spectra or FIRS.  
9 We refined these using the site-specific response  
10 spectra and the new ISG 17 guidance that the NRC  
11 had issued.

12 As a result of doing all this, we  
13 identified certain exceedances at certain  
14 frequencies of the Certified Seismic Design  
15 Response Spectra or CSDRS, and so that was what  
16 drove us to, revise, not redo, I'm sorry, because  
17 we hadn't had to do this before, but perform  
18 seismic analysis of the structures and some of the  
19 systems and components.

20 This slide is, shows you, just as an  
21 example, the exceedances that we have for the  
22 reactor building control building, and you'll see  
23 the black line here is the DCD CSDRS, and then the  
24 blue and red lines provide the reactor building  
25 control building FIRS and you'll see that just at

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 certain frequencies around, starting at around 10  
2 hertz, we have some exceedances here. The same  
3 holds true for the fire water service complex, but  
4 I don't have that slide for you.

5 MEMBER RICCARDELLA: Just, just a  
6 comment while we're on that slide. It's not shown,  
7 but for those of you who weren't at Subcommittee,  
8 the combination of the design spectrum plus the  
9 other ones significantly bounds the spectra from  
10 the Mineral, Virginia earthquake.

11 MS. BORSH: Thank you sir. Yes, the  
12 Mineral earthquake had, minimal -- it really had no  
13 impact on the results overall of the seismic  
14 analysis, so, but we did incorporate it, just to  
15 confirm that.

16 Slide 18 now talks about our seismic analysis and  
17 our evaluation of the seismic Category I  
18 structures.

19 So after we got the input from the  
20 vibratory ground motion, we developed the seismic  
21 design parameters using the site-specific soil  
22 structure interaction input soil profiles and the  
23 ground motions and we performed the site-specific  
24 SSI and structure soils structure interaction  
25 analyses, so that we could evaluate the Cat I

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 buildings, which are the RBFB, the control building  
2 and the fire water service complex.

3 And we were looking at those using our  
4 site-specific ground motion and soil properties.  
5 We used the results of those analyses to determine  
6 the site-specific seismic demands on the structures  
7 and then we performed site-specific analyses of the  
8 structures and the components using the  
9 site-specific seismic demands, along with the other  
10 demands on those items.

11 Finally, just to point out the  
12 methodology and mathematical models that we used  
13 for these analyses were consistent with what was  
14 used for the DCD structures and systems and  
15 components.

16 The results of the analyses show that  
17 there were no changes to the DCD concrete member  
18 properties so, for example, the slabs and wall  
19 thicknesses all stayed the same as the DCD. We did  
20 have to make a couple of minor local changes to the  
21 shear ties and the reinforcement in the reactor  
22 building, building exterior walls one place there.

23 We changed the size of a control  
24 building girder and then we also made some  
25 modifications to the rebarring shear ties that are

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 in the fire water service complex shear case and  
2 basement. For the components, there was a slight  
3 increase in the size of the support saddle bolt for  
4 the Passive Containment Cooling System Condenser  
5 and we slightly increased the ankle bolt size and  
6 corner base plate welds for the field storage  
7 tracks in the buffer pool.

8 So basically, the seismic  
9 constructional analyses that we performed and the  
10 minor design enhancements that we made demonstrate  
11 the capability of the structures, systems and  
12 components to operate at North Anna 3. Any  
13 questions about seismic?

14 In conclusion, we just want to point  
15 out that we did, as I said earlier, implement the  
16 design-centered review approach to maximize  
17 standardization with the DCD and with the R-COLA.  
18 We provided site-specific topics that the NRC has  
19 reviewed and evaluated. And our determination,  
20 along with the SER, is that North Anna 3 site is  
21 adequate to support construction and operation of  
22 the plant.

23 MEMBER SKILLMAN: Gina, would you go  
24 back a slide please?

25 MS. BORSH: Sure.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER SKILLMAN: For the four changes  
2                   that those four bullets represent, should we be  
3                   thinking that each place a change has been made,  
4                   there is a calculation package that has been  
5                   conducted under 10C-450, Appendix B, demonstrating  
6                   the seismic capability of the revised device.

7                   MS. BORSH: Yes, that's correct.

8                   MEMBER SKILLMAN: Thank you.

9                   MS. BORSH: You're welcome. And those  
10                  reports have been submitted to the NRC for review  
11                  too. They've either seen them through audits or  
12                  they're on the docket.

13                  MEMBER SKILLMAN: Thank you Gina.

14                  MS. BORSH: You're welcome. Question?  
15                  Okay. Thank you.

16                  MEMBER RICCARDELLA: Thank you Gina.  
17                  That I guess will have the staff briefing?

18                  MEMBER SKILLMAN: I'd still like to  
19                  hear about source term on the condensate storage  
20                  tank, please.

21                  MS. BORSH: Yes.

22                  MEMBER SKILLMAN: Okay. Thank you.

23                  MR. SHEA: Morning. My name is Jim  
24                  Shea. I'm the NRC's Division of New Reactor  
25                  Licensing Lead Project Manager for the North Anna 3

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 review. The staff is presenting its Phase 4 SER  
2 with no open items. This is a follow-on from the  
3 Phase 2 SER with open items that was completed  
4 based on a full ACRS meeting back in October 2009.

5 During the last ACRS Subcommittee  
6 meeting, the staff presented the review highlights  
7 of the Phase 4 review, and focused on, I think like  
8 Gina mentioned, the differences between the  
9 site-specific differences from the DCD and, of  
10 course, the R-COLA with Fermi.

11 And when you look at it, the review  
12 focus essentially is on, there's, there was five  
13 exemptions, there's a number of departures from the  
14 DCD and then there's some variances associated with  
15 the ESP. And that was the staff's main focus on  
16 the review. And in the past 24 months, the review  
17 focus has really been on the seismic issue.

18 The seismic closure plan, that was  
19 submitted by Dominion in October of 2014 has been,  
20 really, the main focus and you could say the  
21 longest pole in the tent of the review.

22 Our staff spent, along with Dominion,  
23 spent several hours and review time and a couple of  
24 audits in that meantime, and, in fact, we held  
25 biweekly public meetings, to go through all the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 issues of the seismic, to go through the seismic  
2 closure plan, answer all the RAIs, address a number  
3 of issues that were raised during audits, etcetera.  
4 So that's been going on for the last two years.

5 MEMBER RICCARDELLA: For those members  
6 who weren't at Subcommittee, we spent about four  
7 hours on this topic at the Subcommittee meeting.

8 MR. SHEA: So, the structure, to get  
9 through the structure, today's meeting, I'm going  
10 to do a brief highlight of what we did at the  
11 Subcommittee meeting and you're going to see in my  
12 slides, a lot of them are coming directly from the  
13 Subcommittee meeting, so I just highlighted a  
14 couple of the bottom line issues.

15 And if there's any questions that stems  
16 from that, we have our staff that were on the  
17 panels, that we had for Subcommittee, are here to  
18 answer any of your additional questions.

19 And I'd just like to point out, we  
20 mentioned that our review was really, there's other  
21 issues besides the seismic, but that was the main  
22 issue that we reviewed and I want to thank Dominion  
23 and our staff working very diligently through all  
24 these issues, several technical issues, to get to  
25 the point where we are now to be able to present

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       this Phase 4 SER.

2               And there are some of things that we  
3       have are direct duplicates of Dominion, so I'm not  
4       going to reiterate those, except just to point out  
5       like where I highlighted some of the key things  
6       that occurred that influenced our, our review from  
7       the staff side, including the Mineral earthquake on  
8       August 23, 2011.

9               And a couple of other things there, the  
10       seismic closure plan, which I mentioned was  
11       submitted in October 22, 2014 and then the last  
12       updated revision to the FSAR, which included all  
13       the incorporation of all the changes associated  
14       with the seismic analysis have been included in  
15       that June 22 FSAR update.

16              This just kind of highlights what we  
17       already mentioned, the Phase 2 ACRS review.  
18       Mentioned that, just a couple of things, Phase 4  
19       SER. Now this is a 6 Phase review, so if you're  
20       not familiar with the NRO review process, Phase 2  
21       is the SER with open items and then Phase 4 is the  
22       SER, with, the final SER, with all those items  
23       closed and the only thing left really is some  
24       confirmatory items.

25              And that's, really the staff's findings

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 are associated with the Phase 4. The Phase 6 is  
2 more of an admin, the FSAR is an admin review of,  
3 to get it ready for basically, a new Reg. so that  
4 it can be submitted to the Commission. It goes  
5 through an administrative process which is what  
6 we're going through now, and we're, we did actually  
7 confirm all of the items that were open in the Rev.  
8 9 of the FSAR.

9 And that will be included in that,  
10 those confirmations will be included in the final  
11 SER from the staff.

12 MEMBER STETKAR: So Jim, just to be  
13 clear, that, what you're saying -- we had some  
14 discussion about what the SER, what the ACRS is  
15 actually being asked to review.

16 MR. SHEA: Yes.

17 MEMBER STETKAR: And the current  
18 document that we have refers to various  
19 incarnations of the, various revisions of the  
20 Applicant's FSAR, and the supporting DCD. And what  
21 I think I hear you saying is you're going to clean  
22 that all up between now and when you go final?

23 MR. SHEA: No,

24 MEMBER STETKAR: Oh.

25 MR. SHEA: Really, everything is in

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Phase, the Phase 4, and I think I fed back to  
2 Giriya on this issue that was brought up at the  
3 Subcommittee --

4 MEMBER STETKAR: You did and I didn't  
5 understand that, so maybe you could explain it to  
6 the rest of us.

7 MR. SHEA: Okay. Let me see if I can  
8 do this again. So, for example --

9 MEMBER STETKAR: For the Committee's  
10 reference, if you read through the different  
11 chapters of the SER, some, some of them refer to,  
12 and I haven't got it here in front of me, I guess  
13 for the record, I should get it here in front of  
14 me.

15 MR. SHEA: Well I could probably  
16 explain it.

17 MEMBER STETKAR: Let me, let me get my  
18 thing on the record here. That would be because --  
19 if I look at, for example, all of the chapters,  
20 except Chapters 7, 16, 18 and 20, in the SER, refer  
21 to Revision 8, of the COL-FSAR, which is based on  
22 Revision 10 of the ESPWAR-DCD.

23 However, Chapters 7, 16, 18 and 20 of  
24 the SER refer to Revision 7 of the COL-FSAR, which  
25 is based on Revision 9 of the DCD. So there's

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 essentially four chapters in the version of the  
2 FSAR that we're reviewing that explicitly, in  
3 writing, referred to a previous, not the current  
4 revision either of the COL-FSAR and ESPWAR-DCD.

5 So I was questioning about, you know,  
6 why we have that, sort of, time disconnect, in the  
7 SER.

8 MR. SHEA: And, you know, based on your  
9 comments from the Subcommittee meeting, I actually  
10 updated the slide and you can see that Phase 2 SER  
11 was done per the FSAR Revision 6, July 2013, based  
12 on DCD Revision 9. And so, when you look at those,  
13 those are the confirmatory items.

14 So open items were closed based on,  
15 like you mentioned there, was the DCD Revision 10  
16 and FSAR Revision 8. So you're going to see,  
17 there's various stages of the SER and how, over the  
18 years, has evolved. In the sense, the staff made a  
19 number of findings back in Phase 2 and there  
20 weren't, and nothing has changed from those  
21 decisions.

22 And so it was based on those particular  
23 revisions that you see on that slide and we're not  
24 going to go back, you know, since nothing changed  
25 in the FSAR updates except what was requested

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 through RAIs and through these open items. For  
2 example, in Phase 2, the open items were closed by  
3 the Revision 8.

4 Because all those open items had RAIs  
5 associated with them and the response of those RAIs  
6 and then additional, there's been some follow-on  
7 RAIs associated with that, you know, our normal  
8 process, those were closed by that Revision 8 for  
9 the most part.

10 Those were 71 items, Revision 8, June  
11 2014. So when you read the SER, you're going to  
12 see specific sections that were resolved back under  
13 those revisions. Now, Revision 9 hasn't changed of  
14 the FSAR --

15 MEMBER STETKAR: In those areas --

16 MR. SHEA: Yes, in those areas. So,  
17 what you're seeing is, the staff at the time, at  
18 that time, made a decision and found that  
19 acceptable. So the only place where you're going  
20 to see in the FSAR where it says, staff made  
21 decision based on its, the Rev. 9 of the FSAR, it's  
22 really in the area of the seismic in Chapter,  
23 Section 3.7 and 3.8 of Chapter 3.

24 Because just as John pointed out in  
25 Subcommittee meeting, there are sections in Chapter

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 3 that were completed back in Phase 2, that refer  
2 back to these previous revisions. And you're going  
3 to see the same thing, this is the same, and I had  
4 to verify it myself. Based on your question, I  
5 went back to the Fermi SER, and they have very  
6 similar types of -

7 MEMBER STETKAR: I didn't check it --  
8 it happened to be the chapters, some of the  
9 chapters that I was reading, kind of caught my  
10 attention here, that I certainly saw a different  
11 revisions --

12 MR. SHEA: I took back your point, and  
13 you know, I didn't look at Fermi, other than, I did  
14 a lot of comparison. Really, when you look at  
15 this, this SER that we had completed in Phase 4,  
16 one of the things that I did is, to make sure that  
17 it looked similar to the -- obviously it's  
18 incorporated my reference here.

19 You're looking at Fermi, one of those  
20 that line up and so I just confirmed that. And if  
21 there's a question there, I went back to the staff  
22 and asked them. So, you'll see that. These FSER  
23 is very similar to the Fermi FSER, where these  
24 decisions were made for, even Fermi back in that  
25 time frame of 2009, 2008 and under Revision 9 of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DCD and Revision, and then following, final  
2 Revision 10.

3 So that's how it went and in fact, if  
4 you look at -- now every Chapter will say,  
5 incorporate, all the incorporations by reference  
6 from the DCD, is going to say, NUREG 1966, and  
7 that's your key to say that, incorporated by  
8 references, the latest staff FSER related to the  
9 DCD.

10 In fact, I remember you read an excerpt  
11 out of that FSER for DCD and it referred to, in the  
12 I & C area, back to Rev. 6 of the, Rev. 6 of the  
13 DCD. Rev. 7. Anyway, so you'll see that  
14 throughout, how, you know, how we do these FSERs,  
15 because it's not efficient for us to take that  
16 issue and go back every time we have a new Rev. of  
17 the FSER, to go back to the staff and ask them to,  
18 I mean they can do that, if they have the time, but  
19 generally, those issues were finalized back in  
20 previous revisions. So that's kind of the  
21 explanation.

22 MR. BROWN: I just want to make a point  
23 on Chapter 7 in that, in fact when we did the  
24 original DCD certification in, Mike, 2009?

25 MEMBER CORRADINI: 10.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MR. BROWN:       10.       GEH had made  
2 commitments relative to the configuration of the I  
3 & C systems and changes were made, proposed. They  
4 said they would make changes to the DCD to  
5 incorporate the agreements we had reached during  
6 the Subcommittee and the Final Certification. And  
7 my biggest concern was, based on going from Rev. 8  
8 and seeing universe references to Rev. 10, did all  
9 those agreements translate into the later  
10 revisions.

11                   And as soon as I found my earlier  
12 emails and other agreement pieces of paper, from  
13 seven years ago, and then translated, I actually  
14 worked it walking through, I didn't have Rev. 8,  
15 which I now have.

16                   MR. SHEA: Yes, I sent that to you.

17                   MR. BROWN: Yes. I got it.

18                   MR. SHEA: Or I sent it to Girija.

19                   MR. BROWN: Yes. He sent it to me and I  
20 was able to step through the agreements to Rev. 8.  
21 They were documented. Rev. 9, Rev. 10 were  
22 consistent.

23                   Whether I agreed with everything that we  
24 didn't quite catch back then is a different issue.  
25 We issued the certification and I feel that, you

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 know, we got to agree with what we agreed with. And  
2 so I'm satisfied right now and think I was the  
3 biggest vocal --

4 MR. SHEA: I think that was the one  
5 issue that came out of the Subcommittee meeting was  
6 this issue and we weren't going to raise it again,  
7 because we thought, like you did, it's the DCD and  
8 I'm glad you closed that loophole for us. Because  
9 --

10 MR. BROWN: It's all gone.

11 MEMBER RICCARDELLA: You know, I just  
12 wonder would it help John, if they put something in  
13 the introduction to those Chapters that still refer  
14 to Rev. 7 that says --

15 MEMBER STETKAR: You know, what bothers  
16 me --

17 MEMBER RICCARDELLA: That says, these  
18 were closed based on, based on that.

19 MEMBER STETKAR: What bothers me --

20 MR. SHEA: I already did this.

21 MEMBER STETKAR: Oh. Okay. That's good  
22 because what bothers me is that 20 years from now,  
23 people might pick up this safety evaluation report  
24 and say, well what was, what was the real technical  
25 basis and they'll go back to what it refers to and,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       you know, it could raise questions. So I thought it  
2       was a good point,

3               MR. SHEA: It was a good point and I  
4       thought it was confusing, to me it wasn't confusing  
5       because I deal with it every day, but I could see  
6       someone from the public or anybody for the first  
7       time looking at this --

8               MEMBER STETKAR: That's, that's, or  
9       other, other staff --

10              MR. SHEA: Right.

11              MEMBER STETKAR: Or the licensee when  
12       the plant is built, to go back and look at, at  
13       least, the staff safety evaluation of a particular  
14       issue, you know. What was the fundamental  
15       traceability of that.

16              MR. SHEA: So as part as the FSER of  
17       Chapter I, we added a short paragraph to explain,  
18       this very slide basically explained in a paragraph  
19       format, that how these things were reviewed and  
20       finalized, these issues.

21              MEMBER STETKAR: Thank you for doing  
22       that.

23              MR. SHEA: Yes. Thanks for raising that  
24       issue, and you know, I was able to add, I think, add  
25       clarity for Chapter 1, so I appreciate it.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   So, just as last time for the  
2 Subcommittee, we split this thing up into two areas,  
3 which was really the non-seismic information that  
4 were, you know, changes from the DCD or  
5 site-specific issues related to North Anna and the  
6 seismic issues. And we'll, like I said, we'll go  
7 through some of the highlights of those.

8                   Start with meteorology. I don't think,  
9 the meteorology was pretty straightforward. The ESP  
10 meteorology was finalized way back in '06 and the  
11 only thing that was really changed in the later  
12 date, was this update analysis to corporate use of  
13 both ground level mix-mode releases related to the  
14 stack for the Radwaste building.

15                   There was some concern from the staff.  
16 They were originally using it as an, it was a  
17 mixed-mode release, and the staff questioned that  
18 based on the location and they did a re-analysis and  
19 did the conservative route and did a ground level  
20 release and that was all resolved. It still meets  
21 all the requirements and you can see that, you know,  
22 all the regulatory requirements were satisfied and  
23 no additional open items. But that was really the  
24 only issue associated with meteorology over the last  
25 couple of years.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1                   And this really reiterates the flooding  
2                   that Dominion talked about. We, this is the same  
3                   information. One foot below the DCD high parameter  
4                   on the maximum flood and then the recent analysis on  
5                   the LIP, the Local Intense Precipitation sheet flow,  
6                   found that there's a few doors that needed to have,  
7                   you know, thresholds that, it's, that, so that water  
8                   would not ingress into the doorways and that's part  
9                   of the FSAR.

10                   MEMBER RICCARDELLA:       Those aren't  
11                   considered a departure from the DCD? The fact that  
12                   they have to build up the doors?

13                   MR. SHEA: I, no, I, they weren't -- it  
14                   wasn't a departure in a sense because the DCD  
15                   really, the DCD is neutral to where, you know, you  
16                   have to do your individual site-specific flood  
17                   analysis based on the site. It's not really DCD  
18                   issue, correct?

19                   (Off mic comment)

20                   MR. SHEA: The issue was, the question  
21                   was, is this a departure from the DCD related to the  
22                   LIP flow analysis.

23                   MS. BORSH: No.

24                   CHAIRMAN BLEY: I'm sorry. You'd better  
25                   get on the record with that.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER CORRADINI:    Would you identify  
2                   yourself?

3                   MR. SHEA:    Did our staff, Joe, did you  
4                   want to add anything to that?  We have Joe Giacinto  
5                   from the staff, if he wants to add anything to that.

6                   MS. BORSH:    This is Gina Borsh from  
7                   Dominion.  The answer is no, it's not a departure.

8                   MR. SHEA:    Joe, did you want to add  
9                   anything?

10                  MR. GIACINTO:  Well -- Joe Giacinto --  
11                  hydrologist.  It's not a departure from the DCD.  
12                  It's just a matter of flood protection which we  
13                  cover in Section 24.10, so, although it's called out  
14                  in Section 24.3, in Section 24.10, it explains the  
15                  type of flood protection.  So Hydrologic Engineering  
16                  Section 24 is built specifically for these types of  
17                  things.  It's not a matter of being DCD.  It's a  
18                  matter of reviewing it, the Hydrology section.

19                  MEMBER CORRADINI:  Thank you.

20                  MR. SHEA:    Thanks Joe.  Okay, again we  
21                  also did this accident analysis and we essentially,  
22                  the staff just confirmed what Dominion did, using  
23                  our own independent confirmation calculations in  
24                  confirming these accident analyses associated with  
25                  the        industrial        transportation        in        military

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 facilities. Yes.

2 MEMBER KIRCHNER: May I ask a question,  
3 since I asked it of Dominion at the Subcommittee  
4 meeting. So, what was the analysis done to waive  
5 the accident with the delivery truck, the hydrogen  
6 delivery truck? How did you go about confirming  
7 their analysis?

8 MR. SHEA: Do we have, is it Rao  
9 Tammara? From the staff, yes, he will come up.

10 MR. TAMMARA: My name is Rao Tammara.  
11 The Applicant has evaluated the frequency of the  
12 truck and also calibrated this upon the historical  
13 accident event. They determined the probability of  
14 the accident and then they had shown the calibration  
15 that the probability is less than 104-7, which is  
16 acceptable to screen out that kind of accident.

17 So we reviewed their calculations and we  
18 accepted the parameters and also the data that they  
19 have presented. And based upon that one, we agreed  
20 the calibration is acceptable and the probability  
21 is, since it is less than 104-6 with the actual,  
22 realistic data, and it is, within the guidelines of  
23 all the acceptance criteria. Therefore, we accepted  
24 that.

25 MEMBER KIRCHNER: So as John pointed

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 out, the probability, or the frequency is probably  
2 the right word here, for the truck accident is much  
3 higher than 10-6, so --

4 MR. TAMMARA: An actual accident might  
5 be but the design basis accident is defined as the  
6 probability of the accident --

7 MEMBER KIRCHNER: Right.

8 MR. TAMMARA: In connection with the  
9 release that were the 9:18:36 a dose in excess of 10  
10 CFR, 15.34 -- that probability should be less than  
11 104-6. So it is not the, just the mere accident  
12 which has a greater than 104-6 would not entitle  
13 that to be a designated as a design-basis accident.  
14 So the definition is that both have to have the  
15 probability of 10 4-6. The accident --

16 MEMBER KIRCHNER: So let me just --

17 MR. TAMMARA: In connection with the  
18 dose --

19 MEMBER KIRCHNER: Let me just  
20 intuitively compare that to the other accident that  
21 was analyzed, which was a leak from the storage  
22 tank. So you have a larger source --

23 MR. TAMMARA: Yes.

24 MEMBER KIRCHNER: And it's hydrogen in  
25 the delivery truck. And --

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. SHEA: Probably a smaller source in  
2 the truck, compared to the storage tank, because  
3 you've got a liquid --

4 MEMBER KIRCHNER: Oh okay.

5 MR. TAMMARA: You have 6000-gallon tank.  
6 So the maximum tank can hold is 6000 meter. Two  
7 tanks. So they have calculated the minimum distance  
8 that would not yield more than 1 psi to the SSC and  
9 that minimum distance is less than the actual  
10 distance.

11 So that is the analysis performed for  
12 the tank. So the other analysis is you have a  
13 13000-gallon tanker truck, delivering the hydrogen,  
14 which may, for our bound in case, we are assuming  
15 that is totally filled with 13 thousand gallons. So  
16 this is, you know, this is done on a probabilistic  
17 basis, because of the truck route. So that, that is  
18 the difference.

19 MEMBER KIRCHNER: Thank you.

20 MR. TAMMARA: Thank you.

21 MEMBER RICCARDELLA: How often do you,  
22 you know, you're using the hydrogen regularly in  
23 operation. How often do you have to make  
24 deliveries?

25 (Off mic comment)

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER RICCARDELLA: How often would you  
2 expect the deliveries to be made? That might affect  
3 the probability, I would think.

4                   MEMBER STETKAR: While they're checking,  
5 from my experience, you use hydrogen continuously  
6 during plant operation, at a PWR, you use some  
7 continuously so you're keeping a cover on the volume  
8 control tanks so you're losing a little bit of that.  
9 You're losing a little through the hydrogen seal oil  
10 system on the main generator, there's a little leak.  
11 But your usage during power operation is limited to  
12 that.

13                   When you, the time where you really use  
14 a lot is when you shut down, purge the main  
15 generator and have to refill it with hydrogen, you  
16 know? So during any time you shut down, and have to  
17 open up the main generator, you've got to purge the  
18 whole thing, and that's a reasonable volume of  
19 hydrogen in there. So make-up requirements are kind  
20 of limited by, by those evolutions.

21                   MEMBER KIRCHNER: Not to belabor this,  
22 but I just go back to the presentation. You've got  
23 two 6,000-gallon capacity tanks on site. So let's  
24 assume one of those leaks at some frequency or such.  
25 Obviously you go into a calculation based on one of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       those tanks leaking, delayed ignition, and then some  
2       kind of blast over pressure conflagration over  
3       pressure. Now you have a single source that could  
4       be 13,000 gallons, twice as big as one of the tanks,  
5       in an accident, why wouldn't you analyze that,  
6       instead of a leaking tank?

7               MEMBER RICCARDELLA: Because, the reason  
8       I ask my question is, the tanks are sitting there 24  
9       hours a day, 365 days a year. The truck only comes  
10      in once every 10 years. I'm sure it comes more than  
11      that, but, you know, there's a much lower prob --

12             MEMBER KIRCHNER: You're handling the  
13      hydrogen when you have the delivery. It's kind of  
14      static tanks. Just, I'll let it go at this point.

15             MEMBER RICCARDELLA: Yes. Gina, were  
16      you going to make a comment?

17             MS. BORSH: Yes, this is Gina Borsh from  
18      Dominion and the analysis assumes 24 deliveries per  
19      year.

20             MEMBER RICCARDELLA: That's twice a  
21      month.

22             MS. BORSH: Yes.

23             MR. SHEA: And for the record, Pete just  
24      reminded me they're employing hydrogen water  
25      chemistry here, right? So that's an additional

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 source of constant makeup, so --

2 MEMBER STETKAR: When I really well  
3 What the primary use is, I asked if it was static  
4 cooling or if it was primary chemistry and Gina says  
5 it was primary chemistry. This is the hydrogen feed  
6 to the reactor coolant system for suppression  
7 radiolysis.

8 And, once every two weeks for a delivery  
9 of gas? That's probably on a par with most plants.  
10 You've got a hydrogen truck coming in every couple  
11 of weeks, got a nitrogen truck coming in about the  
12 same frequency. So that's not uncommon.

13 MR. SHEA: Okay, we'll move on to the  
14 next slide. Accident release. I have the little  
15 pretty picture. Dominion didn't have it - again, we  
16 just iterate that the assumption from the condensate  
17 storage tank, again it's surrounded by a moat and  
18 also a drain line that's designed to capture all of  
19 that leakage if the tank just instantaneously broke  
20 and spilled its contents.

21 However, the evaluation is based on all  
22 the contents spilling into the yard and finding the  
23 closest, finding the fastest path to the water  
24 source and all that analysis was done. Staff  
25 confirmed that and found it acceptable and meets all

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the requirements.

2 MEMBER SKILLMAN: So Jim, I ask you, why  
3 is the condensate storage tank the objective of this  
4 analysis?

5 MR. SHEA: We have Steve Williams here  
6 that could, from the staff, that could answer that.

7 MEMBER SKILLMAN: Oh.

8 MR. WILLIAMS: Steve Williams, from the  
9 Radiation-Protection-Accident-Consequence Branch.  
10 To give you some background on why the condensate  
11 storage tank was chosen as part of the release to  
12 the environment was, in 11.2 and 2.13, we do a  
13 combined analysis based on Branch Technical Position  
14 11-6.

15 And that requires you to take the  
16 maximum concentration of any activity, in an inside  
17 tank and then release that to the environment, even  
18 though it does have a dyke and some protection  
19 around the dyke, as far as the prevent releases.  
20 Then, Hydrology takes that and takes their values  
21 for dispersion and calculates an end point ECL  
22 concentration, to ensure that they meet 10 CFR 20  
23 requirements.

24 Initially when Dominion submitted their  
25 COLA, they had chosen two tanks that were inside of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the ox-belt or inside of the plant. They weren't  
2 outside tanks, so it didn't meet the criteria for  
3 the condensate storage tank.

4 And the reason, and for your question,  
5 you asked how does the condensate tank get activity  
6 in it. Well, it's used at points to recirculate  
7 from the stud field pull and cleanup and then just  
8 the normal cleanup from the condensate system as  
9 during operation. Any contamination may be from  
10 primary, secondary leaks and cleanup the iodine or  
11 any particulates that they find.

12 MEMBER SKILLMAN: Thank you, Steve.  
13 That takes care of my question to the Applicant and  
14 also to the staff. Thank you.

15 MR. SHEA: Thanks, Steve. Okay. We've  
16 talked about this hurricane missiles and really, the  
17 affect was on the RTNSS Structures, which was  
18 evaluated per the new Reg. Guide. Really, the  
19 departure is related to a new Reg. Guide that came  
20 out.

21 Reg. Guide 1.221 an update to that Reg.  
22 Guide, following the DCD Final Revision that was  
23 approved. And this Reg. Guide came out so  
24 subsequently, these COLA Applicants, I believe Fermi  
25 even revised their COLA to include this Reg. Guide,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 this new Reg. Guide criteria.

2 And so it was a departure. Dominion  
3 evaluated it. It essentially affected the RTNSS  
4 structures, which is the non-seismic I structures.  
5 All the seismic I structures met all the criteria,  
6 based on the wind speed and the hurricane.

7 MEMBER RICCARDELLA: So you're saying  
8 Fermi had the same departure?

9 MR. SHEA: I believe they did. I  
10 believe they had a similar departure. Yes. Fermi  
11 didn't? Gina has additional information on Fermi on  
12 this issue.

13 MS. BORSH: You were busy with North  
14 Anna 3. This is Gina Borsh, from Dominion. Fermi  
15 doesn't have a departure here.

16 MR. SHEA: Hurricanes aren't as big  
17 there, I guess.

18 MEMBER RICCARDELLA: Probably too. We  
19 talked about that.

20 MEMBER STETKAR: This is rather strange  
21 and I understand why Fermi doesn't have a departure  
22 here and why North Anna does.

23 MR. SHEA: Moving on. All right so now  
24 onto seismology. Essentially in the seismology  
25 area, the Mineral earthquake occurred and there was

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 a number of field studies. You can see the field  
2 reconnaissance determined presence or absence of  
3 surface rupture displacement.

4 There was a very extensive review of  
5 that and our staff talked about that at the last  
6 meeting. It also came up from the Public on, it was  
7 Fault A, which was previously discovered when Unit I  
8 and Unit II were being constructed.

9 And that was evaluated in addition, and  
10 showed that there was, that Fault A has been, you  
11 know, for over a million years, has been, it's an  
12 old structure that has, had no deformation  
13 associated with it when the Mineral earthquake  
14 occurred. Any questions? We do have our staff here  
15 if you have. Okay.

16 And the vibratory ground motion, again,  
17 affected by the Mineral earthquake, August 23, 2011,  
18 that affected the, so the local seismic evaluation  
19 was affected by that, along with the other, the new  
20 Central Eastern United States Seismic Source  
21 Characteristic, Characterization, was, came out  
22 around the same time, so that was new.

23 So they combined both, some of the local  
24 information and that new seismic CEUS-SSC to come up  
25 with a site-specific ground motion, which was,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 again, then that affected the seismic I structure  
2 evaluations. That was the crux of the whole seismic  
3 closure plan and all that input into the final  
4 results of the seismic I structures. No questions?

5 So the staff concluded that the GMRS,  
6 the local Ground Motion Response Spectra adequately  
7 represents the seismic hazard at North Anna 3, and  
8 meets the relevant regulatory requirements provided  
9 in 10 CFR Part 52, 10 CFR 100.23. And I think  
10 Dominion showed that the input for the seismic I  
11 structures.

12 So associated with the seismic  
13 structures, Sections 3.7 and 3.8 of the Staff SCR,  
14 reviewed the site-specific Foundation Input Response  
15 which is the FIRS, which exceeded the DCD, which is  
16 part of the Certified Seismic Design Response  
17 Spectra, CSDRS.

18 So the departure and the exemption  
19 associated with the departure essentially was the  
20 definition of the site-specific SSE, which is the  
21 FIRS plus the CSDRS, so they combined those two  
22 rather than just, in the case of, like Fermi, it was  
23 the CS, you know, the DCD was bounded the Fermi  
24 site-specific results. So they used just the CSDRS.

25 So that's the difference. That's the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 departure that was evaluated through the seismic  
2 closure plan. I think someone mentioned all these  
3 calculations, the specific calculations for each one  
4 of these structures and buildings, the staff  
5 completed two on-site audits. One was for the  
6 demand side, which was the input based on the, you  
7 know, the FIRS and the responses of the input to the  
8 structures.

9 And then, the second, which is, the  
10 second audit focused on all the calculations on the  
11 site-specific structures and the impact of that  
12 demand on those structures. And we spent a week at  
13 the GEH site and reviewed all these calculations.  
14 Had a team of our staff of 5 or 6 of our staff  
15 members, along with our consultant, participated in  
16 those audits.

17 Now that, that also, those were  
18 significant efforts associated with verifying these  
19 calculations, met our criteria, and met all the  
20 appendix B requirements, etcetera, along with all  
21 their RAI responses and additional documents that  
22 are on the docket associated with our RAI responses.  
23 And then this all culminated in the final FSAR  
24 Revision 9.

25 And all this information that was in RAI

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 responses and COLA markups, that's how we reviewed  
2 these final sections 37, 38 through the COLA  
3 markups, which were responses to the RAIs and then  
4 verified those in the final redline that they met  
5 what we accepted in the COLA markups.

6 And you can see the staff did their own  
7 confirmatory analysis and seismic input motions and  
8 strain compatible soil profiles, SSI effects on the  
9 FWSC, which is, that's the, what, for some reason I  
10 got S, W, Fire Water Service Complex. Yes, which is  
11 one of the three Seismic I structures.

12 And here's some of their results. In  
13 Appendix 3G, in the FSAR, it shows that the  
14 site-specific demands, except in a few cases, were  
15 met by the DCD. Our staff was very comfortable  
16 after reviewing the, all the reevaluation that the  
17 actual DCD was only exceeded in a few minor cases  
18 that Dominion mentioned, and we mentioned also here  
19 about the steel girder weld sizing anchor bolts  
20 associated with a couple or the structures.

21 The thing that really struck me as a guy  
22 kind of following this as a non-seismic person that,  
23 when we come to the results and found out that  
24 nothing as far as the actual physical plant changed,  
25 as far as the structure of the walls, the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 thicknesses, the base mats, you know, the actual DCD  
2 structure was already a very robust design and the  
3 staff, just in some areas, with all this analysis.  
4 And let me tell you, there was a lot of analysis, it  
5 came down to just some of these few items. So, you  
6 know.

7 MEMBER RICCARDELLI: You know, the  
8 exceedances are at relatively higher frequencies at  
9 7 hertz and above, so. You wouldn't expect to have  
10 that much of an effect on the building.

11 MR. SHEA: And I think I just mentioned  
12 this. This last slide that, standard design is  
13 adequate to meet the site-specific seismic demand is  
14 what the staff determined and meets all the NRC  
15 regulations and guidance.

16 The last thing we, part of this, part of  
17 this effort, we looked at, just some of the effects  
18 of components and two of them was, really, that the  
19 fuel racks inside the structures, we looked at  
20 those. And in some cases, we determined that, you  
21 know, Dominion, we reviewed Dominion's results and  
22 determined that there was a couple of places where  
23 they did some reinforcement for the fuel racks. You  
24 see that, they found that, for this spent fuel pool,  
25 was adequate.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   And then there was a, in the buffer  
2 pool, I believe, yes, the anchor bolts, there were  
3 some anchor bolts in the buffer pool that were  
4 upgraded.

5                   And also, the staff reviewed the fuel inside the  
6 vessel associated with that seismic exceedance. And  
7 the concern there was that in the DCD, some of the  
8 stresses in the references to the DCD for the fuel  
9 design, exceeded what was in the DCD.

10                  So, even though the fuel design reports  
11 had much higher margin as far as those design, you  
12 know, conditions, the DCD had a specific number of  
13 them, because of their exceedances. They're  
14 exceedances obviously where the fuel, some of the  
15 fuel, and therefore the staff looked at it and they  
16 wanted to get a confirmation that, at the end, that  
17 when you combined the loads that you still don't  
18 exceed the actual mechanical design of the fuel as  
19 referenced in the DCD.

20                  And that was all confirmed and none of  
21 those design constraints were exceeded. So that was  
22 part of the staff review in Chapter 4.

23                  So in conclusion, the staff completed a  
24 thorough review of North Anna 3 COLA and, as we  
25 mentioned, that focused on those areas that were

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 site-specific. Much of the COLA, as you can see  
2 through our FSAR or FCR, the Advanced Safety  
3 Evaluation, much of the information is incorporated  
4 by reference from the DCD or in the, or directly  
5 Fermi evaluation.

6 The published Phase 4 Advanced Final SCE  
7 represents the staff Final Safety Review Findings  
8 for the North Anna 3 ESBWR. So, I think that  
9 answers the question. A little question came up  
10 about the FSER. The FSER is really just an  
11 administrative final product that's going to be,  
12 that will be prepared for the new Reg. Just part of  
13 a process that we go through. And that's all I  
14 have. Any questions?

15 MEMBER STETKAR: Yes, I had one where we  
16 have ample time here. So, the Applicant and the  
17 staff, neither of you discussed the departures and  
18 exemption on the electric power system. We had some  
19 discussion about that at the Subcommittee meeting.

20 For the benefit of the other members,  
21 they're, North Anna is proposing a change to the  
22 certified design connections to the switchyard.  
23 They're installing what's called an intermediate,  
24 they call it an intermediate switchyard but  
25 basically, it's three single phase step-up

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 transformers that go from 500 kV down to 230 kV with  
2 an isolation circuit breaker and motor operating  
3 disk connects.

4 By doing that, it allows them to use the  
5 same design and voltage ratings for their unit  
6 auxiliary transformers and their reserve auxiliary  
7 transformers. In the certified design description,  
8 there's no, you just see lines going off to offsite  
9 power. So there's no, there's no particular voltage  
10 indications or anything. But this is something new  
11 and it required a departure from the DCD because it  
12 does affect --

13 MEMBER BLEY: Even though those things  
14 weren't specified in the DCD?

15 MEMBER STETKAR: Yes, because --

16 MEMBER BLEY: It's curious to me.

17 MEMBER STETKAR: No because changes that  
18 can -- the DCD implies that there's a single  
19 switchyard. It implies that there's a single  
20 switchyard

21 MEMBER BLEY: Oh.

22 MEMBER STETKAR: It implies that there's  
23 single switchyard but it doesn't specifically say  
24 that. The, I'll eventually get to what I'm getting  
25 to, but I'm trying to get the background to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 everyone. The reason that it had to be a departure  
2 is that it altered the configuration of the  
3 connections in a way that is different from what the  
4 DCD implies on what's called the normal preferred  
5 power supply, which is the generator connection to  
6 and what comes back into the unit auxiliary  
7 transformers.

8 So okay. They made a change and they  
9 had to do it. It's an exemption because it affects  
10 a drawing in Tier 1 of the DCD so it's more than  
11 just a point specific departure.

12 And I got curious. And there's some  
13 discussion in the FSA, in the Applicant's FSAR.  
14 There's a good discussion about what it is. I mean,  
15 it's well documented what it is. So I got curious  
16 about, well, how does this affect the risk from  
17 things. And we had some discussion in the  
18 Subcommittee meeting and the Applicant noted that  
19 they did not change the certified design PRA to  
20 account for this.

21 That they will do that for the PRA  
22 that's submitted before fuel load, but it hasn't  
23 been changed. So in the SER, I then went to look to  
24 see what the staff did about this and I found a  
25 statement in Chapter 19 out of the PRA part of the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 SER that says, the staff finds that the ESBWR design  
2 PRA provides a bounding assessment of loss of  
3 preferred power events. So I said, well bounding is  
4 a strong word.

5 We had quite a bit of discussion about  
6 what that might be, what it might mean. I, since  
7 the Subcommittee meeting, and today's meeting, I  
8 went and dredged up Revision 6 of the PRA Report,  
9 which I found is a public document so, indeed I can  
10 talk about it. The long and the short of it is that  
11 the ESBWR PRA is not a bounding assessment.

12 That, indeed, this configuration will  
13 increase the risk primarily, the only thing that I  
14 could find, the only that it introduces is it  
15 increases the frequency of loss of preferred power  
16 from the 500 kV supply. Not loss of all off-site  
17 power. And those failures, the mass majority of  
18 them would be non-recoverable within the PRA  
19 ignition time. So it's a, non-recoverable loss of  
20 that supply.

21 When I delved into the PRA models, that  
22 particular type of event was not evaluated in the  
23 PRA. Now it can be mitigated because the 230 kV  
24 supply should not be affected by failures, should  
25 not, unless there's some sort of strange electrical

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 transmit, be affected by failures in the  
2 intermediate switchyard. So my conclusion, my  
3 personal conclusion, and I've got numbers to kind of  
4 back this stuff up but that's too much detail.

5 My personal conclusion is that it's,  
6 it's clear that the risk would be higher but I think  
7 the increase would be rather small. And the current  
8 contribution from switchyard-related losses of  
9 preferred power is a small contribution to overall  
10 risks. It's not miniscule. It's a couple of  
11 percent.

12 I don't think that that would increase visibly. I  
13 mean, it might be in the second significant figure,  
14 or something like that. So I think that, I think  
15 that, you know, from my perspective, it's okay.  
16 It's not a risk-significant change certainly.

17 On the other hand, I'd caution the staff  
18 very carefully about using terms like, the design  
19 certification bounds this, is an indication to any  
20 rational reader would be that it can't be any higher  
21 than the design certification. It certainly will  
22 be somewhat higher.

23 MEMBER BLEY: Sounds like a reasonable  
24 caution but helping you beat this dead horse a  
25 little bit, I would have kind of thought, and I

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 haven't looked at this at all, but if you'd dug even  
2 deeper you might find that there's more flexibility  
3 from that kind of arrangement you described and  
4 maybe it gives you something back somewhere else.

5 MEMBER STETKAR: It, what it gives back,  
6 is it allows them, and I don't know what their plans  
7 are, it allows them to have, for example, one spare  
8 transformer on site that they can use to replace any  
9 one of the four UATs and RATs which, under the PRA,  
10 under the PRA configuration, they had 500 kV UATs  
11 and 230 kV RATs.

12 So this allows the Applicant to have a  
13 single spare transformer, rather than having two  
14 spare transformers, that they can swap in and out if  
15 they do have a failure of one of the UATs or RATs.  
16 It doesn't help you in PRA space because it takes  
17 you a long time to swap out a transformer that's  
18 been failed.

19 That's the only flexibility that I see.  
20 When I dug into the PRA, the PRA, with the exception  
21 of what I mentioned on the record here, the PRA does  
22 cover, it covers two different voltage switchyards.  
23 It covers unavailability of the 230 kV switchyard.  
24 It covers common cause failures of all of the  
25 transformers. So about the only thing that I could

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 find was the one thing that I mentioned on the  
2 record here.

3 But again, in terms of staff  
4 conclusions, just be careful about that word,  
5 bounding. Thank you. I don't know if the staff or  
6 the Applicant wants to say anything about that.

7 MS. BORSH: I don't. Dominion doesn't  
8 have anything we want to add to that. Thank you.

9 MR. DONAHUE: Mr. Stetkar, we, this is  
10 Joe Donahue from the staff. We didn't have the  
11 staff from that branch here to deal with that  
12 question, so I'll bring your comments back to them  
13 and bring back a --

14 MEMBER STETKAR: Yes. We had some  
15 discussion, a little bit of discussion during the  
16 Subcommittee meeting, and well, as I said, at that  
17 time I only had the previous revision of the PRA  
18 reports, so I didn't want to draw any particular  
19 conclusions until I dredged up the current revision  
20 and confirmed that, indeed, it can be discussed in  
21 public, which it can.

22 MR. DONAHUE: Thank you.

23 MEMBER MARCH-LEUBA: Okay, I'd like to  
24 put also a comment on the record. And it's going to  
25 be in the form of a rhetorical question. I don't

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 expect an answer from this and it's somehow related  
2 to this, but it has to do with digital I & C. Okay.

3 In the generic ESBWR design, everybody  
4 concluded it was prudent not to specify the platform  
5 of the protection system because it's evolving so  
6 rapidly that it makes sense, at least it's very  
7 prudent, to wait until the implementation to gain  
8 some more benefit of experience and eventually, you  
9 install the one that makes more sense. Okay.

10 Now, but because of that, it had not  
11 been reviewed, the platform itself. And we  
12 mentioned the PRA for fuel loading that will be  
13 executed on the as-built plant, and that PRA will  
14 have a probability of failure for scram on demand.

15 Now, I, and here's my rhetorical  
16 question. I expect that the staff, the expectation  
17 of the staff be that probability of failure on  
18 demand, not the historical number, based on all the  
19 analog system that have been implemented in the  
20 past, but be an evaluation of that platform as  
21 implemented. And, as I say, I don't expect a  
22 question.

23 But I want to put it in the record that  
24 whatever platform North Anna decides to implement  
25 and build on their plant, use that number in the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 PRA, not a historical from 1960 so with analog  
2 systems.

3 MEMBER STETKAR: All right. Thank you  
4 Jose.

5 MEMBER MARCH-LEUBA: Sorry. I, final  
6 question. Just a caveat, we realize that PRA  
7 analysis of digitalizing systems and so forth and  
8 they've all been scram, maybe has to be qualitative  
9 on this, okay, but at least an attempt to identify  
10 the failure models should be made.

11 MEMBER STETKAR: Yes. I think the, you  
12 know, the, just again for the record, the  
13 requirement is that the PRA that's submitted before  
14 fuel load has to be a local 1, local 2 PRA, yes,  
15 local 1, local 2 PRA for all operating modes  
16 consistent with the NRC-endorsed standards that are  
17 available one year prior to that date. I believe  
18 that's correct.

19 I think I've characterized that. The  
20 methods for evaluating quantitatively and  
21 qualitatively digital systems are evolving and maybe  
22 by the time they perform their site-specific PRA,  
23 one year before fuel load, we'll have a lot better  
24 guidance in that area. It's pretty sparse right at  
25 the moment.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER MARCH-LEUBA: Yes, my comment is  
2 use this judgement of the time and just because it's  
3 difficult don't say we've got to do it. Try to do  
4 your best in identifying failures that could be  
5 inserted by that system.

6                   MEMBER BROWN: Since everybody else is  
7 talking about my area, I feel compelled to amplify  
8 -- I'm sorry --

9                   MEMBER CORRADINI: Where does your  
10 ownership lie?

11                  MEMBER BROWN: I've got lots of  
12 ownership here. They may have confidence that we  
13 may evolve methods for PRAs that adequately  
14 represent digital I & C in whatever form it takes,  
15 either five years from now, or 10 or 15 years from  
16 now.

17                  I have voiced in the past skepticism  
18 that PRAs and FMEAs would adequately define the  
19 performance of these things. I think that's  
20 consistent with some of my past comments. And the  
21 effort that has been made in the digital I & C world  
22 is to ensure that the application of digital  
23 systems, computer-based, software-based systems,  
24 can't, because of their inherent characteristics of  
25 locking up and other types of performance

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 characteristics, have a mechanism built into them to  
2 sense that, and translate that into a more  
3 deterministic demand for a trip in any division that  
4 goes, that comes up, if that division locks up.

5 So, maybe by the time my grandchildren,  
6 okay, have graduated and gone on to the, if they go  
7 into the technical world, maybe 20 years from now,  
8 there may be somebody that's smart enough to get a  
9 PRA analysis.

10 Right now, I think the approach we're  
11 taking to try to get a computer-based system to be  
12 monitored by hardware-type systems that trigger  
13 themselves and initiate trips in the various  
14 divisions, if they are so, if they lock up, is the  
15 proper approach right now, while we're in this  
16 mushy, ambiguous area for FMEA and PRA.

17 So that's the path we've been taking.  
18 We've been approaching it that way and I just wanted  
19 to reemphasize that we did do that on ESBWR in terms  
20 of, and it can be done in a number of ways. You  
21 don't necessarily always have to trip.

22 If you can reset the microprocessors or  
23 the computer, and it gets back up within a few  
24 hundred milliseconds, that's an acceptable approach  
25 to doing things, as opposed to issuing a trip. And

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 actually, the GEH systems as they talked about them,  
2 do initiate an automatic reset and generate a trip  
3 at the same time.

4 MEMBER RICCARDELLA: Kind of like  
5 rebooting your laptop every so often?

6 MEMBER BROWN: Pardon?

7 MEMBER RICCARDELLA: Kind of like  
8 rebooting your laptop?

9 MEMBER BROWN: Yes. We do it  
10 automatically. Well, no, your laptop will take five  
11 minutes, you know, they can take, and if you're  
12 looking at one of the other projects, I think, I've  
13 forgotten what platform it was. Well I don't want  
14 to mention, it takes literally five or ten minutes  
15 to reboot, which is unsatisfactory.

16 So, in the Naval Nuclear Program, if you  
17 lose a processor due to lockup, it'll reboot in less  
18 than about a 150 milliseconds, faster than you can  
19 blink your eyes. So, anyway, that's kind of a  
20 design concept. It's a prescriptive design concept  
21 but it can be done in a non-technology based manner,  
22 which is what we've attempted to do.

23 So I just reiterate that. Maybe in a  
24 little more coherent than I was, ten years or eight  
25 years ago. That's, I just wanted to get my two

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 cents' worth in here on the record. Thank you.

2 MEMBER RICCARDELLA: Thank you Charlie.

3 Okay, with that, are you finished Jim?

4 MR. SHEA: Yes.

5 MEMBER RICCARDELLA: Are there any other  
6 comments or questions from members? Okay, so then  
7 we will then ask for comments from the public. Are  
8 there any members of the public in this room that  
9 would like to address the Committee? I'm not  
10 hearing anything. Could we have the phone line  
11 turned on and ask for questions from any members of  
12 the public that might be on the line?

13 ERICA GRAY: Yes. This is Erica Gray,  
14 in Richmond, Virginia. Can you hear me?

15 MEMBER RICCARDELLA: Yes we can.

16 MS. GRAY: Yes. I would like to know,  
17 first of all, I mean, I guess, I'm not watching the  
18 presentation, I guess, viewing it so, unusual that I  
19 didn't hear an introduction. So don't really even  
20 know, when you say full Committee, how many members  
21 are there? And who's present?

22 MEMBER RICCARDELLA: It'll be in the  
23 transcript. The entire Committee is here. It's 14  
24 members.

25 MS. GRAY: Okay. And then, also, for

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the members, because this is a full Committee. I've  
2 been participating through this COLA application for  
3 years and I'm curious to know if all the members,  
4 the Full Committee Members, have read through the  
5 last two transcripts of the Subcommittee.

6 CHAIRMAN BLEY: I'm sorry. This is a  
7 time for public comment. It's not a time for  
8 interaction with the Committee. We're receiving  
9 information to help us in our deliberations. So if  
10 you have any comments, please go ahead. This is  
11 Dennis Bley, Chairman of the Committee.

12 MS. GRAY: Okay. Well, I mean, I think  
13 it's relevant, though, because it was even stated in  
14 the very last meeting that this seems to be a very  
15 rushed proceeding and there were a lot of other  
16 discussion about other departures and exceedances,  
17 quite a few, and it seems to be kind of being  
18 glossed over here.

19 I mean, even I the last transcript, it  
20 was mentioned by Member Stetkar that you have to  
21 recognize that part of the Committee these days, we  
22 have new members, who aren't even familiar with the  
23 history the ESBWAR, including the Chairman.

24 And the reason why I'm mentioning this  
25 is the last meeting was 9 hours long and the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 transcript really went over a lot of stuff that,  
2 today, is not even being mentioned. The polyfiber  
3 piping is not being mentioned.

4 The Radwaste storage, that Dominion's  
5 asking for, for to allow them to store ten years of  
6 such storage of Class BC Radwaste and 3 months of  
7 storage of Class A for right now, the DCD has 6  
8 months. There's quite a few other issues, including  
9 the departure and exemption from Reg. Guide 1.221  
10 for hurricane force missiles. In certain instances,  
11 the velocities of certain missiles at North Anna is  
12 higher than the velocities that are in the DCD.

13 I mean, one after the other, this  
14 process is being glossed over in so many ways,  
15 including the issues of the seismic issues, because,  
16 frankly, someone needs to question Dominion how they  
17 came up with the numbers, because I have been on  
18 these meeting calls before, where obviously we were  
19 missing the data and at least for some amount of  
20 time, we didn't get the data during our 5.8  
21 earthquake. There was failures and including the  
22 failure of free field sensor.

23 And I'd also like to mention that the  
24 USDS has stated, Mr. McNutt, unlike the typical  
25 situation in the Western U.S. fault, in this part of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the country, we do not have surface expression,  
2 making it more difficult to estimate the maximum  
3 possible magnitude earthquake that a fault can  
4 generate or the expected repeat time of earthquake.  
5 And, you know, the data that's being used is not  
6 complete.

7 And I'd also like to mention that how  
8 can this full Committee move forward with an  
9 approval or proven of the safety, so many issues,  
10 including fire safety, site-specific fire hazards  
11 need to be analyzed. The issues with the fuel rods  
12 themselves being different, need to be analyzed.

13 There are so many issues with this COLA  
14 that's being pushed through. And even my comments  
15 at the last, because there were only two at  
16 Subcommittee, is why is it being rushed? Because  
17 there was a lot of issues that came up and including  
18 the one that was sort of mentioned earlier, that  
19 didn't want to really be rehashed.

20 But it frankly stated in the last  
21 meeting about that loose end, and that loose end  
22 being that there was an issue where the DCD for  
23 Fermi, where they were granted their combined  
24 license, where the cybersecurity firewall, you know,  
25 there was no, there was nothing mentioned in the DCD

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 at all. So there was more than a loose end.  
2 Something went through with actually being analyzed,  
3 looked at and taken care of.

4 So, of course, I have a lot of problems  
5 with this COLA, in general. And I'd also like to  
6 mention that, you know, we've only gotten through,  
7 and I'm even sure complete, the Tier I post action  
8 items.

9 You know, risk assessment need to be,  
10 will not be required to be completed until 2016,  
11 2019 so, you know, we're not even through the Tiers  
12 of lessons learned, yet this Committee, or at least  
13 the Subcommittee felt like everything looked so  
14 great.

15 There are a lot of loose ends.

16 This should not move forward and I'm  
17 very disappointed that the way things are worded, in  
18 particular also with the issue of how the departure  
19 of the liquid waste management system, that's also  
20 involved the piping line discharge instead of the  
21 blow down. I mean, there are a lot of departures  
22 from the DCD and, you know, trying to converge  
23 things just to kind of make them look good is way  
24 different than actually using data and looking over  
25 things well.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           So I could probably go on longer but I  
2           was told that I would have five minutes and I'd also  
3           like to say that, when the public can't even receive  
4           the information needed, not even within 24 hours, it  
5           makes it very difficult to be able to look over  
6           what's going to be looked at and reviewed, including  
7           transcripts that are not usually made public, like  
8           the last transcript of the Subcommittee.

9           It took 11 days and finally, I called  
10          and I received it from Mark Banks and so, you know  
11          if this full Committee, is just going to agree with  
12          everything that Dominion has put forward, it really  
13          shows that this is not a regulating body to protect  
14          the public and the safety in the environment. It's  
15          more to just push this process through because  
16          Dominion wants it. That's all I have to say.

17          MEMBER RICCARDELLA: Thank you for your  
18          comments. Are there any other commenters on the  
19          line that would like to speak?

20          MR. KALTA: This is Paksis Kalta, a  
21          local resident.

22          MEMBER RICCARDELLA: Okay. Go ahead  
23          please.

24          MR. KALTA: My comment is a little bit  
25          an echo of Erika's in that it's extremely likely,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 unlikely that this reactor is going to go forward  
2 quickly. It seems like the Subcommittee and the  
3 Committee are pushing forward faster than is  
4 necessary, when we actually have the luxury of time  
5 to be able to review these issues, especially  
6 seismic issues. So, I think that's all I have to  
7 say at this point.

8 MEMBER RICCARDELLA: Thank you. Are  
9 there any other members of the public who would like  
10 to make a comment? And, with that, I'll turn the  
11 meeting back over the Chairman Bley.

12 CHAIRMAN BLEY: Thank you sir. At this  
13 time, we're going to recess until the 10:45  
14 presentation on the AREVA extended flow window for  
15 Monticello and there'll be a recess until 10:45.

16 (Whereupon, the above-entitled matter  
17 went off the record at 10:06 a.m. and resumed at  
18 10:47 a.m.)

19 CHAIRMAN BLEY: We're back in session.  
20 At this time, I will turn the meeting over to  
21 Professor Corradini for AREVA extended flow window.

22 VICE CHAIR CORRADINI: Okay, thank you,  
23 Mr. Chairman. So our session now is speaking about  
24 the Monticello Nuclear Generating Plant and the  
25 extended flow window. Rob Kuntz is going to lead us

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 through this.

2 I'll just mention to the members,  
3 because I looked at Rob's slides, and he'll give us  
4 the beautiful history of all of this as to where we  
5 are, just to mention to the members that we're not  
6 at the last two subcommittee meetings.

7 This is a particular discussion about  
8 the application of AREVA methods and with their fuel  
9 to the Monticello Nuclear Generating Plant. All of  
10 the other specifics, if you've missed the  
11 subcommittee meetings, will be dealt with by Mr.  
12 Kuntz. Rob?

13 MR. KUNTZ: Oh, I don't know about all  
14 of them.

15 VICE CHAIR CORRADINI: Well, and I'm  
16 sorry, I did forget one other thing. And Member  
17 March-Leuba is not going to participate in this  
18 discussion.

19 MR. KUNTZ: Okay, thank you, Chairman.  
20 As mentioned, my name is Rob Kuntz. I'm a senior  
21 project manager in the division of operating reactor  
22 licensing, and I'm the Monticello project manager.

23 CHAIRMAN BLEY: Maybe pull your mic a  
24 little closer.

25 MR. KUNTZ: Is that better?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 CHAIRMAN BLEY: Yeah, thank you.

2 MR. KUNTZ: So a quick review of the  
3 history of the ACRS review of this license request,  
4 so there was an information session in July of 2015,  
5 and then we've had two subcommittee meetings, a full  
6 day on September 19, and then a half-day again on  
7 October 5.

8 Just a quick history of the Monticello  
9 licensing pertaining to this amendment, they were  
10 approved for APU in 2013, came in for a MELLLA+ and  
11 were approved in 2014. They had a separate  
12 amendment to transition the AREVA fuel, and that was  
13 approved in June of 2015, and then this extended  
14 flow window amendment request came in 2014, and this  
15 is the first extended flow window amendment request  
16 the staff has received.

17 VICE CHAIR CORRADINI: Just one  
18 clarification for the members. When they were  
19 transitions to AREVA fuel, until this is reviewed  
20 and approved by staff, they are going to be  
21 operating in the MELLLA regime.

22 MR. KUNTZ: Correct.

23 VICE CHAIR CORRADINI: Okay.

24 MR. KUNTZ: We issued a draft safety  
25 evaluation that went to the ACRS a month before the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 first subcommittee in September. Since the issuance  
2 of that draft, we've received two supplements from  
3 the licensee, and they dealt with the safety limit  
4 minimum critical power ratio.

5 So the supplement revised the technical  
6 specifications to include that penalty. So the  
7 safety evaluation you got stated that the staff felt  
8 that that penalty still applied, and to address that  
9 penalty, the licensee submitted revisions to the  
10 tech spec to include that.

11 Then there was another limitation 9.23,  
12 and that has to do with submitting cycle specific  
13 icon value tracking data. The licensee said that  
14 that does not apply, and the staff agrees, and so  
15 the final SE will note that that limitation is not  
16 applicable to Monticello.

17 And the last one had to do with  
18 submitting a reload licensing report, and they're  
19 just verifying that they'll do that in the time when  
20 that's prepared. And so, all of these, the topics  
21 in those two supplements, the staff has reviewed,  
22 and the final SE will be consistent with the  
23 licensee's request.

24 This is just a quick overview of the SE  
25 that you guys got. I don't think we need to go

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 through all of the sections, just the agenda for  
2 today. We'll have an open session. After the  
3 staff's done Xcel, go through some of the  
4 operations, and then we'll close the meeting as Xcel  
5 goes into ATWSi, and then the staff will present the  
6 results of their review.

7 VICE CHAIR CORRADINI: Just one  
8 clarification though, Rob, so I understand. So will  
9 staff want to come up prior to the closed session to  
10 give their evaluation of the open session topics?

11 MR. KUNTZ: No.

12 MR. SAENZ: No, we were just going to  
13 present it in closed session.

14 VICE CHAIR CORRADINI: Okay, all right,  
15 so then my plan then will be, if we're going to go  
16 into closed session -

17 CHAIRMAN BLEY: I'm sorry, if we have  
18 staff review of open public area materials, we  
19 really ought to have that in the - we have to have  
20 that in the open session. We can't have that  
21 closed.

22 VICE CHAIR CORRADINI: But I thought  
23 Diego said - can you clarify? I heard it  
24 differently. Are you going to -

25 CHAIRMAN BLEY: Well, he said it

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 differently. We can't have your comments on public  
2 information in a closed session.

3 MR. SAENZ: So most of our presentation  
4 is geared toward AREVA methods, and that contains  
5 proprietary information.

6 CHAIRMAN BLEY: Okay, so you don't have  
7 anything particular to say on the public  
8 information?

9 MR. SAENZ: That's right. It will be  
10 proprietary discussion.

11 CHAIRMAN BLEY: Okay, that's probably  
12 all right.

13 VICE CHAIR CORRADINI: Okay, and so my  
14 plan would be then to ask for public comment before  
15 we go into closed session so that we don't have to  
16 go through open, close, open, close, okay? That was  
17 my only clarification.

18 MR. KUNTZ: Then that will be after the  
19 first presentation from Xcel.

20 VICE CHAIR CORRADINI: Okay.

21 MR. KUNTZ: Okay, all right, and so now  
22 I'll just turn it over to Tim McGinty.

23 MR. MCGINTY: Thank you. Good morning.  
24 I'm Tim McGinty. I'm the director of the division  
25 of safety systems in the Office of Nuclear Reactor

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Regulation. The Monticello application is the first  
2 to request operation in the extended flow window or  
3 EFW with AREVA methods. EFW is parametrically the  
4 same as MELLLA+, and Monticello has been previously  
5 approved to operate in the MELLLA+ power to flow  
6 domain.

7 Since the fuel at Monticello was changed  
8 to AREVA fuel, the review focus of my staff was on  
9 the reactor systems. There are three main parts of  
10 the review from Monticello to operate in the EFW,  
11 first, the review of the AREVA design basis methods,  
12 second, the review of the AISHA and SINANO codes as  
13 acceptable codes for an ATWSi beyond design basis  
14 analysis, and third, the application of those  
15 methods and the acceptability of the plant specific  
16 portions of the enhanced option three, also EO3,  
17 stability solution.

18 The staff has been working long and hard  
19 on this review. We had a very productive audit at  
20 the AREVA facility in Richland, Washington during  
21 the week of June 15, 2015. The staff did a thorough  
22 review of the areas described above, and was  
23 assisted by ORNL, Oak Ridge.

24 We would specifically like to thank Dr.  
25 March-Leuba for the outstanding job he has done for

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the staff for the last, it says here, 30 years, and  
2 so we want to thank you. And I know you already  
3 acknowledged that, so appreciate it.

4 MEMBER POWERS: You realize, of course,  
5 that we're now going to have to put up with him.

6 MR. MCGINTY: I apologize in advance for  
7 that.

8 MEMBER POWERS: We will get even for  
9 this. We fully intend to get even.

10 MR. MCGINTY: Thank you very much for  
11 that.

12 MEMBER POWERS: You're welcome.

13 MR. MCGINTY: The staff also has had  
14 some very productive meetings with the ACRS  
15 subcommittee on thermal hydraulics on September 19  
16 and October 5 of this year, and we're fully prepared  
17 to discuss the result of the review with the full  
18 committee today. Thank you very much, and with  
19 that, I'll turn it over to Pete Gardner for the  
20 licensee's presentation.

21 VICE CHAIR CORRADINI: Okay, if the  
22 licensee will come up? If the team will come up, I  
23 should say. Glenn, are you going to start us off or  
24 -

25 MR. GARDNER: I'm going to start off.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 VICE CHAIR CORRADINI: I'm sorry.  
2 Excuse me.

3 MR. ADAMS: You can go ahead and go.

4 MR. GARDNER: All right, very good, just  
5 making sure we're ready. All right, good morning.  
6 I'm Pete Gardner. I'm the Monticello site vice  
7 president. And on behalf of Xcel Energy, I just  
8 wanted to thank Mr. Kuntz, the NRC staff, and the  
9 ACRS for performing this review on an AREVA extended  
10 flow window for Monticello. This amendment does  
11 support our transition from GNF fuel over to AREVA.

12 Including our informational briefing in  
13 July of 2015, this is actually our fourth visit with  
14 the ACRS. We have no follow-up open items from the  
15 prior meetings, and our presentation today will be  
16 an abbreviated version just to kind of give you the  
17 highlights of what we've been through.

18 All right, before we get the AREVA  
19 presentation, we're going to go through a couple of  
20 particulars specifically from the Xcel team, and who  
21 you see in front of you right now is Rick  
22 Stadlander. He's from operations, and currently in  
23 engineering from our site, and Tamara Malaney, and  
24 she's one of our staff reactor engineers, and she's  
25 done a lot of work on this project. So right now,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 I'm going to turn it over to Tamara, and we'll  
2 continue into the presentation.

3 MS. MALANEY: Okay, so I want to provide  
4 a little bit more detail on what this EFW amendment  
5 is. This is a site specific license amendment  
6 request. We're using many AREVA topically approved  
7 methods, but the submittal is site specific, and we  
8 are in no way seeking any form of topical review for  
9 generic use for any other BWR.

10 EFW is the region on the power flow map,  
11 and it's, as been previously said, is parametrically  
12 identical to the MELLLA+ region that we're currently  
13 licensed to use with AREVA - or with GE fuel and GE  
14 methods. The new EFW domain will be implemented in  
15 the core operating limits report the same way that  
16 MELLLA+ is implemented in our current core operating  
17 limits report.

18 The main point of similarity is that  
19 they're both the same power flow domain. And  
20 finally, we're using enhanced option three instead  
21 of the detect and suppress solution confirmation  
22 density for long term stability protection.

23 This is the only physical modification  
24 required to implement EFW. We have to put the  
25 jumper back on, and so we don't use the DSS-CD

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 algorithm anymore, and it greatly simplifies the  
2 progression through our technical specifications in  
3 the event of an inoperable OPRM, which has honestly  
4 been the biggest challenge for implementation. It's  
5 a very complicated progression through the tech  
6 specs.

7 MEMBER SKILLMAN: So Tamara, on that  
8 note, what is the primary safety benefit of this  
9 change?

10 MS. MALANEY: I would say it's  
11 approximately equivalent from a safety perspective.

12 MEMBER SKILLMAN: As what?

13 MS. MALANEY: As our current fuel and  
14 methodology.

15 MEMBER SKILLMAN: So neither more safe  
16 nor less safe?

17 MS. MALANEY: On the whole, yes. It's  
18 primarily an economic decision.

19 MEMBER SKILLMAN: Okay, thank you.

20 VICE CHAIR CORRADINI: You may want to  
21 speak up a bit.

22 MS. MALANEY: I'll try.

23 VICE CHAIR CORRADINI: Please do.

24 MS. MALANEY: I'll look down more.

25 CHAIRMAN BLEY: I'm just a little

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       curious. Can you give me a little brief tutorial on  
2       why the progression through your tech specs was so  
3       difficult? I've never heard this one before, so I'm  
4       a little - I missed the - I wasn't part of the  
5       subcommittee.

6               MS. MALANEY: Yes, so right now, when  
7       your OPRMs are operable, you are not required to use  
8       any backup stability regions.

9               CHAIRMAN BLEY: Okay.

10              MS. MALANEY: If your OPRMs become  
11       inoperable, then you immediately implement your  
12       backup stability regions. You have 12 hours to turn  
13       on your automatic backup stability protection trip.

14              Now, if for some reason your automatic  
15       backup stability protection trip doesn't work, then  
16       you're still using the BSP regions implemented  
17       immediately, and then you cut off a chunk of the top  
18       of the power flow map that's called the BSP backup  
19       region, the BSP boundary.

20              CHAIRMAN BLEY: So it's kind of a giant  
21       set of "and" and "ors" that are confusing.

22              MS. MALANEY: And everyone gets confused  
23       because it all has BSP in it, so we've renamed -  
24       there's a stability trip that's based on simulated  
25       thermal power on the EPRMs for the enhanced option

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 three. We've renamed it to the Extended Flow Window  
2 Stability trip because everyone got confused with  
3 BSP boundary, BSP backup, BSP -

4 CHAIRMAN BLEY: So it's really the  
5 renaming that's made it easier for your operators.

6 MS. MALANEY: And the tech spec  
7 progression is a lot easier because we always have  
8 the EFWS trip on -

9 CHAIRMAN BLEY: Oh, okay, you don't have  
10 to go back and forth.

11 MS. MALANEY: - when we're above 70  
12 percent power.

13 CHAIRMAN BLEY: Okay, thanks.

14 MS. MALANEY: We did want to update you  
15 on how our experience in the MELLLA+ domain has  
16 been. Honestly, it's no different from day to day.  
17 I talked to a bunch of our operators, and I couldn't  
18 get any operating experience that said it was any  
19 different. We finished our MELLLA+ testing in June  
20 of 2015 with no issues there, and we have had no  
21 stability events.

22 This slide is a little bit big and  
23 complicated. It shows all of the methods that we  
24 had before for GE analysis in blue, and then it  
25 shows everything we have for AREVA in red. And you

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 can see we have equivalent analysis. We have ATWSi  
2 methods and analysis over on the right for AREVA,  
3 and the GE methods and analysis over on the left.

4 Besides showing the EFW meets the  
5 licensing precedent set by MELLLA+, we also want to  
6 talk about three fundamental concepts, one, the  
7 AREVA codes are applicable, codes and methods are  
8 applicable in the EFW region. We have met the  
9 applicable limitations of the MELLLA+ licensing  
10 topical reports, and then we have a comparison of  
11 the non-proprietary MELLLA+ versus EFW results.

12 In ANP-3135, which was submitted as part  
13 of the initial license amendment request, we  
14 describe specifically the applicability of each code  
15 and method. First, the method was checked for SER  
16 restrictions on power, flow, or the parameters most  
17 impacted by the increased power level, so steam or  
18 feed flow, jet pump M ratio, or core average void  
19 fraction.

20 The AREVA methods are characterized by  
21 technically rigorous treatment of phenomena, and are  
22 very well benchmarked. Key Monticello data was  
23 plotted against the method qualification data to  
24 show that Monticello is within the qualification of  
25 the method.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           One example of this that was going to be  
2           fairly quick and easy to explain is the SPCD and the  
3           ACE CPR correlations. We're using SPCD for the GE  
4           fuel, the co-resident GE14 fuel, and we're using ACE  
5           for the ATRIUM 10XM fuel.

6           There are no SER restrictions on power  
7           or flow on either of those methods, and our data is  
8           within the qualification database. That's all I had  
9           for methods. If there's any other questions, it  
10          would have to be deferred to the proprietary  
11          session.

12          This picture shows where we did  
13          analysis, so primarily the thermal hydraulic type  
14          analysis. We didn't do every single analysis at  
15          every point, but you can see we covered all of the  
16          corners of the map and then quite a few places in  
17          between.

18          For MELLLA+ limitations and conditions,  
19          like I said, we either met them, or we decided that  
20          they were not applicable and showed why they were  
21          not applicable.

22          So one that we met was NEDC-33173,  
23          limitation and condition 9.3 requires that extended  
24          operating domains are either limited to 50 megawatts  
25          thermal per megapound per hour, or additional

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 information needs to be provided. The Monticello  
2 application is less than 50 megawatts thermal per  
3 megapound per hour, so this limitation and condition  
4 is met.

5 One that was not applicable for us is  
6 out of the same topical limitation and condition  
7 9.14 requires that the part 21 on the GESTR-M  
8 thermal conductivity degradation needs to be applied  
9 until the NRC approves what ended up being the prime  
10 methodology. This is not applicable because thermal  
11 conductivity degradation is already included or  
12 addressed in AREVA methods.

13 Next, we have the key results  
14 comparison. You can see this slide just as well as  
15 I can. The one thing to note is the OLMCPRs are for  
16 the representative core because we're not quite to  
17 the point in the cycle, in the next cycle core  
18 designs, that we have OLMCPRs for next cycle. We  
19 don't refuel until next April, but we do have the  
20 safety limits set up now.

21 And then on the next slide, we have the  
22 LOCA, a short discussion on Appendix R, and then  
23 both of the LSI PCTs meet applicable limits, but  
24 both of the values are proprietary, so I can't tell  
25 you now. This is the end of my presentation. Oh,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       sorry, I have - I forgot. I added a bunch.

2               One thing that we talked about at every  
3       meeting, and quite a bit with the staff, is the  
4       operator action times. The primary action time for  
5       ATWSi is the 90 seconds to initiate level reduction  
6       by terminating and preventing feed water injection.  
7       The other 10 critical operator actions related to  
8       boron and - what's the other one - oh, suppression  
9       pool cooling, are unaffected by what's going on  
10      exactly on the core. It's just about decay heat.

11              So here, I have a timeline, and this is  
12      something that nobody's seen written out like this  
13      before, so maybe it will be useful even for the  
14      people who were here before. For the two recirc  
15      pump trip, which is our limiting event with  
16      oscillations -

17              VICE CHAIR CORRADINI: If I might just  
18      ask you to back up, so you might want to tell  
19      everybody why the 2RPT is limiting because I think  
20      the subcommittee people will remember vividly, but  
21      other members might want to hear that.

22              MS. MALANEY: I can say that now instead  
23      of the next slide.

24              VICE CHAIR CORRADINI: Okay, yeah.

25              MS. MALANEY: The 2RPT is limiting

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 because as long as we take our operator action to  
2 terminate and prevent within 90 seconds, there are  
3 no significant oscillations during the turbine trip  
4 with bypass event, so we went looking for another  
5 event. It's the same event as was analyzed for the  
6 MELLLA+ under GE, and we used the same boundary  
7 conditions.

8 MEMBER REMPE: So I have a question, and  
9 I know I kind of kept asking this during the  
10 subcommittee meetings, and probably didn't ask it  
11 well, but I've thought about it some more since  
12 then. And if you want to wait until the closed  
13 session, you can answer it there.

14 But when you did these analyses with the  
15 2RPT and the turbine trip, you assumed the analysis  
16 of record feed water flow down reduction, and then  
17 to really try and get some oscillations going, I  
18 believe it was the 2RPT where you actually did some  
19 more conservative run down temperatures.

20 How do you know what's conservative and  
21 what's best estimate? I mean, you have the nominal  
22 case, and you have this more conservative estimate.  
23 Do you have, like, plant data, or what's the basis  
24 for saying something's conservative or nominal?

25 VICE CHAIR CORRADINI: Let me try

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 something as your expert is coming to the mic. My  
2 memory is from the subcommittee meeting that they  
3 basically took the analysis of record that GE used  
4 in terms of what was determined conservative. So  
5 they were -

6 MEMBER REMPE: Yes, I know.

7 VICE CHAIR CORRADINI: Okay.

8 MEMBER REMPE: I remember analysis of  
9 record, but what's the truth is where I'm coming  
10 from, and we made other licensees who came in after  
11 you guys talk about what the truth is, and that's  
12 what I was trying to get to here.

13 MR. TINKLER: Yeah, this is Dan Tinkler  
14 from AREVA. For Monticello, we license typically  
15 with a nominal feed water temperature, and we give  
16 that versus steam flow, so as the steam flow  
17 changes, you get different heating, so we have a  
18 nominal feed water temperature that we know.

19 We also license it with a feed water  
20 temperature band. So we say as long as the feed  
21 water temperature is within, I believe it's -5  
22 degrees of the nominal, then you're within license  
23 space.

24 MS. MALANEY: It's plus five, minus 10.

25 MR. TINKLER: Oh, plus five, sorry, plus

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 five, minus 10. So the feed water temperature is  
2 based on plant operation, so the nominal is a plant  
3 operation value, but we do license it within a  
4 certain band.

5 MEMBER REMPE: So what's on the analysis  
6 of record? Does it just stay pretty constant the  
7 whole time, or does it assume some sort of transient  
8 behavior, and what is assumed in the analysis of  
9 record, and why do you know it's true? Is it just  
10 within that band the whole time?

11 MR. TINKLER: We actually, for our  
12 analysis, it was outside of the band.

13 MEMBER REMPE: And what's the basis for  
14 that analysis to make you feel comfortable that the  
15 nominal case is correct?

16 MR. TINKLER: We can get into that in  
17 closed session.

18 MEMBER REMPE: Okay, that's fine.

19 MR. TINKLER: I think I have some things  
20 in the slides. I'll try to - if I don't elaborate  
21 on it, please remind me.

22 MEMBER REMPE: Okay.

23 MR. TINKLER: I will try to address that  
24 during the closed session.

25 MEMBER REMPE: Thank you.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MS. MALANEY: Okay, so at time zero,  
2 both of the recirc pumps trip. Within the first  
3 minute, we would expect our operators to take manual  
4 action to initiate a trip, but we are not crediting  
5 that action in this analysis, which I think is  
6 different than some other licensees.

7 Within 50, 45 to 100 seconds, we would  
8 expect the stability trip, the extended flow window  
9 stability trip based on simulated thermal power on  
10 the APRMs to initiate a trip. We are also not  
11 crediting that trip.

12 We are only crediting the trip to fail  
13 at about 300 seconds from when the OPRMs detect  
14 instabilities. That is the trip that we are  
15 crediting to fail. And then within 90 seconds of  
16 that trip failing, we have the operators initiate  
17 level reduction.

18 VICE CHAIR CORRADINI: And that is the  
19 same as the analysis of record from under GE  
20 assumption, so the timing is identical?

21 MS. MALANEY: That is correct.

22 VICE CHAIR CORRADINI: Okay, thank you.

23 MS. MALANEY: The turbine trip with  
24 bypass timeline is much less interesting because at  
25 time zero, the turbine trips. There's a failure to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       scram, and then within 90 seconds, operators  
2       initiate level reduction. This terminates the event  
3       prior to significant instabilities developing.  
4       That's why we had to do the 2RPT analysis to give  
5       you an ATWSi analysis. And that's all I have.  
6       Questions?

7                   VICE CHAIR CORRADINI: So, to remind the  
8       members, staff has nothing to discuss about these  
9       topics in open session, so my plan is to get  
10      comments from the members, comments from the public,  
11      and then go into closed session because of  
12      proprietary material. Members, any questions?

13                   Okay, so why don't I turn to - does  
14      anybody from the members of the public want to make  
15      comments in the room? And can we please have the  
16      phone line open so if there is comments from members  
17      of the public on the bridge line, we can hear their  
18      comments?

19                   I hear noise. Can someone who is on the  
20      bridge line please at least acknowledge that they're  
21      there so we know the line is open? Anyone? So no  
22      one is on the line. Why don't we close the line?  
23      And then can we ask members of Xcel Energy and of  
24      AREVA to verify that no one in the room is -  
25      everybody in the room is bonafide? And we can close

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the outside line since we're going to go into closed  
2 session.

3 (Whereupon, the above-entitled matter  
4 went off the record at 11:13 a.m. and resumed at  
5 1:46 p.m.)

6 CHAIRMAN BLEY: The meeting will come to  
7 order. Again, before we move on to this afternoon's  
8 session, we said this morning we had no one who had  
9 asked to make public comments. We erred. In fact,  
10 Doug Tonkay of the Department of Energy had asked  
11 for five minutes to read comments in the record at  
12 the end of this session, so we will certainly allow  
13 him to do that.

14 At this time, I'll turn the meeting over  
15 to Dr. Chu to lead us through the Part 61 work.

16 MEMBER CHU: Thank you Mr. Chairman. On  
17 October 18th, the Radiation Protection and Nuclear  
18 Materials Subcommittee heard from the staff on the  
19 final proposed rule language for revisions to 10  
20 C.F.R. Part 61, low level radioactive waste  
21 disposal. This full Committee session is the sixth  
22 time the staff has briefed the Committee on proposed  
23 revisions to Part 61.

24 The Committee has previously written  
25 four letters to the Commission on this matter. The

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 proposed rule is with the Commission now as SECY-16-  
2 0106, waiting for the decision of the Commission.  
3 The staff has been provided extra time today to  
4 present the rule language, but also the guidance on  
5 implementing the rule, which was not discussed in  
6 any detail at the October subcommittee meeting.

7 So with that introduction, I turn to  
8 Gary Comfort of the NMSS staff to begin with  
9 session. Gary.

10 MR. COMFORT: Thank you, Margaret.  
11 Today, as you indicated, we're here to talk about  
12 the Part 61 low level radioactive waste disposal  
13 final rule, the draft final rule is before the  
14 Commission right now for their review. To my right  
15 is Dr. Dave Esh. He's going to be doing a  
16 presentation on more of the technical aspects. I'm  
17 going to be going over the overview of the rule.

18 I'm a senior project manager in NRC's  
19 Office of Nuclear Material Safety and Safeguards in  
20 the Division of Material Safety States, Tribal and  
21 Rulemaking Programs. We last discussed this topic  
22 before the Committee back in -- before the full  
23 Committee back in 2013.

24 So first of all, just to give quick  
25 overview of the discussion topics, I plan on going

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 over what the purpose of the rule was, just to  
2 remind you all of that, what types of Commission  
3 direction we've gotten through the years, and just  
4 remind of the letters that, you know, some of the  
5 major topics that were discussed before.

6 Then because what you last saw was  
7 really what we submitted to the Commission as part  
8 of a SECY paper in 2013, I'm going to go over the  
9 transition from the SRM as to what kind of comments  
10 they gave us and what we actually published for  
11 public comment, and then move into the description,  
12 you know, what kind of comments we got and then the  
13 description of the final rule. Dave will then take  
14 over with the technical elements. Feel free if you  
15 have any questions to jump in at any time.

16 The purpose of the rule, I'd like to  
17 start with first, and it's really to ensure the safe  
18 disposal of new waste streams not analyzed as part  
19 of the original 10 C.F.R. Part 61 regulation. Back  
20 when the rule was originally promulgated in 1982 or  
21 thereabouts, the rule was based upon what was the  
22 waste streams being disposed of at that time period.

23 And so it didn't include many of the  
24 waste streams or some of the waste streams that are  
25 now being disposed or were envisioned to be disposed

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1 of in the future. For example, depleted uranium.  
2 Back in the 1980's, you know, the early 1980's,  
3 uranium enrichment was primarily a function of the  
4 U.S. government, and there weren't any privatized  
5 operations.

6 So the expectation was a lot of the  
7 depleted -- all that depleted uranium would be  
8 disposed of by the Department of Energy complex.  
9 Since then, enrichment has become a privatized  
10 activity and one of the pathways that they're  
11 looking at doing is through the low level,  
12 commercial low level waste sites, you know.

13 Similarly DOE, Department of Energy is  
14 also considering doing some waste through the  
15 commercial waste sites that wasn't envisioned back  
16 in the early 1980's. Other things that have  
17 changed, that there's some consideration of  
18 including blended wastes into the commercial waste  
19 stream.

20 Blended waste is basically taking a  
21 class of waste that's higher like, you know, Class B  
22 and combining it with a lower class waste such as  
23 Class A, but it going to keep it a higher  
24 concentration than the Class A level than what was  
25 envisioned to be going into these waste sites.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1           So the idea of the whole rule that we  
2           were going forth in this rule is to capture all of  
3           these known new wastes, as well as anything that may  
4           come up in the future when we developed this rule.  
5           Over the years, we've had a lot of interactions with  
6           the Commission. This thing really came out of a  
7           procedural, a license hearing procedure for  
8           Louisiana Energy Services, which was a uranium  
9           enrichment facility and the question came up as to  
10          was it -- could this material be disposed in low  
11          level waste sites?

12                 The Commission came back and asked the  
13          staff to evaluate how Part 61 fit into this and what  
14          the rule of DU in Part 61 right now, because a lot  
15          of depleted uranium wasn't really envisioned to go  
16          into these sites. The final rule didn't  
17          specifically address DU, so it kind of falls under a  
18          default category of Class A waste.

19                 So the question was well, now that we  
20          have a lot more, is that appropriate? The staff  
21          came back and provided the Commission what they  
22          wanted, and the Commission directed us to go forth  
23          with this rulemaking. That was in 2008.  
24          Eventually, the Commission directed the staff to add  
25          into the idea of the blending into the rulemaking in

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 2010.

2 The staff went out and it had gone  
3 through and developed a regulatory basis for the  
4 rule, where we did a lot of public interaction,  
5 trying to determine, you know, what aspects we  
6 should be considering during the rule. We went out  
7 with proposed rule or preliminary proposed rule  
8 language, and eventually the Commission came forth  
9 during this process and provided us additional  
10 direction in 2011, which is the SRMCOMWDM-11-0002  
11 and COMGEA-11-0002, basically giving us more  
12 specific direction on how we should require the  
13 analysis using a two-tiered approach.

14 We eventually finally got a final  
15 proposed rule to the Commission in 2013, which was  
16 SECY-013-0075. In this rule, that's the language  
17 where we last provided this Committee to look at,  
18 and you guys provided comments back to the -- that  
19 were directed to the Commission, and I'm going to go  
20 over what was in that in a minute.

21 But the Commission then eventually came  
22 back with their SRM and had us to some significant  
23 revisions, which I'll describe briefly that ended up  
24 in the proposed rule. But one of the things that  
25 they also directed is they encouraged the ACRS to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 provide an independent review on both the rule  
2 language as well as the guidance, and that's a large  
3 part of the reason why we're here today.

4 Now this next slide basically shows a  
5 comparison on the left side of the slide is what's  
6 known as SECY-013-0075. This is the package that  
7 the staff had provided the Commission, including the  
8 rule language and it basically encompasses what you  
9 saw. During that time period when we went to the  
10 Commission, we had recommended going forth as the  
11 Commission directed with an analysis of two time  
12 frames.

13 This included a compliance period of 0  
14 to 10,000 years. It would have for the -- a  
15 performance assessment would be part of that, which  
16 would have a 25 millirem dose limit for protection  
17 of the public, as well as we added an intruder  
18 assessment as part of that, which would have a 500  
19 millirem limit.

20 We added also basically waste acceptance  
21 criteria, because we're going to site-specific  
22 intent. So you could actually use the  
23 classification tables, or you could use the site-  
24 specific information that you develop to determine  
25 what your waste acceptance criteria were.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           Then we updated the ICRP dosimetry  
2 modeling that would be allowed to be used in the  
3 performance objectives in 10 C.F.R. 61.41 and 42,  
4 and we recommended to the Commission to allow  
5 flexibility to the Agreement States, that the rule  
6 should be compatible with Category C.

7           The Commission reviewed the rule and  
8 then as I said had gotten your comments and all, and  
9 they provided us back additional direction, which on  
10 the right, which is what's shown to be the published  
11 portion of the rule. The big changes in that were  
12 the Commission directed us to instead go to a time  
13 frame with three tiers.

14           They basically directed a -- they  
15 directed -- my mind just went out of words -- a  
16 compliance period, thank you, of zero to 1,000 years  
17 versus the zero to 10,000 years that we had  
18 originally suggested. Again, it had the 25 millirem  
19 dose limit for the public, as well as a 500 millirem  
20 dose limit for the inadvertent intruder assessment.

21           And real quickly, on the inadvertent  
22 intruder assessments, what we're talking about there  
23 is somebody who doesn't -- isn't aware of the  
24 radioactive material disposed of at the site.  
25 Instead, they're walking onto the site randomly and

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 taking upon activities that would be normal for the  
2 activity, and they happen to infringe upon the waste  
3 or possibly do.

4 So what you're doing is assessing it.  
5 It's not to evaluate somebody coming advertently  
6 into the site and trying to remove the waste or do  
7 something to the waste because they know it's there.  
8 So the compliance was there to 1,000 years. Then it  
9 was followed by a new protective assurance period  
10 that the Commission directed that was from 1,000 to  
11 10,000 years. Now this was going to have a 500  
12 millirem dose goal. It wasn't a limit, but a dose  
13 goal to try to be compared to.

14 And then this was followed by a  
15 performance period, which we've also suggested in  
16 our rule, the original rule as a second tier. This  
17 was now the third tier for 10,000 years out. The  
18 performance period assessment was basically supposed  
19 to be a qualitative review that looked at what was  
20 going to -- what the assumptions that would go on  
21 after that time period not, you know, very  
22 quantitative although you could use quantitative  
23 data.

24 But the intent was to basically provide  
25 an opportunity to minimize potential exposures out

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 to the far future. They did include, you know,  
2 allow us or they did agree with the performance  
3 assessment and intruder assessment. One of the  
4 changes, though, they did address in the intruder  
5 assessment is we had not really defined down the  
6 scenarios the time frame for where those scenarios  
7 should be evaluated out to.

8 The Commission instead directed in their  
9 rule or in their SRM for the staff to include that  
10 the scenarios should be evaluated based upon the  
11 time of closure of the site so you're not looking  
12 far into the future and trying to guess what's going  
13 on at the site and developing scenarios based on  
14 that.

15 They added a requirement or directed the  
16 staff to add an explicit description of what a  
17 safety case is. I mean the staff had already  
18 thought the safety case was implicitly evaluated and  
19 included in Part 61 at the time, but they wanted to  
20 describe it explicitly. Similarly, they wanted us  
21 to add an defense-in-depth analysis, which we had  
22 added per the Commission direction.

23 Finally, in the compatibility category,  
24 instead of doing the C, they directed us to do  
25 Compatibility B. Compatibility B basically says

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       that the rule language that the states incorporate  
2       has to be basically exactly the same as what the  
3       NRC.    So things like the compliance period time  
4       frames that we incorporated for the three tiers, the  
5       states would have to match in their regulations.

6               If it were in Compatibility Category C,  
7       they can be more -- they can be similar or more  
8       restrictive than what we had done on that.    So  
9       that's basically what we published back in -- we  
10      ended up publishing as the rule.

11             Next, I'm going to go quickly over -- we  
12      have had, as we said, numerous meetings with you  
13      over the years prior to this.    What the letter  
14      reports that the ACRS had identified as some of the  
15      key issues that we saw in the letters.    The ACRS  
16      directed that we do a -- or suggested that we do a  
17      risk-informed based on site-specific realistic  
18      performance assessments, with a consideration for  
19      uncertainties.

20             Basically, they wanted us to make sure  
21      the scenarios were realistic and looked at a range  
22      of site-specific conditions.    They suggested that we  
23      use time frames based on case by case site-specific  
24      basis, rather than finding specific fixed periods  
25      for performance.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           They also requested that or recommended  
2           that we do compliance with the performance  
3           objectives after the institutional control period  
4           be evaluated, considering features, events and  
5           processes or otherwise known as FEPs for a given  
6           site for a period, commensurate with a site-specific  
7           risk.

8           For protection of the inadvertent  
9           intruder, they were concerned that we were  
10          requiring, being too specific in the requirements  
11          for that with the dose limits and all, and that the  
12          large -- because there were large uncertainties  
13          associated with human intrusion, and it wouldn't  
14          really help a lot with the decision-making process.

15          Instead, they felt that durability and  
16          stability of the site and evaluation of that should  
17          be sufficient. Finally, they recommended that  
18          previously disposed waste should not be subject to  
19          any additional compliance evaluations. So if a  
20          material's already been disposed of, it shouldn't  
21          fall under this rule.

22          These letters went to the Commission.  
23          Although we incorporated some of the recommendations  
24          of this Committee, we didn't incorporate all of  
25          them. Things like we do have time periods, time

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 periods specified and all, and in response to the  
2 recommendations, the staff did provide responses as  
3 to why we weren't accepting or what recommendations  
4 we did accept.

5           Quickly, I just want to go where we are  
6 in the rulemaking process, you know, what we are --  
7 and where we got to since we last had met with you.  
8 We issued the proposed rule as SECY-013-0075 in  
9 March 26th, 2015. That was after the SRM was issued  
10 about a year earlier. Because the Commission  
11 provided us so much direction, it took us a period  
12 of time to incorporate all the new requirements and  
13 get all the documents up to speed.

14           Per the Commission direction, we issued  
15 it for a longer than normal period for review by the  
16 public, for 120 days for the comment period. We got  
17 a significant number of comments, but we also got a  
18 few -- a number of people who requested additional  
19 time. So we reopened the comment period from August  
20 27th to September 21st, 2015.

21           So we finally closed the period and  
22 moved forward with development of the rule, to the  
23 point that we about a year later just recently  
24 submitted the draft final rule to the Commission on  
25 September 15th. The paper is in -- part of the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 package of SECY-016-0106, and currently the  
2 Commission is reviewing that package.

3 As part of the rule, you know, we went  
4 out for the public comment period and we received  
5 2,401 comment letters. Approximately 2,300 of those  
6 were form letters. While the document was out for  
7 public comment, we held six workshops. We did  
8 extensive public outreach. We also held a webinar  
9 on the guidance document.

10 We got comments from a large number of  
11 people, through both written and during these oral,  
12 which we transcribed the oral comments and included  
13 them in our package. The people that were  
14 represented are listed individuals, public interest  
15 groups, Native American tribes, industry groups,  
16 licensees and state and federal agencies.

17 Overall, we had over 800 comments that  
18 we identified and then binned them, and we've  
19 responded to those in the statements of  
20 consideration of the draft *Federal Register* that was  
21 part of the SECY that we recently sent.

22 MEMBER REMPE: I'm curious. 2,300 were  
23 form letters. The same form letter or --

24 MR. COMFORT: Yeah. They were the same  
25 form letter basically. We get that often in a

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 rulemaking, that somebody will put out a general  
2 form and people will sign their name to it, put  
3 their name.

4 MEMBER REMPE: Oh, so it's almost a  
5 petition basically?

6 MR. COMFORT: Yeah, effectively.

7 MEMBER REMPE: Got it, okay.

8 MR. COMFORT: These were a lot from, you  
9 know, individuals in some of the states that  
10 basically, you know, were concerned are we being  
11 restrictive enough or, you know, they were concerned  
12 about what waste was going into their sites and all  
13 that, that may be nearby.

14 MEMBER REMPE: But this is the identical  
15 same one, 2,300?

16 MR. COMFORT: They were all -- oh, I  
17 mean there might have been a word or two that were  
18 different, but yes, they were effectively the same  
19 letter and, you know, we go through. We have  
20 software that goes through and divides it all out  
21 and looks at it to compare it out, to make sure that  
22 they are similar and identify where there's objects  
23 or statements that are different.

24 MEMBER REMPE: Thank you.

25 MR. COMFORT: So I'm going to move on

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 and discuss a little bit of some of the comments  
2 that we received. Remember, this is on a proposed  
3 rule that we did actually publish with the three  
4 tier system. A big comment that we got from most, a  
5 large number of the stakeholders was that the system  
6 was much more complicated than necessary.

7 They felt going to the three tier system  
8 would be very difficult to evaluate, you know, the  
9 separate tiers. A lot of the individual members of  
10 the public had a perception concern that the 500  
11 millirem dose goal that was associated with the  
12 protective assurance period assessment period would  
13 reduce, actually reduce public health and safety.

14 In our regulations, you know, for public  
15 health and protection we had a 25 millirem dose  
16 limit. Now again, you have to look at it that in  
17 Part 61, the currently Part 61 it doesn't have any  
18 time frames associated with it. So one could argue  
19 that time frame goes -- should go out that long. A  
20 lot of people, you know, when we were doing the  
21 evaluations, it was considerably lesser that we were  
22 allowing and applying that 25 millirem.

23 But what the rule change would do is  
24 basically clarify the time period that we would  
25 expect, so there's not any confusion. So as part of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 this rule, in response to those comments, we did go  
2 back and we tried to move to a new, more simplified  
3 approach that I'll get to in a few minutes.

4 Another big area was the compatibility  
5 category. We got a lot of comments on this. A lot  
6 of people thought this reduced the current health  
7 and safety provided by some states. Again, under  
8 Compatibility B, which is what we went out with the  
9 rule, the states would have to meet exactly what we  
10 had, which was the zero to 1,000 year compliance  
11 period.

12 Many of these states already had  
13 requirements that were longer, 5,000 or 10,000 year  
14 requirements, or even at the peak dose in some  
15 cases, and that they applied the dose limit to. So  
16 by having this Compatibility B, they would be  
17 actually having the states have to, you know, go  
18 back and change the regulations to effectively  
19 reduce the amount of time they were already  
20 evaluating against.

21 Most of the commenters, as a result,  
22 recommended Compatibility C. This would allow the  
23 states such that if we had a 1,000 year compliance  
24 period, that they could make it 10,000 years.  
25 They're meeting the 1,000, they're being more

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 restrictive. They could do whatever they wanted to  
2 on that and apply the limit. So it gave them a lot  
3 more flexibility.

4 And that's effectively what we did, is  
5 we changed the compliance period definition, and  
6 then the waste acceptance criteria information in  
7 61.58 Compatibility C to provide them that  
8 flexibility.

9 Not directly stated in the rule, you  
10 know, what we did state in the rule for  
11 grandfathering, that there would be no  
12 grandfathering to sites that were still operating.  
13 We expected to those sites to go back and do their  
14 performance, redo their performance assessments, to  
15 address both the new waste and the old, you know,  
16 and the waste that were currently in site.

17 The intent was not to make them go and  
18 find out, you know, we think that if there's  
19 anything wrong with their sites currently. We  
20 don't, but you really have to have an overall  
21 assessment of the site to do your site-specific  
22 evaluations and all, and that's all we were trying  
23 to indicate with the grandfathering and all.

24 So basically some of the comments we  
25 got, that the grandfathering should be allowed. You

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 know, particularly if a site's not going to be  
2 accepting any of these new wastes, why should these  
3 rules apply to them, you know? If it does, they  
4 shouldn't really have to apply it to the wastes that  
5 are already disposed of and all.

6 There was also a segment of persons that  
7 identified that in 10 C.F.R. 61(1)(a), that there's  
8 some statements in there that basically say that a  
9 state can adopt only part of the regulations that  
10 come about. That was kind of an over, an artifact  
11 from the original rulemaking, that at that time we  
12 really didn't have a framework when Part 61 was put  
13 on.

14 So we didn't want to suddenly throw all  
15 these rules at somebody at a state and say you have  
16 to meet them all at once. So they were able to  
17 adopt them over a longer time period, and address  
18 them to their sites as needed.

19 Our indication from reading of the rule  
20 language and finding, you know, reviewing it was  
21 that 61(1)(a) really only applied to that first time  
22 the rule was implemented. It was never intended to  
23 address future amendments to the rule.

24 So as a matter of fact, one of the  
25 things we did as a result of those comments that

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 wasn't in the proposed rule was to remove those  
2 clauses in 61(1)(a) that identified that ability for  
3 the state to not include, you know, not meet the  
4 regulations for NRC or include in their regulations  
5 on it. So that is removed from the final rule.

6 The other big issue that came out of the  
7 public comments was the idea of backfit. Part 61  
8 does not have a backfit requirement. We do have to  
9 do a regulatory analysis, which is effectively a  
10 cost benefit and that's included as part of the  
11 package that was sent to the Commission.

12 Particularly some of the licensees that  
13 were fuel cycle operators and stuff had concerns  
14 that there are backfit provisions under their  
15 requirements. They felt that their backfit  
16 provision should apply, since they were going to be  
17 indirectly impacted because it was going to  
18 potentially impact where they could dispose of their  
19 wastes.

20 We did a review of what the backfit  
21 requirements are and how we've applied them before,  
22 and in the past we have not applied them to  
23 secondary, you know, secondary persons who are  
24 affected by a rule. So if you're not part of that  
25 rule, that part, you know, we don't really address

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       that.

2                   It doesn't say the Commission can't, you  
3       know, go back and take a review of these comments  
4       and redirect the staff to do a backfit.  There's  
5       nothing saying that they can't.  We determined that  
6       there is no requirement for us to do a backfit in  
7       our regulatory analysis, which we did based on  
8       public comment also do a lot of revision to provide,  
9       you know, more data that was from the states as well  
10      as the licensees themselves.

11                  So that's really the major comments that  
12      we got.  This resulted in the --

13                  MEMBER CHU:  Gary, Gary.

14                  MR. COMFORT:  Yes.

15                  MEMBER CHU:  Can I ask you only a slide  
16      question.  What was the Commission's direction on --  
17      I'm looking at Slide 5.  What was the Commission's  
18      direction on the intrusion scenario?

19                  MR. COMFORT:  Basically, after the --  
20      when the staff submitted theirs, they basically said  
21      we're going to do an intruder assessment and then  
22      you'll basically look at what is going on at the  
23      site, you know, reasonable activities and all.  It  
24      didn't define a time period a time period so it  
25      could go out, you know, far into the future.  You're

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 looking at evaluations past 10,000 years.

2 The Commission basically came back in  
3 theirs and said no, basically put the assessment  
4 only at time of closure, what you expect the  
5 activities to be at the time of closure at the site.  
6 Don't try to look far into the future. But they  
7 agreed that we should have an intruder, an  
8 inadvertent intruder assessment as part of the rule,  
9 as well as with the --

10 MEMBER CHU: But at closure not --

11 MR. COMFORT: But at closure, not at  
12 yeah. That's one of the things I'll get into is we  
13 did have a -- we did get public comment on that, and  
14 in the final rule we did change that even further,  
15 because a lot of these sites may be operating for 40  
16 years. A lot of things can change in 40 years.

17 So instead, we changed it to instead --  
18 the rule language would say you do the activities  
19 going on at the site at the time that you're doing  
20 the actual assessment. Don't try to predict what's  
21 going on in the future. As time goes forth, they're  
22 going to redo the assessments at renewals, as well  
23 as we've got an explicit requirement that they'll  
24 have to update their safety case at closure, and at  
25 that point they'll actually get the Commission's

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 final, you know, this is what it is.

2 But we're not requiring to look out  
3 after that as to what kind of -- you know,  
4 unexpected activities. I mean if they're aware that  
5 yes, you know, hey in ten years the building  
6 requirements around the thing have changed to allow  
7 certain other activities, we'd expect them to  
8 probably address that.

9 But we're not trying to, you know, if  
10 that hasn't happened and it's a desert, we're not  
11 expecting them at this point to say hey, we expect  
12 to major city to be in there in 100 years and stuff  
13 on it, and to evaluate it against that.

14 So going back to the major rule changes  
15 and all, so as a result of all the public comments  
16 that we received, we did make a lot of, you know, a  
17 lot of changes. I mean we thought the comments,  
18 many of them were quite good. They were well  
19 spelled out as to what there were problems. I mean  
20 everything from, you know, we have some technical  
21 issues, that we have areas that we need to enhance  
22 direction both in the rule as well as in guidance,  
23 you know, as well as just minor editorial that fixed  
24 a lot of issues that we had.

25 But this slide basically shows some of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the major items, you know. Now this is all compared  
2 to what's in the current rule, the changes from it,  
3 that the new rule is going to require site-specific  
4 analysis that you have to do, whether you're using  
5 the waste classification tables or not. It provides  
6 now for a compliance period that you're going to  
7 have to do, that you can evaluate.

8 But the change now is that we're  
9 requiring it only 1,000 years if there aren't  
10 significant quantities of long-lived waste. If  
11 there are significant quantities of long-lived  
12 waste, and Dave will get into what that means in a  
13 few minutes in his slides, you'll have to do your  
14 evaluation out to 10,000 years for the compliance  
15 period, for protection of general public and  
16 similarly the requirement is the same out for the --  
17 have similar requirements for the inadvertent  
18 intruder.

19 We do a add new requirement for the  
20 technical analysis for the protection of the  
21 inadvertent intruder, that -- in addition, it has a  
22 dose limit associated with it, which wasn't in the  
23 current rule. Protection of inadvertent intruder,  
24 the performance objective is found in 61.42, and we  
25 now have a new requirement for a 500 millirem limit

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 as part of that assessment that you have to meet.

2 We now add a new post-10,000 year  
3 performance period analysis. Again, as I indicated  
4 before, our intent is that's not supposed to be a  
5 real detailed quantitative analysis. It's more  
6 supposed to be used qualitatively to make sure that,  
7 you know, you're minimizing the -- you're aware of  
8 what types of impacts you can have, so that you can  
9 minimize them out in the future.

10 The expectation is in most cases, you  
11 can just, you know, run your model out further what  
12 you currently are for the compliance period. It  
13 adds a new requirement, as I said before, to update  
14 your technical analyses at site closure, so that you  
15 know that what, you know, when you're closing the  
16 site, you know what your waste, all the waste that  
17 you disposed of and now you can do an evaluation for  
18 the final impacts and make any changes that you need  
19 to, to make sure that you continue to meet the  
20 performance objectives.

21 Finally, we also add a new requirement  
22 to identify defense-in-depth protections, as well as  
23 we explicitly state safety cases as was directed by  
24 the Commission.

25 MEMBER SKILLMAN: Dave, before you

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 change this slide, let me ask a question about the  
2 800 comments two slides back. Among those 800  
3 comments, were there any comments related to the  
4 volume of DU waste that would be handled under this  
5 rule?

6 MR. COMFORT: I mean in the way of  
7 asking how much would be handled?

8 MEMBER SKILLMAN: Yes.

9 MR. COMFORT: I don't remember. I mean  
10 I don't remember any specific to asking that  
11 specific question at all, I mean, because we would  
12 have come up with a response saying we expect, you  
13 know, this amount. I know in the rule though, I  
14 mean in the statements of consideration, I think we  
15 look at where the volumes are coming from. But I  
16 don't think we specifically address that. Dave may  
17 have more.

18 MEMBER SKILLMAN: I'd be curious what  
19 your and David's thoughts are on this, and I'll tell  
20 you why in just a minute. Go ahead.

21 MR. ESH: Yeah. This is David Esh.  
22 Leading up to this phase of the regulation,  
23 especially early on we had some workshops on the  
24 various topics, of which we communicated about the  
25 depleted uranium issues and how much material you

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 might be dealing with. So the estimates, I believe,  
2 were there's about 700,000 metric tons in DOE's  
3 inventory with Paducah and the other enrichment  
4 programs.

5 Then there was estimated to be maybe  
6 about that much or a little bit more that would be  
7 generated on the commercial side also. So there was  
8 more than a million metric tons of depleted uranium  
9 and the potential source term. But I agree with  
10 Gary. I don't remember for sure that we received  
11 any specific comments about the volume.

12 The volume is large, but whether it's,  
13 you know, a million or two million or 500,000, I  
14 don't remember anything like that.

15 MEMBER SKILLMAN: It seems to me that  
16 that's -- that's an important feature that we  
17 haven't spoken about, and since our last meeting was  
18 about 10-12 days ago, I was reviewing some material  
19 that I had, and was involved with the Zippe  
20 Centrifuge Plant in Eunice, and see in your mind, a  
21 short take off and landing airport, two side by side  
22 just north of that facility.

23 I estimate those landing strips are  
24 three to four thousand feet long, and they are only  
25 there for the DU cylinders. If the experience at

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Capenhurst, which is the -- which is the leading  
2 facility for Hobbes is any example, both of those  
3 runways will be filled with as many DU cylinders as  
4 can be parked there safely stacked two or three  
5 high. So we're talking hundreds of thousands of  
6 cylinders.

7 MR. ESH: Right. It's many football  
8 fields to use a sports analogy of these cylinders.

9 MEMBER SKILLMAN: Bingo. That's what I  
10 --

11 MR. ESH: When you see pictures of the  
12 ones that exist right now, that's a lot of material.

13 MEMBER SKILLMAN: That's what I --  
14 that's exactly. That's what I'm communicating. So  
15 it seems as though that little piece of information  
16 might be a factor in what it is that we're talking  
17 about and some of the concerns that the ACRS has  
18 expressed, particularly this idea of in the future  
19 having to rehandle or rebury or do something else  
20 with what's already there, because this is as much  
21 material as will fit in a small city. Thank you.

22 MR. ESH: Thank you.

23 MEMBER REMPE: So in the subcommittee  
24 meeting a few weeks ago, you had another bullet that  
25 you seem to have taken off now about better aligning

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 with the requirements with current safety standards.  
2 Was there a reason that you -- I mean that was  
3 something that was discussed by one of the public  
4 comments at the end of our meeting about other  
5 safety standards, and is there a reason you decided  
6 --

7 MR. COMFORT: It was more just to keep  
8 it, you know --

9 MEMBER REMPE: Focused?

10 MR. COMFORT: Keep the meeting focused  
11 more on the more technical aspects rather than, you  
12 know. I mean that is technical but, you know,  
13 something I stated earlier, that we did do that  
14 change, you know, in the rule, that we were  
15 addressing changing the performance objectives to  
16 allow more site or to allow more up to date dose  
17 methodologies to be used versus what was, what's in  
18 the current regulations and all.

19 MEMBER REMPE: Okay.

20 MR. COMFORT: But yeah. I did just do  
21 it more -- it wasn't because, you know.

22 MEMBER REMPE: That you found that  
23 you're not aligning with them, okay.

24 MR. COMFORT: No, no, that we're still  
25 aligning with the newer requirements. It's just it

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 didn't seem to be quite the technical area that we  
2 were really looking at on this.

3 Just real quickly, I'm going to go over  
4 some of the key areas where we did changes. 61.12,  
5 which we covered specific technical information. We  
6 added a new requirement O, which is that it -- for  
7 defense-in-depth, which requires identification of  
8 the defense-in-depth protections, including a  
9 description of the capability of each defense-in-  
10 depth protection relied upon.

11 This is not supposed to be a big  
12 elaborative analysis. One of the big areas that we  
13 got comments from, including one of our  
14 Commissioners, was in our original proposed rule we  
15 had this in 61.13, which is under the category of  
16 "Technical Analyses," and we called it a technical  
17 analysis.

18 Our intent was never that it was  
19 supposed to be a big, new evaluation or anything.  
20 There was only supposed to be summation of all the  
21 other evaluations you've done, so that you can  
22 identify what your defense-in-depth. So by moving  
23 it to this location, we thought that we, you know,  
24 hopefully covered that, that it's not supposed to be  
25 that big technical evaluation or analysis.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           The biggest changes really in the rule  
2           came in 61.13, in the area of technical analyses.  
3           First of all in A, we added -- the requirement, you  
4           know, in A really covers the technical analyses for  
5           protection of public health which were there. We're  
6           now making it more defined to call it a performance  
7           assessment, and that falls into that category.

8           We do require you to do it for the  
9           compliance period that we've now defined and  
10          evaluated. It still meets, you know, goes towards  
11          meeting the performance or demonstrating the  
12          performance objective in 61.41 on it, and you  
13          basically have to meet the requirements as indicated  
14          on the slide. Most of those are a lot similar to  
15          what it was before.

16          In 61.13(b), we've now added this new  
17          more specific requirement that you have to do an  
18          inadvertent intruder assessment, and you have to  
19          meet the new limit that's in the performance  
20          objective in 61.42 on it.

21          And basically as I indicated before, one  
22          of the big changes from the proposed rule in this  
23          area was that instead of doing the scenario at the  
24          time of closure, you do your evaluation of scenarios  
25          at the time that you're doing the assessment, so

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1       there's less, you know, conjecture as to what's  
2       going on at that time period or somewhere out in the  
3       future.

4                       And then the other big area in 61.13  
5       that we made a change to was we added this new  
6       performance period analysis, which is your  
7       qualitative review post-10,000 years, to basically  
8       assess how the disposal site limits the potential  
9       long-term radiological impacts during the  
10      performance period.       There are performance  
11      objectives in 61.41 and 42 for the public and an  
12      inadvertent intruder, that basically say, you know,  
13      minimize the exposures to -- as I'll come up in a  
14      second to say the exact wording.

15                      That's where, again, 61.41, the big  
16      changes were for the compliance period for 61.41(a)  
17      basically stayed the same. You've got a 25 millirem  
18      dose limit, but it's really using the more modern  
19      update dose standards that we're allowing. You're  
20      going to demonstrate it through 61.13(a) as I said,  
21      and now you have this performance period that you  
22      also have to do for protecting the public health  
23      post-10,000 years.

24                      MEMBER POWERS:   A question about this.  
25      You have these analyses, a performance assessment

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 and things like that, none of which will be devoid  
2 of uncertainty.

3 MR. COMFORT: Correct.

4 MEMBER POWERS: And then you've got this  
5 defense-in-depth description that you talked. Why  
6 aren't the two tied together? Why isn't the need  
7 for defense-in-depth tied to the uncertainties in  
8 these various analyses you do?

9 MR. ESH: Right. So the defense-in-  
10 depth, I think is tied to the analyses in our mind,  
11 and that's one of the primary ways that you may be  
12 able to mitigate the impact of some uncertainties,  
13 especially unanticipated events or things like that  
14 that may go on.

15 MEMBER POWERS: Well, it seems to me  
16 that they really ought to be explicitly tied, that  
17 says okay. If you can do your compliance analysis  
18 and you come back and you're compliant, and there's  
19 no big uncertainty that you've identified here, the  
20 heck with defense-in-depth. You've already got it.

21 MR. ESH: Yeah. Well in --

22 MEMBER POWERS: And on the other hand,  
23 more typically I suspect, you've come along in your  
24 performance assessment and they said well, you know,  
25 I assume they also have good justification for

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 assuming this, but I could be wrong. And so here,  
2 I'm going to do a little defense-in-depth, you know.  
3 Why aren't they just tied together at, welded at the  
4 hip?

5 MR. ESH: Right, and I think we were  
6 probably more in that direction with the initial  
7 proposed language that went up to the Commission,  
8 where the defense-in-depth was in 61.13. But as  
9 Gary indicated, we had both public comment but a lot  
10 of the public comment, I think, parroted what the  
11 one Commissioner said.

12 Basically that, you know, you're  
13 requiring this burdensome defense-in-depth analyses  
14 of these people and you don't need to do that. You  
15 know, okay. That's fair, but also in many cases the  
16 defense-in-depth analyses may be quantitative.  
17 There's no reason why it can't be if somebody feels  
18 they can do a quantitative.

19 But by making it in 61.12, in basically  
20 an information requirement, then it allows somebody  
21 to do something more qualitative or softer. They  
22 could still do something quantitative, which would  
23 be tied more directly to the technical analyses.

24 So I don't disagree with you at all.  
25 I'm just trying to explain where, why we're at the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 point that we're at.

2 MEMBER POWERS: I appreciate it.

3 MEMBER KIRCHNER: I just wanted to  
4 concur with Dana. It strikes me odd that it's not  
5 integrated. I would build my performance analysis  
6 or technical analysis or safety case, there's a lot  
7 of terminology out here, based on the measures I  
8 chose to ensure that I had defense-in-depth. I mean  
9 it's just a logical thing. I mean I don't want to  
10 make the reactor analogy but I will.

11 You know, you start with the fuel and  
12 you start with the primary cooling boundary and have  
13 the containment, and you go through some kind of  
14 performance analysis, actually very detailed  
15 technical analysis to show that for, you know, the  
16 design that you are proposing for licensing, these  
17 key elements provide that level of protection to the  
18 public.

19 It's a way of addressing the  
20 uncertainties that we obviously have in something  
21 that's going out so many years, 1,000 or 10,000.

22 MR. ESH: Right, and we hope to have in  
23 the defense-in-depth analyses information that's  
24 developed by a licensee, we hope that it will  
25 describe the defense-in-depth protections, and it

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 will also provide a basis for them. The basis for  
2 them, I think, is part of what you're getting at,  
3 and there's kind of two ways I think you could go  
4 about it.

5           You could look at the material you're  
6 dealing with and then say what protections do I need  
7 to add in there to provide safety and to provide  
8 resilience of my system. The other way though, and  
9 this happens in this field of performance  
10 assessment, is people will identify safety functions  
11 that they need for their system, and then based on  
12 the safety functions, they'll build their analysis  
13 of the problem and then they even build out their  
14 design and modify their design.

15           So they might determine I need to limit  
16 water contact with the waste. Now what are the ways  
17 that I can limit water contact with the waste? And  
18 so that kind of top-down approach of coming at it  
19 from the safety functions, it starts with the  
20 performance objective, which is the, you know, the  
21 main criteria. Then off that allows you some, I'd  
22 say considerable flexibility of how you achieve the  
23 performance objective.

24           From the other direction, if you come  
25 from the waste and build things in, that might in

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 some cases from a regulator's standpoint push you in  
2 the direction of building like subsystem performance  
3 requirements or objectives, and that was done  
4 previously in our high level waste regulations, but  
5 it runs into a lot of challenges, especially in the  
6 waste field.

7 Not when maybe when you have one waste  
8 site, but where you have lots of waste sites that  
9 are substantially different. The subsystem  
10 requirements or what you might want to achieve for  
11 one site might be considerably different for another  
12 site. So that's part of why you have this approach  
13 that we have here. I think you can make it work  
14 either way, even though I'm very sympathetic to your  
15 views and Dr. Powers.

16 MR. COMFORT: Okay. Next Dave.  
17 Continue on. Just the performance period, to  
18 minimize the release, the radioactivity to the  
19 general environment for 61.41(a), and it's  
20 demonstrated through 61.13(e). 61.42 is parallel to  
21 it. We do have the in compliance period the new  
22 limit of 500 millirems that we've added. But  
23 otherwise, it's effectively similar to the  
24 requirements of 61.41.

25 Finally, just going over where we're

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 going from here, the Commission currently has the  
2 paper. They'll be reviewing it, including whatever  
3 input that the ACRS provides to them. If the  
4 Commission approves the draft final rule for  
5 publication, we'll incorporate any changes that they  
6 may have if they do.

7 Then we'll send the package to the  
8 Office of Management and Budget for a review of  
9 approximately 90 days. Once the OMB approves that,  
10 we'll send it to the *Federal Register* publication.  
11 Once it's published, it has an effective date of one  
12 year from the publication. And then licensee  
13 updates are due at their next renewal within five  
14 years of an effective, of the effective date.

15 Now since NRC doesn't have any direct  
16 licensees for Part 61, instead the Agreement States  
17 will have to incorporate similar regulations or  
18 compatible regulations. They actually have three  
19 years from the date of publications, and then they  
20 would have similar, or likely have similar  
21 requirements about the five years. So we may not  
22 see an actual update to this for, you know, eight  
23 years or something of that sort at all.

24 So that's where we're at. Next, we're  
25 going to turn over to Dave for going over more of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the technical portion that you're going to enjoy in  
2 the guidance. Or there any other last questions on  
3 that?

4 VICE CHAIRMAN CORRADINI: I wasn't at  
5 the Subcommittee meeting, so I have a lot of  
6 questions that were probably answered. So just help  
7 me. The 25 millirem is an EPA limit. It's set with  
8 mutual agreement between EPA and NRC; is that  
9 correct?

10 MR. ESH: The 25 millirem as established  
11 by NRC, so like in the high level waste project, EPA  
12 set the standard at 15 millirem, when then NRC  
13 adopted. But in low level waste, the NRC  
14 established the 25 millirem limit.

15 VICE CHAIRMAN CORRADINI: And the logic  
16 of that number is from where?

17 MR. ESH: The basis for the 25 millirem?

18 VICE CHAIRMAN CORRADINI: Yes.

19 MR. ESH: I think it's -- there is the  
20 idea that 10 C.F.R. Part 20 public dose limit is 100  
21 millirem per year, and that from other licensed  
22 facilities that could contribute to that public dose  
23 limit, each of them should be a portion or it could  
24 be some portion of that public dose limit. So the  
25 low level waste dose limit was established as a

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 fraction of an overall public dose limit, in this  
2 case 25. Chris, do you have --

3 MR. McKENNEY: Yeah. This is Chris  
4 McKenney. I'm the Chief of the Performance  
5 Assessment Branch. The 25 millirem was established  
6 in 1982 as the dose limit, the original dose limit  
7 in 61.41, and it is very similar to the fuel cycle  
8 numbers and it is based largely similar on that.  
9 But it was a question asked during the rulemaking  
10 and during the rulemaking for -- in 1981.

11 VICE CHAIRMAN CORRADINI: And that limit  
12 is --

13 MR. McKENNEY: But it's not directly  
14 tied to that -- but it's not directly tied to the  
15 fuel cycle rule.

16 VICE CHAIRMAN CORRADINI: Okay. So if  
17 this is -- Margaret, you stop me if this is ground  
18 that's being plowed and I'll just be quiet. --

19 MR. McKENNEY: It's for any sort of --

20 VICE CHAIRMAN CORRADINI: What I guess  
21 I'm getting at is that's from release, right?

22 MR. McKENNEY: Right, from the release.

23 VICE CHAIRMAN CORRADINI: So is an  
24 intruder an accident or is an intruder a normal  
25 release? In other words, I'm trying to get a siting

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 criteria equivalency, 10 C.F.R. 100, where one limit  
2 is for some sort of accidental event versus  
3 something of normal release. So I assume 25  
4 millirem is normal release, not accident?

5 MR. MCKENNEY: Right.

6 MR. ESH: Right, correct.

7 VICE CHAIRMAN CORRADINI: Then is there  
8 a different standard for the intruder?

9 MR. ESH: The intruder is 500 millirem.  
10 Well, in the original regulation developed in 1982,  
11 there is not a dose limit for the intruder, because  
12 intruder protection for wastes that were similar to  
13 what was analyzed to develop the regulation,  
14 protection is provided by meeting the other  
15 requirements in the regulation, such as waste  
16 segregation and the waste meets the waste  
17 classification tables, Table 1 and Table 2 in 10  
18 C.F.R. Part 65.

19 But in this rulemaking, where we're now  
20 requiring an intruder analysis because some wastes  
21 are materially different from what was analyzed in  
22 the original regulation, we're using 500 millirem,  
23 which is the same value that was used to calculate  
24 the waste classification tables. Yes, it is an  
25 unexpected or in your language accident scenario.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 It's not an expected release scenario for the  
2 intruder.

3 VICE CHAIRMAN CORRADINI: And the 500 is  
4 just a -- okay.

5 MR. ESH: I'm going to talk about that  
6 in more detail when we get to mine. If I don't get,  
7 scratch your itch, then come back at it.

8 VICE CHAIRMAN CORRADINI: Okay, that's  
9 fine.

10 CHAIRMAN BLEY: Okay.

11 VICE CHAIRMAN CORRADINI: Can I try  
12 another thing? So some people have thought this  
13 through. So what's limiting under this new set of  
14 rules for a -- if on 1,000 -- I'm sorry. Let me say  
15 it, if I understand the logic. If I don't have DU  
16 as 1,000 years I can choose. If it's DU of some  
17 threshold quantity, it's 10,000 years, and is it  
18 normal release or is it accidental release that  
19 tends to limit these sites?

20 MR. ESH: All right. So first, it could  
21 be depleted uranium that triggers that 10,000 years.  
22 It could be something else too. It's written  
23 generically to just be long-lived isotopes, because  
24 we didn't want to get in the situation where this  
25 would address depleted uranium, but then some new

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 waste stream comes into play or blended waste, where  
2 you're raising the concentrations of say the long-  
3 lived isotopes, but you're in the same situation.

4 So the issue is generic that we wanted  
5 to solve, and so we did that with these time frames  
6 and the language of the significant quantities,  
7 which I'm going to talk about here in a bit. So it  
8 was intended to be generic. Yes, the main problem  
9 that we're trying to address is the one that the  
10 Commission gave us direction for, which was these  
11 large quantities of depleted uranium.

12 That's the one that this rulemaking is  
13 supposed to address. But we also wanted to address  
14 other circumstances that are similar. So what was  
15 the second part of your --

16 MEMBER POWERS: Wouldn't you get in  
17 trouble if a large -- if I have a large pile of  
18 banana peels?

19 MR. ESH: No, because it's -- in some  
20 cases it's driven by inventory and other -- I  
21 remember now. The other part, it's driven by  
22 concentration. So it's a combination of the two,  
23 concentration and inventory, and from a risk  
24 perspective, of course you can have large quantities  
25 of dilute material, and you're not going to trigger

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 that 10,000 year analyses.

2 Likewise, you could have small  
3 quantities of very concentrated material, and you're  
4 also not going to trigger that 10,000 year analyses.  
5 It's only as you move up the risk spectrum and you  
6 have both enough quantity and enough concentration,  
7 that that should kick into play. The other part of  
8 your question was --

9 MR. MCKENNEY: Which of the --

10 MR. ESH: Oh, which are the drivers,  
11 yeah. So the drivers could be different from site  
12 to site, and some sites, say some of our very arid  
13 sites, where the releases to groundwater might be  
14 very low, in those cases the intruder protection  
15 performance objective might be more of the driver.  
16 In other sites, say in some arid, especially a humid  
17 site, the releases to groundwater might be the  
18 driver rather than the intruder protection  
19 objective.

20 So that's -- these two are supposed to  
21 work together and cover all the different types of  
22 sites that we might have the U.S. The U.S. is, you  
23 know, in my opinion a great country and it's a great  
24 country for waste disposal too because you have all  
25 these different sites, different environmental

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 conditions that you can dispose of material and you  
2 can target your solutions to your material.

3 VICE CHAIRMAN CORRADINI: Your comment  
4 almost choked our chairman.

5 (Laughter.)

6 VICE CHAIRMAN CORRADINI: Okay, fine.  
7 Sorry. That was helpful. I'll wait for your other.

8 MR. ESH: So I appreciate the  
9 opportunity to come give you an overview of the  
10 major technical elements. I haven't got a read yet,  
11 but I hope the Committee is comprised of Cubs fans  
12 and not Indian fans. Okay, we've got at least one.

13 If I cover something as I go through  
14 these slides, feel free to talk about it, either  
15 during or after or whenever, anything, because  
16 there's a lot of material and we kind of had to make  
17 a guess of what material you might want to hear  
18 about, and we might not have addressed something in  
19 these slides that you want to talk about. But  
20 hopefully we're prepared to address it, even if it's  
21 not in the slides.

22 CHAIRMAN BLEY: Dave, you slides I don't  
23 think really are anchored to specifics of the  
24 guidance. But maybe as you go along, you could  
25 highlight places where --

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. ESH: Right.

2 CHAIRMAN BLEY: --the guidance is there,  
3 because we've only had that very short time to look  
4 at it.

5 MR. ESH: Right, and the guidance is --  
6 it's a decent size and has a lot of material in it.  
7 So I can see if you're busy people like we are, that  
8 you want to focus your attention on the parts that  
9 might be more sensitive or more important to you  
10 from the issues you're trying to address. So I'll  
11 try to cover that. Gary, you can go ahead.

12 MEMBER REMPE: The area that I was  
13 curious about was I mean we were talking about well,  
14 the rule has to stand on its own. But from what I  
15 went back and looked at later, the treatment of  
16 radon would only come from the guidance in how you  
17 expected it to be treated, not from the actual rule.  
18 Is that a true statement?

19 MR. ESH: I believe that is an accurate  
20 statement, because the rule does not have explicit  
21 language in it about radon. But I have a couple of  
22 slides here where I'm going to talk through that  
23 issue.

24 MEMBER REMPE: Yeah, because I'd like to  
25 hear more about that issue.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. ESH: So on the outline here, it's a  
2 little bit different from the regulation, partly  
3 because we're going to come from the top down and  
4 look at some of the important elements that we felt  
5 you wanted to hear about, and then also during the  
6 subcommittee briefing, there were a couple of areas  
7 that the subcommittee expressed interest in getting  
8 additional information on.

9 So I'm going to cover those in a bit  
10 more detail. I hope to explain what we did and why  
11 we did it, and I've combined the rule and the  
12 guidance in this talk. In some slides, I have  
13 guidance on the title. But a lot of it is kind of  
14 intertwined. Of course, the rule has to stand on  
15 its own and the guidance does not provide  
16 requirements. That's a clear thing you need to  
17 understand.

18 Our licensees in some cases will use the  
19 guidance and in some cases they will not. So if  
20 they can achieve the requirements by their own  
21 means, then they're not obligated to follow guidance  
22 of course. We feel that those provide a useful tool  
23 for them and especially for Agreement State  
24 regulators.

25 I have a lot of respect for our

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Agreement State regulators, because they have tough  
2 jobs. They have to interface with the public. They  
3 have to work on a lot of these complicated things,  
4 on essentially a part-time basis, you know. They  
5 don't have teams of different ologists to work on  
6 various things that go into a performance  
7 assessment. So hopefully our guidance is useful to  
8 them.

9 CHAIRMAN BLEY: Maybe there's something  
10 I didn't ask at the subcommittee, but this ties to  
11 it.

12 MR. ESH: Uh-huh.

13 CHAIRMAN BLEY: The rule tells the  
14 Agreement States to some extent what they have to  
15 do. The guidance, is that up to the -- you know, if  
16 they were submitting to the staff, then if you met  
17 the guidance you're good. If you're submitting to  
18 an Agreement State, does the same thing apply or do  
19 they adopt the guidance or do they have their own  
20 guidance derived from yours? How does that work?

21 MR. ESH: In some cases they will use  
22 our guidance. In other cases, they'll develop their  
23 own guidance. So and they might use not just this  
24 NUREG-2175 that we developed now, but they'll also  
25 consult other NUREGs and other technical documents

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 in doing their review.

2 CHAIRMAN BLEY: And so if I'm a licensee  
3 who's got a -- in an Agreement State, I can't really  
4 say I meet the NRC's guidance; therefore, I'm good.  
5 I have to know what my own regulator is requiring of  
6 me?

7 MR. ESH: Right. The Agreement State,  
8 because it is guidance, it doesn't hold the weight  
9 of the rule requirements. Even the Agreement State  
10 regulator, I think, could push for a deviation from  
11 the guidance if they chose, based on their state-  
12 specific circumstances so --

13 MR. COMFORT: And remember also, the  
14 states can adopt sometimes regulations that are  
15 different in ways from what we have. So they would  
16 of course, you know, what may meet our guidance for  
17 our regulations, if they do something more  
18 conservative it may not meet their requirement.

19 MR. ESH: So next slide please Gary.  
20 This is an overview of all the pieces of the  
21 regulation that from my viewpoint I would say are  
22 risk-informed performance-based. I know that's a  
23 sensitive terminology to some, but the argument I  
24 would put forth is if you take these things out, do  
25 you believe it is more risk-informed and

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 performance-based than if they are in.

2 I would argue that all these things  
3 combined, individually and in totality, give you a  
4 more risk-informed performance-based way to do low  
5 level waste regulation. An interesting challenge  
6 that we face is that some stakeholders, of course,  
7 don't view it that way and they even present things  
8 in somewhat of the opposite direction, based on the  
9 staff's approach in the proposed final regulation.

10 I'm going to explain many of these in  
11 more detail and our guidance document provides quite  
12 a bit more detail of most of these topics. Now  
13 throughout my presentation today, when I refer to  
14 the original regulation and if I talk about things  
15 that were done in the past, I might use "they." I'm  
16 referring to NRC. I am NRC, but it's just not  
17 straight in my mind yet that I should be saying  
18 "we." I remember I was playing Little League when  
19 that was done.

20 So it's just understand, I'm speaking of  
21 NRC, whether I say we or they. And I also use the  
22 language existing and current. So existing and  
23 current is what's on the books right now. What we  
24 came to talk to you about is what the proposed final  
25 regulation would be. So that's some terminology

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 things I might use.

2 Next slide, please. So the first area  
3 that I'll talk about here is the safety case. This  
4 was added at the direction of the Commission, and  
5 our view is that the safety case has always been an  
6 implicit part of Part 61, and it's now being made  
7 explicit and at least in the sense of terminology.

8 It's defined as the combination of  
9 defense-in-depth and technical analyses. So this is  
10 where you do get some merging of defense-in-depth  
11 and technical analyses and how they both come  
12 together to form the safety case. We do believe  
13 that the safety case should be a plain language  
14 description.

15 So essentially an executive summary of  
16 your licensing basis. It should be understandable  
17 to many. It may be, have some, quite a bit of  
18 technical information, but it should be presented in  
19 the language and form that provides your overall  
20 safety basis. The overall safety basis is going to  
21 be a lot different than just your calculations.  
22 There's a lot that goes into developing the safety  
23 case for a low level waste disposal facility, of  
24 which only one part of it is the calculations.

25 CHAIRMAN BLEY: Can I ask you about the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 language a little bit?

2 MR. ESH: Yeah, sure.

3 CHAIRMAN BLEY: I'm familiar with what  
4 the Brits do in this area, and what their safety  
5 case is and the safety case there is filed by the  
6 applicant or licensee, and it's maintained at the  
7 regulator's headquarters and they refer to it. Here  
8 in the past, we have a submittal from an applicant  
9 or licensee, and an SER from the staff, and some  
10 could argue that that combination constitutes the  
11 safety case under which we operate.

12 Why did you pick the language, and do  
13 you see something different than what we've always  
14 had here?

15 MR. ESH: I don't see it as different.  
16 I believe that -- I mean the overall safety basis,  
17 of course, is what's supplied by the licensee. But  
18 then part of that is the independent regulatory  
19 review provided by the NRC. That's a key part of  
20 the overall decision process. But the licensee's  
21 basis has to stand on its own merit.

22 So as we get information in, of course  
23 if it's not complete or insufficient, we'll develop  
24 requests for additional information, which they'll  
25 go forth and produce more information. But then

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 ultimately the decision as to whether to approve the  
2 application or not is dependent on the licensee's  
3 information.

4 So I don't know if I answered your  
5 question or not.

6 CHAIRMAN BLEY: So now I'm still not  
7 sure why we introduced the new language.

8 MEMBER CHU: Can I add something?  
9 Safety case is sort of a standard language in the  
10 waste disposal community, especially in Europe.

11 CHAIRMAN BLEY: And it is in the nuclear  
12 power plants in Europe too, but it hasn't been over  
13 here.

14 MEMBER CHU: See, I don't know. I'm  
15 just telling you I see the phrase "safety case," you  
16 know and used all the time in the European community  
17 in waste disposal.

18 CHAIRMAN BLEY: So this is an effort at  
19 harmonization with the Europeans?

20 MEMBER CHU: I don't know. I think  
21 people read it all the time and then they kind of  
22 use it, okay. That's my interpretation why it's  
23 there.

24 MR. ESH: And I would concur with Dr.  
25 Chu. I mean this was added at the direction of the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Commission, the specific language, the language for  
2 the safety case. And our approach is, I believe, in  
3 alignment with the IAEA, the International Atomic  
4 Energy Agency.

5 There are some differences though, so  
6 for the IAEA and especially in the European  
7 community, partly their safety case process may  
8 involve very direct and collaborative integration  
9 with stakeholders, especially in the siting phase of  
10 development of a facility.

11 So that's different here in the NRC  
12 licensing processes. We don't have that step in the  
13 process. Then in addition in the European  
14 community, some member states will do multiple  
15 safety cases. So they'll do a safety case for site  
16 selection, they'll do a safety case for  
17 construction, a safety case for operation, a safety  
18 case for closure. In NRC, our safety case is all  
19 wrapped up in one.

20 So you may and you will update your  
21 safety case potentially when you get to the closure  
22 step, but everything -- you should have all the  
23 basis up front whenever you come in to say yes, I'm  
24 going to authorize the facility. To me personally,  
25 I don't think it makes sense to do a safety case for

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 site selection, and then do a different one for  
2 operation and construction.

3 What happens if you say well no, you  
4 can't operate it and construct it. Well then you  
5 spend all that money and energy in doing the site  
6 selection, and then you never can see the thing  
7 through. It's better if all the information is  
8 developed up front, so you can determine whether I  
9 get from A to B with what I've done. So that's kind  
10 of my personal opinion on it.

11 VICE CHAIRMAN CORRADINI: So this --  
12 you're going down a path that's going to help us.  
13 But let me ask, what is considered a site? If I'm  
14 just storing depleted uranium as a gas in a  
15 monitored facility above ground, is that a site?

16 MR. ESH: No. This is for disposal.

17 VICE CHAIRMAN CORRADINI: So as long as  
18 I do that, I don't have to follow these rules.

19 MR. ESH: No. This is for disposal. So  
20 disposal is defined in the regulation in 61.2, a  
21 disposal site and disposal facility. There's  
22 definitions that describe what those are.

23 VICE CHAIRMAN CORRADINI: All right, so  
24 let me ask my next question then. Is when I do  
25 enrichment, which we've stopped doing here. We do

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       it all somewhere else. But if I'm still doing it in  
2       New Mexico and I have a bunch of depleted uranium on  
3       the LES site, and it's manned, that's not one of  
4       these sites? That doesn't have --

5                   MR. ESH: No.

6                   VICE CHAIRMAN CORRADINI: So is the  
7       safety there any different than I'd expect from the  
8       safety of depleted uranium on a site such as this?  
9       It seems to me the mobile nature of it, I'd more  
10      worry about LES than I'd worry about a bunch of  
11      reengineered chemical form that's a hell of a lot  
12      less, a hell of a lot more inert. So am I missing  
13      something?

14                  MR. ESH: Well, I mean the material has  
15      to be managed safely throughout its life cycle. So  
16      if it's in UF<sub>6</sub>, uranium hexafluoride form, gaseous  
17      form in canisters, that material has to be -- that's  
18      essentially being stored. But it has to be stored  
19      safely, and it has different requirements associated  
20      with storage and the safety assessment of that  
21      material while it's sitting there in storage.

22                  So when it moves to disposal then,  
23      that's where this kicks in for commercial disposal,  
24      in facilities licensed by the NRC or one of our  
25      Agreement States. That's when this comes into play.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 VICE CHAIRMAN CORRADINI: So my final  
2 question, since this is totally -- I'm just a  
3 reactor person, so I don't understand any of this.  
4 Is the front end depleted uranium regulations  
5 consistent with the disposal regulations?

6 In other words, to just my simple mind,  
7 I would think the chance of having something as a  
8 release to concern the public would be a lot more  
9 when I have UF6. So I assume the regulations there  
10 are different or restrictive than these? These seem  
11 relatively restrictive for a relatively inert  
12 substance, but I could be wrong.

13 MR. ESH: Right, and I can't speak to  
14 what those requirements are under storage at this  
15 time.

16 VICE CHAIRMAN CORRADINI: I would think  
17 staff would want to make sure that I'm not  
18 regulating the apples and oranges and I'm making the  
19 oranges super-safe and the apples are not so.

20 MR. COMFORT: Well again, you're  
21 evaluating two different things. I mean like for  
22 the onsite storage, you know, you're generally  
23 looking that it's going to be actively assessed, you  
24 know. You're going to have controls on it and all.

25 A lot of these regulations are that the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 site at some point is going to be, you know, let go,  
2 then it's going to be free release. Or not free but  
3 released, and you want to make sure that when  
4 somebody somewhere down the road comes by, they're  
5 not going to be impacted. For the storage scenario,  
6 I mean the expectation is that somebody's going to  
7 be actively monitoring and making sure there's  
8 protections on top of --

9 VICE CHAIRMAN CORRADINI: And that's the  
10 physical difference of my first question. Okay  
11 fine, thank you.

12 MR. ESH: So the safety case is to  
13 describe all safety-relevant aspects of the disposal  
14 site, the design of the facility, things like  
15 managerial control measures and regulatory controls,  
16 to inform this overall decision of whether to grant  
17 the license or not.

18 It's the same type of information that  
19 is in the current 10 C.F.R. Part 61, and that's to  
20 be submitted as part of the license application on  
21 Section 61.10 and 61.16. We expect that the safety  
22 case will be updated over time, but the safety case  
23 also may be somewhat static. It depends on whether  
24 the information associated with the performance of  
25 the facility changes over time, and how maybe

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       unforeseen things may have been appropriately  
2       anticipated at the time of licensing or not.

3               So next slide, Gary. So the first, one  
4       of the two main components of the safety case is the  
5       defense-in-depth, and this was also added at the  
6       direction of the Commission. It's also in our mind  
7       it was implicit in the existing Part 61, and now  
8       it's being made explicit. So all the pieces of Part  
9       61 fit together in some ways that I'll explain, to  
10      provide you defense-in-depth.

11             The defense-in-depth requirements,  
12      because there was this opposition to the terminology  
13      of analyses, are listed here in the bottom three  
14      bullets. It's to identify the protections  
15      commensurate with the risk, describe the  
16      capabilities of the defense-in-depth protections and  
17      then provide a basis for those defense-in-depth  
18      protections.

19             We didn't want to add a new definition  
20      for defense-in-depth and low level waste disposal  
21      because it is a concept that's used in many other  
22      regulatory programs, especially in the reactor area  
23      that you're very familiar with.

24             But there are some differences, so in  
25      the waste disposal problem, especially as you go out

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 in time, you're relying on passive performance of  
2 the system and not active management. This goes to  
3 your question just about these storage versus  
4 disposal.

5 So there's a difference between passive  
6 versus active and what you may do to achieve  
7 protection in public health and safety.

8 Next slide, Gary. So during operations,  
9 you have the opportunity to use active safety  
10 systems, and that may include personnel doing  
11 things, measuring things and maintaining things.  
12 You still also will have passive safety systems  
13 commensurate with the hazard and complexity of  
14 activities during operations.

15 When you move to post closure, which is  
16 the time when you've done operating, done receiving  
17 all your waste and then you move through your  
18 institutional control period, the disposal site is a  
19 passive system, and you're only relying then on the  
20 natural site characteristics and the engineered  
21 features.

22 So that's a bit different from the  
23 defense-in-depth perspective, and some of the  
24 comments that we received were associated with well  
25 does this mean that I have to have multiple barriers

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 of the same type. So in a reactor, you might have a  
2 pump and a backup pump. Well, in a waste disposal  
3 system, you have engineered cover, you have a  
4 drainage layer in it. Does that mean I need two  
5 drainage layers?

6 So we had to explain that no, you're  
7 looking at the redundancy or the resiliency of the  
8 functionality of the system, not necessarily the  
9 specific components. This affords you considerable  
10 flexibility about how you're going about  
11 demonstrating your defense-in-depth protections.

12 Now each layer that you're using in this  
13 argument about defense-in-depth should be a layer a  
14 defense and make a definitive contribution to  
15 isolation of the waste. But that isn't to say that  
16 everything has to be credited as a layer of defense.  
17 You may choose which features of your system you  
18 want to bring forward into your defense-in-depth  
19 arguments. Next slide, please.

20 MR. GROSSMAN: Hey Dave, this is Chris  
21 Grossman from the NRC staff. If I can interject  
22 here.

23 MR. ESH: Sure.

24 MR. GROSSMAN: To go back to some of the  
25 members' earlier questions about the tie between

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 defense-in-depth and the analyses, if you go back to  
2 your previous slide that showed the graph. In the  
3 guidance, while the rule may not show as direct of a  
4 tie as we'd like.

5 In the guidance, when we talk about  
6 providing a technical basis, a lot of the guidance  
7 focuses on drawing from insights from the analyses  
8 to develop that basis, and making sure that they're  
9 consistent.

10 So for instance we might use what we  
11 term a barrier analysis and performance assessment,  
12 where you look at the capabilities of the barriers  
13 and how they contribute to the performance of the  
14 system, and you would use that information then to  
15 perform your defense-in-depth projections.

16 MR. ESH: Thank you, Chris. So the next  
17 area that I'll discuss is the analysis time frames.  
18 I believe I have 13 slides or so on this, and  
19 hopefully we can give you a clear picture of what  
20 we're doing and why.

21 Throughout this process, the rulemaking  
22 process, from the beginning there's been significant  
23 interest in this topic. We received significant  
24 comments reflecting some diverse opinions, and we've  
25 devoted significant effort to the formulation of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       this final position that we're discussing here  
2       today.

3               The subcommittee desired more  
4       information on this topic, so that's why I'm giving  
5       you some more material to walk through here, and  
6       provide more of the basis for what we're doing. If  
7       you're -- if you're going to rely on the technical  
8       analyses-based approach, then our opinion is you  
9       need to analyze your system to the best of your  
10      ability, and you should bring to bearing on your  
11      decision the full weight of information that you  
12      can.

13             There's no reason to limit the  
14      information, especially if you can clearly explain  
15      and discuss the uncertainties associated with it  
16      and the caveats associated with the information.  
17      The uncertain information is better than no  
18      information at all in our opinion.

19             So in the area of time frames here on  
20      this slide, the existing language in Part 61 is that  
21      the compliance period is not defined for either  
22      61.41 or 44. That's what Gary mentioned in his  
23      talk. For intruder, the inadvertent intruder  
24      protection, the language is the inadvertent intruder  
25      should be protected at any time under 61.42.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           So I mean you can interpret that a lot  
2 of different ways, and it has been interpreted  
3 different ways, but the language is at any time. So  
4 I could see that some people may truncate that  
5 interpretation, but the language is there in the  
6 existing regulation.

7           What we're attempting to do in the  
8 proposed final rule is we have a compliance period  
9 of 1,000 years that the site does not contain  
10 significant quantities of long-lived waste, and  
11 otherwise it's going to be 10,000 years.

12           Then the performance period, which is  
13 this probably quantitative calculations that are  
14 interpreted very qualitatively, occurs after the  
15 compliance period and the standard is just to  
16 minimize the exposures to the extent reasonably  
17 achievable. As Gary indicated, that was in the  
18 proposed rule package and the Commission left it  
19 untouched in their direction to us that came back.

20           So we once again preserved that. The  
21 difference here in this proposed final rule is that  
22 as Gary indicated, we had that three-phased approach  
23 with a goal and the goal was above the public dose  
24 limit, and there was a lot of confusion,  
25 misinterpretation and a lot of stakeholders said

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 this complexity really isn't warranted. You don't  
2 need to do this.

3 And so we were trying to, even then but  
4 especially now, balance this idea that low level  
5 waste in some ways, much of it can be contained and  
6 it is short-lived, and so what is your obligation to  
7 do anything burdensome or over the long term if you  
8 can manage that short-lived activity?

9 But low level waste also has a component  
10 that's long-lived, and in the case of depleted  
11 uranium it's a very big fraction that's long-lived.  
12 So what do you do with that? This approach is  
13 attempting to tailor your analyses to the type of  
14 waste that you're dealing with, so that you don't  
15 have the burden of longer analyses associated with  
16 the long-lived waste, but you do have it when you do  
17 have long-lived waste.

18 We think that is a risk-informed way to  
19 look at these very different waste forms that you  
20 may be dealing with. Now go back please Gary. The  
21 existing slides or the existing approaches in the  
22 regulation, because it's not defined has led to  
23 broad variances in how that's been interpreted.

24 So the compliance periods that have been  
25 used in our four Agreement States have ranged to 500

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 years to 50,000 years. Then in addition, in the  
2 area of intruder protection, two of the Agreement  
3 States analyzed intruders in their licensing  
4 analysis, even though it's not required by the  
5 existing regulation, and another one is in the  
6 process of doing that now an one of them did not.

7 So the existing status of what goes on  
8 in low level waste is described by those bullets and  
9 then my language. Now it has been a very tortuous  
10 path to get from existing to proposed final. We're  
11 prepared to discuss that with you if you like, but  
12 it also is a bit of a tortured path. So you know,  
13 if you'd like to we will, but I don't know if it's  
14 going to be useful to you to judge the merits of the  
15 proposed final approach.

16 MEMBER KIRCHNER: David, if you skip the  
17 torture, could you just explain with -- give us  
18 examples from the compliance states how this last  
19 line has been interpreted, or you expect it to be  
20 interpreted minimize exposures to the extent  
21 reasonably achievable?

22 MR. ESH: Oh, for the performance  
23 period, yes. So that would be -- this would be a  
24 new requirement. So we don't have any basis yet to  
25 how that might be interpreted in our Agreement

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 States. Now what I would indicate is that that is  
2 intended to only apply when you have significant  
3 quantities of the long-lived isotopes.

4 So it might be a very limited number of  
5 Agreement States that are going to be doing that  
6 interpretation. But we do have in our, the guidance  
7 document --

8 MEMBER KIRCHNER: Wait a minute. Didn't  
9 you share with us, we have like four Agreement  
10 States, three of which used 10,000 years?

11 MR. ESH: What we have is we have four  
12 Agreement States, and under the existing rule, so at  
13 the top part of this slide. Originally, one of them  
14 used 500 years, one of them used 2,000, one of them  
15 used 10,000 years but then looked longer in their  
16 environmental analyses, and one of them used 50,000,  
17 okay.

18 MEMBER KIRCHNER: Okay. I didn't get it  
19 quite right, but --

20 MR. ESH: Right.

21 MEMBER KIRCHNER: So what would your  
22 expectation be going forward with this?

23 MR. ESH: Going forward under this  
24 proposed final approach, if a site came into NRC, we  
25 would use 1,000 years for the compliance if they do

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 not have significant quantities of long-lived  
2 isotopes, and we would use 10,000 years otherwise  
3 combined with the performance period.

4 The Agreement States are all -- or I  
5 mean the four existing states are all under  
6 Agreement States, and with the compatibility being C  
7 in the draft final regulation, that they would be  
8 free to use this or be more restrictive. So the  
9 ones that used say 2,000 for their compliance period  
10 could still use 2,000.

11 If they had significant quantities of  
12 long-lived waste though, they would be -- they would  
13 need to increase that to 10,000. The one that used  
14 10,000 and 50,000 could still use their 10,000 and  
15 50,000 for all waste even -- okay.

16 MEMBER KIRCHNER: I'm with you that far  
17 I think explicitly. My question is how, what's your  
18 expectation on how the last line is going to be  
19 interpreted?

20 (Off mic comment.)

21 MR. ESH: On the proposed final down  
22 here, for the performance.

23 MEMBER KIRCHNER: Analyzed exposures to  
24 the extent reasonably achieved. How is that going  
25 to be defined? Are you going to -- does the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 guidance have a standard suggestion?

2 MR. ESH: I mean this -- this is the  
3 standard. The guidance has an interpretation of  
4 that standard. It's an interpretation that the staff  
5 would find acceptable for somebody to do when  
6 they're in this situation. I mean the --

7 MEMBER KIRCHNER: Could you show that,  
8 what you would do as staff for this implementation,  
9 your suggested guidance?

10 MR. ESH: Right. Priya, do you want to  
11 look up where that is in the guidance?

12 MS. YADAV: Sorry, that's really loud.  
13 This is Priya Yadav with the NRC. It's actually in  
14 Section 6.3. So Section 6 covers the performance  
15 period. The whole section covers the performance  
16 period analyses. So if you look at 6.3.1.1.3, I know  
17 a lot of you have the CDs that we gave out maybe a  
18 couple of weeks ago?

19 MEMBER KIRCHNER: I don't have it with  
20 me, no.

21 MS. YADAV: Well that just -- that just  
22 is where we talk about how we envision this being  
23 interpreted.

24 VICE CHAIRMAN CORRADINI: I think all  
25 Walt's asking, I think, is this an empirical

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 example that's acceptance?

2 MR. ESH: Okay. So what we intended for  
3 this is that for that post-10,000 year period, when  
4 you have significant quantities of long-lived waste,  
5 you're probably going to be doing quantitative  
6 calculations of what you expect to happen in the  
7 system. You're going to then qualitatively  
8 interpret that as to whether you've minimized  
9 exposures, and part of that might be like  
10 traditional barrier analyses.

11 What are my barriers that are  
12 contributing to mitigating those longer-term  
13 impacts? If I, for instance, looked at a different  
14 engineered cover or a different waste form, how  
15 would that change my projection of how I think the  
16 system is going to behave? It's a standard similar  
17 to our ALARA standard that applies under our current  
18 regulation, except for ALARA, you have to have a  
19 dose limit, and there was not a lot of support for  
20 dose limits for the very long time periods.

21 So we developed this standard that is  
22 conceptually similar, I don't know if you're  
23 familiar with ALARA.

24 MEMBER KIRCHNER: In theory I am.

25 MR. ESH: So the ALARA standard is

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 basically a -- I would call it in layman's terms a  
2 combined technical analyses, not necessarily an  
3 optimization of lowering your doses, but a cost-  
4 benefit analyses of your doses and what you might  
5 do, the things you might be able to do to reduce  
6 those and is it reasonable to take those actions.  
7 So in simple terms that's what it would look like.

8 MEMBER KIRCHNER: So but you said it  
9 well. That's what I expected. So how in  
10 implementation does that play out with the Agreement  
11 States? Is it likely that then the license, the  
12 licensee will have to do detailed analyses that go  
13 way beyond performance period, where you're more in  
14 a compliance. You'll do a calculation, demonstrate  
15 to us that the exposure is less than the  
16 requirement?

17 But here, it just suggests somewhat  
18 open-ended. What is a cost-benefit analysis going  
19 to look like here in terms of costs or how many  
20 millirem so to speak?

21 MR. ESH: Right. Well I think -- well  
22 the challenge in waste disposal when you get out to  
23 very long times is what or what or even if you do  
24 with discounting, okay? So in NRC space, whenever  
25 we look at rules and rulemaking, we'll apply

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 discounting to look at whether it's reasonable to  
2 implement something.

3 In waste space, because of the long time  
4 frames involved, if you apply discounting at any  
5 sort of manageable rate, you say I shouldn't do  
6 anything with any impacts beyond a very short period  
7 of time, and that's really not in alignment with the  
8 principles of what people try to do in waste  
9 management. I think it's an artifact of trying to  
10 extrapolate this approach with discount rates, the  
11 very long periods of time.

12 So but the cost-benefit, and we talk  
13 about this hopefully in Section 6-3 of the guidance  
14 document, if I remember, is more like I tried to  
15 explain earlier. It could be quantitative, but it  
16 could also be qualitative. What are my options for  
17 doing things to change these impacts in a positive  
18 way from what I estimate with my system?

19 VICE CHAIRMAN CORRADINI: But I think --  
20 that I figured you'd have to do. But then they'd  
21 have to compare it to something to say I've done  
22 enough. And so I'm still struggling to what the  
23 something is, or an example of what you think the  
24 something is that's acceptable. I'm looking for  
25 some measure.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. McKENNEY: They can either use --  
2 this is Chris McKenney again from the Performance  
3 Assessment Branch. We have an example on page 615  
4 of using, still running out the dose model to try to  
5 do elevations but not actually using the dose limit  
6 to show the relative magnitude of that, which is one  
7 area we've used in the area of waste and stone  
8 reprocessing, when we've been reviewing long-term  
9 analyses related to that with the Department of  
10 Energy, to evaluate how system behave past 10,000  
11 years.

12 Other areas that have been discussed,  
13 especially in the international field of using stuff  
14 like natural fluxes for those type of things, of how  
15 things are relative to the natural functions in the  
16 area, so that you can compare to those.

17 Instead of dose rates, you can compare  
18 it to other subsystem performance and relative  
19 changes compared to in your system. So you could do  
20 it on rates of change and look at that, on how  
21 stabilized your system has become. Those are the  
22 other modes to say here, my system is stabilized  
23 out. This is what I'm doing.

24 What is my rate of release over time,  
25 because when you get out to really long time

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1 periods, there are not only -- there's some spikes  
2 in the data also that are caused by this modeling  
3 artifacts, like the fact that you've got all these  
4 individual packages that are in your system, and if  
5 you actually assign probabilities of failure then  
6 they'll almost all fail at once, and then all of the  
7 sudden you'll have this big spike of data, and  
8 you're on -- but that's just modeling but --

9 VICE CHAIRMAN CORRADINI: So let me just  
10 ask my question. Let me give you an example and you  
11 tell me if I was the licensee, you'd be telling me  
12 to go pound sand. So if I prove that at 10,000  
13 years I can meet the 25 millirem, but at a million  
14 years I predict, due to wear and tear and just it  
15 goes away, it's 250 millirem at a million years and  
16 I tell you that I don't want to do anything more  
17 than that, because I'm going to spend more than  
18 \$5,000 a person rem averted, is that good enough?

19 MR. ESH: Right. I think something like  
20 that would be good enough, yeah. I don't --

21 MR. MCKENNEY: That would be good  
22 enough.

23 MR. ESH: We don't have a -- and that's  
24 the point is after the 10,000 year period, we don't  
25 have dose limit associated with it. The standard is

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 here and it's subjective, and it's going to be  
2 subjectively interpreted, but it's similar to ALARA.  
3 The ALARA standard is also subjective and it's  
4 interpretive.

5 Now ALARA is reducing below the limit  
6 that you're applying, because you do have a limit to  
7 compare with and to go down further. This  
8 performance standard at the longer time, you don't  
9 have a dose limit and it may be larger and you may  
10 be able to make a suitable argument to why you've  
11 achieved -- why you've achieved as much as you can  
12 achieve with your disposal system.

13 So the fact that the doses may be, and  
14 this is one thing that we couldn't really address in  
15 this rulemaking, but it bears stating again at  
16 least, you know, this fear of radiation and how we  
17 regulate it. If you think about what people do in  
18 their everyday lives with respect to radiation, and  
19 then how they react in -- how they act in reaction  
20 to a dose standard in the waste regulations, those  
21 two things in many cases can be substantially  
22 different.

23 So I don't know people that live in  
24 North Carolina and say I'm not moving to Colorado  
25 because I'm going to get two or three hundred more

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 millirem by changing states. But you know, there's  
2 a big concern about potentially 25 millirem from the  
3 waste disposal system. So I mean that's a problem  
4 that we could not resolve in this regulation.

5 But for the very long time frames, I  
6 think that sort of discussion with the stakeholders,  
7 where that facility is located is appropriate and  
8 can be used as the basis for whether you've achieved  
9 this minimum exposures to the extent reasonably  
10 achievable.

11 MEMBER REMPE: In the example, you  
12 compare it with -- you had a larger millirem per  
13 year at 30,000 years and you're having in the  
14 example the licensee includes a comparison with  
15 natural occurring radionuclides from the disposal  
16 facility. So if they're -- if they were better than  
17 background, you'd say oh sure, go ahead probably.

18 But then it gets a little more fuzzy  
19 about if they did an analysis of barriers because  
20 there's no cost-benefit that you've said is  
21 acceptable. So you just kind of have fuzzy guidance  
22 at this time is where they're at.

23 MR. ESH: Well, I don't think we should  
24 focus on trying to put too much precision on this  
25 sort of calculation or on this sort of requirement.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 I think it's a good principle to have, and I think  
2 it's an effective or it may be an effective means to  
3 understand your system and make good decisions about  
4 the design of your system.

5 But in order to try to argue that it's  
6 precisely providing some public human health and  
7 safety benefit at longer times, then it gets kind of  
8 the wrong way. The wrong way I look at it, you  
9 know, I don't know. We can --

10 VICE CHAIRMAN CORRADINI: Just one  
11 clarification. But the performance period beyond  
12 10,000 years was a direction by the Commission?

13 MR. ESH: Yeah. The performance period  
14 was in the proposed regulation, and it was retained  
15 by the Commission whenever they gave our direction  
16 back on it. So it was in the proposed regulation,  
17 and they didn't say get rid of the performance  
18 period.

19 MEMBER MARCH-LEUBA: Let me ask, if you  
20 -- oh, go ahead.

21 MEMBER CHU: You know, I was reading the  
22 past letters from this committee that was before me,  
23 and one of the letters, I can't remember from  
24 exactly when, one of the recommendations from this  
25 committee was why have a fixed time frame, okay?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       Why not do it case-by-case? When you think about  
2       it, you only have four sites.

3               You know, it can be a reasonable  
4       recommendation, you know, because you only have four  
5       sites. It's not that you have 80, you know, that  
6       you have to impose some kind of a big rule and  
7       because eventually it's almost like you're going to  
8       be doing a case by case, right? I just want to make  
9       that comment, you know.

10              MR. ESH: Yeah, let me get the slides.

11              MEMBER POWERS: It seems more that the  
12       compliance period and performance period ought to be  
13       a product of the performance assessment. I mean  
14       that's the way you ought to look at them and it's  
15       the NRC's responsibility to find the criteria that  
16       you use for saying okay, my particular site I have a  
17       compliance period of 250 years and a performance  
18       period of 30,000 years.

19              MR. ESH: Right, right. Let me get  
20       through a few of these slides, and I think we'll  
21       hopefully cover both of your --

22              MR. COMFORT: I just want to bring one  
23       comment. You had a question of did the Commission  
24       direct us? Yes, in their SRM to CRMWDM-1102, they  
25       specifically said use a two-tiered approach with a

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 compliance period covering reasonably foreseeable  
2 future and a longer period of performance.

3 So that was -- that's the way we  
4 interpreted that to come out is what they were  
5 looking for, something that you can have a  
6 quantitative limit and then you've going to have  
7 some further period after that.

8 VICE CHAIRMAN CORRADINI: So if I might  
9 just expand. So they were open to a qualitative  
10 factors beyond the time period?

11 MR. COMFORT: Right. They specifically  
12 said -- well, they said a longer period of  
13 performance, but that's where we took it as  
14 qualitative.

15 MEMBER STETKAR: If I read the SRM to  
16 SECY-13-0075, number eight in there specifically  
17 says "The Commission has approved the staff's  
18 proposal for applicants to provide a qualitative  
19 analysis covering a performance period of 10,000  
20 years or more after site closure to evaluate the  
21 ability of the disposal system to mitigate long term  
22 risks associated with the disposal of long-lived low  
23 level radioactive waste."

24 So that's pretty clear guidance from the  
25 Commission on that, but it's -- it specifically says

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 "provide a qualitative analysis."

2 VICE CHAIRMAN CORRADINI: Okay.

3 MEMBER MARCH-LEUBA: But let me change  
4 the topic a little bit. If you make a good design  
5 that satisfies the one to 10,000 year perfectly and  
6 you have a good disposal site, under which  
7 circumstance will you have you a bad one at year  
8 10,001? I mean if you do the work for the first  
9 10,000 years, it's also going to work for  
10 afterwards, right?

11 MR. ESH: Right. It should, yes.

12 MEMBER MARCH-LEUBA: Okay. So if you're  
13 going to complain about this and nobody's going to  
14 fail.

15 MR. ESH: We don't -- I think it would  
16 be rare that you would have a facility that had  
17 significant quantities of long-lived waste that you  
18 could demonstrate that it meets the criteria for  
19 10,000 years, and then you run into this enormous  
20 problem after 10,000 years.

21 About the only way you do that is if you  
22 say you used an engineered barrier design like a  
23 canister, stainless steel canisters or something  
24 that have discrete failure, and they're good for a  
25 certain period of time and then they fail. Maybe

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       you run into it in something like that.       But  
2       otherwise it should be -- it should not be very  
3       likely.

4               But to follow on with Dr. Chu's point,  
5       you know, the ACRS or the ACNW discussed this issue  
6       back even in the mid-90's of the time frame.  
7       There's a lot of letters.       There's a lot of good  
8       information in there.

9               We read all of those and tried to come  
10       up with something that would work with the main  
11       principles of it, and I think this framework has all  
12       those main principles, but there are some ways that  
13       it deviates, and that's what I hope to talk through  
14       here.   You can go to the next slide, Gary.

15               MEMBER MARCH-LEUBA:   How about -- no,  
16       going back to the point.   I mean if this performance  
17       period of 10,000 years precludes you from using a  
18       sacrificial barrier, then you know it will only last  
19       for 10,000 years.   That is a good requirement.

20               MR. ESH:   Right.

21               MEMBER MARCH-LEUBA:   I mean you should  
22       not design your thickness that you know it will fail  
23       10,001.

24               MR. ESH:   Right.   We would agree with  
25       that.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MEMBER MARCH-LEUBA: So I --

2 MR. ESH: So this slide is out of the  
3 guidance document or slightly modified from the  
4 guidance document. But this basically summarizes  
5 the time frames that are used in Part 61 or required  
6 in Part 61.

7 Most of these are not changed in this  
8 rulemaking. They're existing in Part 61, and the  
9 area where it is changed is the two, the second one  
10 down and in the third one down, the compliance  
11 period and the performance period.

12 That is new material in this rulemaking  
13 in this regulation, and that was done because we  
14 had fairly extensive stakeholder interactions early  
15 in this process, and this was one area where the  
16 stakeholders were in agreement, that they wanted the  
17 compliance period or the analyses time frames  
18 defined in the regulation.

19 Of course, they could not agree as to  
20 what they should be, but they wanted them defined.  
21 So that's how -- why we are where we are now. Most  
22 of the time frames in the existing -- are in the  
23 existing regs besides their compliance and  
24 performance period. Overall though, there was some  
25 significant confusion even to this date about the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 time frames.

2 So there's language in 61.7 that's  
3 reflected here on the slide 61.7(a)(2), where it  
4 says the site characteristics should be considered  
5 for a 500 year time frame or the indefinite future.  
6 That was interpreted by some stakeholders, and even  
7 it's reflected in their comments on the rulemaking  
8 package, that Part 61 was using a 500 year  
9 compliance period.

10 Part 61 was never using a 500 year  
11 compliance period. The 500 years comes into play  
12 mainly with the Class C intruder barrier with  
13 respect, or the intruder barrier with respect to  
14 Class C waste. It had nothing to do with 61.41. So  
15 that's a misconception that I wanted to make clear  
16 here.

17 And then the other point is that much  
18 too much focus is being placed on the technical  
19 analyses, especially the dose assessments. When the  
20 dose assessments are products of computer modeling  
21 and yes, we're in a modern age and we can do so much  
22 more than we used to be able to do.

23 But there's still the output of computer  
24 models. The computer models are not making the  
25 licensing decisions. It's the regulators, licensees

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 and other stakeholders that are taking that input to  
2 make the decisions.

3 So NRC has always felt that these  
4 performance assessments are not projections of a  
5 future radiological impact to a person. They're a  
6 regulatory tool to make a regulatory decision, and  
7 that may be splitting hairs, but it's a very  
8 important distinction in what we're doing and why  
9 we're doing it.

10 So next slide, please Gary. So in the  
11 development of the technical basis for the approach  
12 for time frames we did a lot of things. We did a  
13 white paper that I think Derek distributed to you  
14 that went through a lot of these considerations. We  
15 looked at waste characteristics.

16 If you look at the top figure here,  
17 which is pretty small but it's in that paper I  
18 believe, depleted uranium, the trigger for this  
19 rulemaking was quite a bit different than commercial  
20 low level waste.

21 The commercial low level waste has a lot  
22 of short-lived activity that by 1,000 years it has  
23 decayed. But one of the important points though is  
24 that even though the commercial low level waste  
25 curve drops down, what's remaining there after 1,000

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 years is not riskless. That long-lived activity,  
2 even with normal commercial low level waste can pose  
3 risk, depending on the site-specific design and the  
4 characteristics of the disposal site.

5 But I'm going to walk you through these  
6 various factors here that we have on the slide, at  
7 least most of them. Next slide, please.

8 MEMBER MARCH-LEUBA: Hold on. Can you  
9 keep that? That increase in risk is because of  
10 radon accumulation?

11 MR. ESH: Yes. It's for all the data  
12 products, but it's for radon.

13 MEMBER MARCH-LEUBA: Oh yeah radon.

14 MR. ESH: It's radium-226, lead-210 and  
15 all the daughters in the decay chain.

16 MEMBER MARCH-LEUBA: The decay of the  
17 radon numbers?

18 MR. ESH: Right.

19 MEMBER MARCH-LEUBA: But has anybody  
20 considered letting it leak? Letting it leak out of  
21 the containers, the same way that it does in a mine.  
22 In a mine it has been leaking all the time.

23 MR. ESH: In the analysis for the  
24 disposal of say the depleted uranium, yes of course  
25 you would look at releases of material, which may

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 occur --

2 MEMBER MARCH-LEUBA: Controlled leaks of  
3 radon. You just vent --

4 MR. ESH: Oh venting? No. Yeah, right.  
5 I don't know. It depends. If somebody designed  
6 their system to vent, yeah. Then of course --

7 MEMBER MARCH-LEUBA: You keep it under -  
8 - you have a stack. You put it down there and  
9 that's what radon does. It goes out.

10 MR. ESH: Right, right, right.

11 MEMBER REMPE: I was curious about this  
12 white paper, which I appreciated getting a copy of.  
13 But like this composites on the lower right was I  
14 guess a composite based on the earlier Figure 3,  
15 which had no axis on the different plots.

16 But it said the staff used their  
17 experience with waste disposal systems to generate  
18 Figure 3, which I guess was the basis for Figure 4.  
19 Some of the information in both of those figures is  
20 pretty precise.

21 There's no code. It's just somebody  
22 drawing a line? I mean what was the basis for these  
23 things?

24 MR. ESH: Yeah. I have to admit that  
25 I'm the authored of the squiggly line figure and so

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       --

2                       (Laughter.)

3                       MEMBER REMPE:  It's not a really precise  
4       drawing.

5                       MR. ESH:  I was trying to communicate  
6       how uncertainties can change over time, and how they  
7       may change differently based on different parts of  
8       the system that you're looking at.  So the  
9       uncertainties associated with engineered components,  
10      and this is focused for near-surface disposal, low  
11      level waste facility type designs, might be quite a  
12      bit different than the uncertainties associated with  
13      the natural system, for instance.

14                      Or especially the big one is the green  
15      line on here, the societal technology activities  
16      component.  So what's going on with people and what  
17      are they doing?  If you think about how people were  
18      living 200 years ago, it's a lot different than what  
19      we do today.  So what are people going to be doing  
20      200 years from now?  Well, that's a good guess.

21                      But I would submit that the  
22      uncertainties associated with the human aspect of  
23      the problem are much larger than the harder science  
24      aspects of the problem, and that's all this figure  
25      was really attempting to communicate.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MEMBER REMPE: So no calculations; just  
2 your --

3 MR. ESH: Well I mean --

4 MEMBER REMPE: Shouldn't it be on there?

5 MR. ESH: Well, I've worked on many  
6 performance assessments that have dose curves  
7 produced in them, that --

8 MEMBER REMPE: Look similar and --

9 MR. ESH: --that have components of this  
10 going on. So when you break them down and analyze  
11 them and you look at the contributions of NGO  
12 barriers and natural barriers and things like that,  
13 you'll see this type of behavior. So in a  
14 performance assessment so when we do a probabilistic  
15 performance assessment, we'll generate what we call  
16 a horsetail plot now, which has all the  
17 realizations, all the dose histories.

18 What you'll see many times is that the  
19 uncertainty early is larger than the uncertainty at  
20 later times, and that's because the uncertainty or  
21 variability about when engineered barriers may fail,  
22 especially the discrete ones, can cause big impacts  
23 for the high specific activity radionuclides of the  
24 -- in the system.

25 Whereas when you move out to later

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 times, eventually your knowledge and basis for how  
2 the engineered systems are going to behave gets very  
3 limited, and whether it's accurate or not, most of  
4 the analysts do not take credit for the very long-  
5 term engineered performance, which I think is fair.  
6 That's what I would do if I was analyzing the  
7 problem.

8 So what you see is the horsetail plot  
9 sometimes will pinch down at later times because  
10 that engineered component is dropping out. So  
11 that's the -- this is a crude figure and it was just  
12 designed to be a communication tool, okay. But it  
13 is based on our experience and on our -- a lot of  
14 different projects so --

15 MR. WIDMEYER: Hey Dave. Could you  
16 explain the pedigree of the white paper? What was  
17 it used for? You kept calling it white paper and  
18 people are asking me, you know, what is it.

19 MR. ESH: Yeah.

20 CHAIRMAN BLEY: Derek, identify yourself  
21 for the record.

22 MR. WIDMEYER: I'm Derek Widmeyer of the  
23 ACRS staff. Thank you very much.

24 MR. ESH: So that was a paper that we  
25 developed to kind of look at what are all the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 factors that make go into this decision and what  
2 should we do with the analysis time frames.

3 So that's the pedigree of it. It just  
4 supplied -- basically it was a consolidation of  
5 information to the staff internal to NRC, to kind of  
6 look at what factors should we consider and how  
7 should we consider them in developing a position on  
8 analysis time frames.

9 MEMBER RICCARDELLA: So what is the  
10 message you're trying to communicate with that plot?

11 MR. ESH: The bottom figure?

12 MEMBER RICCARDELLA: Yeah.

13 MR. ESH: The bottom figure was used to  
14 communicate that the -- you have different sources  
15 of uncertainty and the influence of those  
16 uncertainties can be different as you go out in time  
17 in the system. At some point, you have to  
18 acknowledge that the natural system uncertainties  
19 are going to get very large, you know. When you get  
20 out a million years you're talking about like  
21 mountain formation and all sorts of things like  
22 that.

23 So it is reasonable to be trying to  
24 consider those impacts in your decision-making  
25 process? I would say no, not when you get out

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       there.       The one challenge in the performance  
2       assessment field is the green line though, because  
3       the green line occurs early and in our opinion if  
4       you truly tried to incorporate it, it would be a big  
5       impact.

6               So like what's the likelihood that we  
7       cure cancer in the next 200 years. I can't answer  
8       that, but if you did it would totally change what  
9       you're doing with radioactive waste, wouldn't it?  
10      So those sorts of impacts I think are not really  
11      amenable to quantification, and what we've done, NRC  
12      and the performance assessment community is say  
13      don't speculate on the societal component of the  
14      problem, that you really can't get a firm answer on.

15             You should use cautious and reasonable  
16      assumptions about society and what people are doing  
17      and what they may need to do today, in order to do  
18      these radiological regulatory analyses. But it  
19      wouldn't be very productive to speculate, overly  
20      speculate on that component.

21             MEMBER RICCARDELLA:    So once the red  
22      line and the blue line cross then you don't care  
23      anymore? Is that the basis for 10,000 years?

24             MR. ESH:   Well, not necessarily. I'll  
25      go through that where that more comes from. But it

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 is a factor in the decision-making process. So at  
2 some point in time at long times, and that depends -  
3 - see, that's the other challenge though. That  
4 depends completely on your site.

5 So if you go to like the Atacama Desert  
6 in Chile, that's been very stable for a very long  
7 time. There's a whole variety of meteorites there  
8 that have been there for anywhere from thousands of  
9 years to millions of years, and because they're all  
10 present, you can say okay, that gives me an  
11 indication that this environment has been stable for  
12 a very long time.

13 But say if you moved to location in  
14 western New York on the glacial material deposited  
15 by the last glaciers, those areas are actively  
16 eroding and, you know, the stability of that site  
17 and the time frame that you might use might be quite  
18 a bit different than when look at the other one.

19 So let me try to get through some of  
20 these, and then hopefully that will answer a lot of  
21 your questions. So in the domestic part of it, this  
22 question came up in the subcommittee, well what's  
23 done? Well, this was in that paper and then we  
24 thought it would be just good to put it in your  
25 slides here for you, that you can see what's been

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 done in various programs.

2 And what's been done is a lot of  
3 different things. As you move down the diagram, I  
4 would say you're in the table. You're kind of  
5 progressing towards more difficult waste to handle.  
6 But not necessarily so. I mean you could argue that  
7 chemical waste that's dealt with under EPA and RCRA  
8 is every bit as difficult to manage as the  
9 radioactive waste that's done.

10 They made this deliberate decision to  
11 tackle the problem in the way that they did, which  
12 is basically they look at 30 years for the material.  
13 But it's basically a perpetual control management  
14 solution.

15 So every 30 years, they'll look at the  
16 RCRA disposal facilities and decide do we still need  
17 to control the facility? Is it still operating  
18 appropriately, and they just iterate until  
19 necessary. But it's an open-ended process.

20 For uranium mill tailings, the  
21 compliance period, the standard is 200 years, but  
22 there's a goal up to 1,000. That was really a  
23 remediation problem though. It's not really a  
24 disposal problem. So the reason why those  
25 regulations came into develop is that there were a

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 lot of mill tailings that management problems  
2 associated with them throughout the country.

3 It was a very expensive problem. Some  
4 of the entities that have generated those materials  
5 were maybe no longer in business or had limited  
6 resources. So they had to take that into account,  
7 NRC had to take that into account when those  
8 regulations were developed.

9 The ones that I'll point out here that  
10 are probably of most interest to the committee, the  
11 DOE Order 435.1 that requires 1,000 years compliance  
12 period, and then in low level waste disposal that's  
13 in brackets, and I put red there, guidance, because  
14 the brackets were for guidance.

15 There isn't a number associated with it  
16 in the current regulation, and that's what we're  
17 attempting to do in this rulemaking. So this is  
18 reflecting what's on the books now, not what will be  
19 on the books in the future, which would be  
20 1,000/10,000 if the rulemaking went forward.

21 For waste determinations, what the  
22 Department of Energy does, that's the WIR there,  
23 Waste Incidental to Reprocessing, DOE applies DOE  
24 Order 435.1, but NRC is involved by statute for  
25 Idaho and South Carolina facilities. So in those

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1 cases, the law says that DOE is to use NRC's  
2 performance objectives for 10 C.F.R. Part 61.

3 So when NRC and those two states is  
4 obligated to consult with the DOE and then perform  
5 monitoring activities, we apply our requirements at  
6 those locations.

7 So you know, if DOE is making waste  
8 determinations at other facilities, then they'll use  
9 their criteria or whatever's determined by their  
10 stakeholder. So for instance, at Hanford DOE may  
11 apply Order 435.1, but the other stakeholders at  
12 Hanford require them to do longer analysis. That's  
13 state of Washington.

14 So there is some ability to control the  
15 analyses, but not complete. Let's go to the next  
16 slide.

17 VICE CHAIRMAN CORRADINI: Just so I  
18 understand.

19 MR. ESH: Yeah.

20 VICE CHAIRMAN CORRADINI: So we're only  
21 talking about -- the rule is only going to apply to  
22 the one that is identified with guidance; is that  
23 correct?

24 MR. ESH: Yes. That will be changing  
25 from undefined right now, only described in guidance

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 to it will be defined in the regulation.

2 VICE CHAIRMAN CORRADINI: And you're yet  
3 to explain to us what is sufficiently large enough  
4 quantity to fit that?

5 MR. ESH: Right. Hopefully we'll get to  
6 that. This is an example. One area that we had a  
7 lot of interest in, even I think the committee in  
8 some of their letters discussed this, is why not use  
9 the mill tailings requirements for depleted uranium?  
10 They're both uranium, but that's about as far as the  
11 comparison goes.

12 So down at the bottom here it says "Mill  
13 tailings, Falls City, Texas. I calculated that,  
14 because at the mill tailings sites, the ones that  
15 are closed, they'll put a nice plaque there that  
16 gives many times the volume and the total curies of  
17 radium in the site. So you can just take the volume  
18 and calculate the concentration.

19 So for mill tailings, you're talking  
20 about, you know, 100 to 200 picocuries per gram for  
21 most mill tailings in the U.S., somewhere in that  
22 ballpark. For this depleted uranium, it starts off  
23 well but then eventually gets very high, and this  
24 was something we discussed in the subcommittee.

25 If you were to use say 1,000 year

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 compliance period for depleted uranium disposal,  
2 you're only getting about roughly 1/1000th of this  
3 ingrowth phenomena. If you move to 10,000 years,  
4 you're getting 1/10th.

5 So yes, we are missing 90 percent of  
6 what's going on with depleted uranium disposal in  
7 the compliance period. But that performance period  
8 with the subjective criteria associated with it, we  
9 hope is the ability to look at the safety or make  
10 considerations with this other 90 percent that  
11 eventually might grow into the material.

12 Now this is not to imply that the mill  
13 tailings requirements are not appropriate. They're  
14 appropriate for that problem. But that material is  
15 much more dilute than this material that you're  
16 talking about, the concentrated depleted uranium.  
17 And those regulations were developed to address a  
18 problem, which was essentially a remediation  
19 problem.

20 The problem we're dealing with here is a  
21 disposal problem, and that's an important  
22 distinction to make. There's a few other backup  
23 slides related to uranium and uranium in the  
24 environment that we can talk about if we have time.  
25 Next slide.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 VICE CHAIRMAN CORRADINI: The guidance  
2 doesn't -- we're talking time frame. The guidance  
3 doesn't talk about form of what's disposed?

4 MR. ESH: Yeah, well in a way because I  
5 think in the guidance we may discuss that the  
6 hexafluoride form is inappropriate for near surface  
7 disposal. So an oxide form, an oxide form is much  
8 more appropriate. Sandia did an analysis in 1992  
9 and they found really massive impacts associated  
10 with disposal of it in the fluoride form, and those  
11 -- you don't -- the solubility of uranium is a lot  
12 lower in the oxide -- depending on the oxide and  
13 oxide form.

14 VICE CHAIRMAN CORRADINI: So except for  
15 excluding certain forms, you're not including an  
16 allowable form?

17 MR. ESH: Right. We did not specify a  
18 particular form it must be. The other point  
19 associated with the depleted uranium is that  
20 material, depending what's done with it, may end up  
21 being essentially a powder. It has a very high  
22 surface area to volume ratio. That's bad from a  
23 waste disposal standpoint, both in terms of radon  
24 release to the environment and in terms of release  
25 to the groundwater.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           You want low specific surface area to  
2 volume ratio to limit risk. So we don't have  
3 specific requirements associated with depleted  
4 uranium, but ultimately this performance-based  
5 approach using technical analyses should determine  
6 what form you need to put that depleted uranium in,  
7 in order to meet the criteria. We can hit the  
8 button here. It's going to --

9           So this is a different example but a  
10 similar problem. This is from a Department of  
11 Energy report associated with the Hanford site, and  
12 I thought this was a good example because it  
13 elucidates the problem associated -- a problem  
14 associated with the performance assessments in the  
15 analysis time frames.

16           So what you have here is somebody wanted  
17 to know how do I need to design my waste forms?  
18 What do I need my release rate to be, and they  
19 looked at two different standards. So a 25 millirem  
20 at 1,000 years and 25 millirem at 10,000 years.  
21 Well in order to achieve the standard at 1,000  
22 years, they could have roughly 70,000 parts per  
23 million per year released of the technetium, whereas  
24 if they're trying to achieve 25 millirem at 10,000  
25 years, that reduces to about 150.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           So it's roughly a four to five hundred  
2 factor, reduction factor going from outside the  
3 1,000 year window to the 10,000 year window. And  
4 this is because the Hanford site is very dry and has  
5 a very thick unsaturated zone. So it can take a  
6 long time for the contamination to move through the  
7 unsaturated zone until it hits the aquifer.

8           Now that's a good thing. You do want  
9 long delays to create impacts for the public. But  
10 also it's a risk deferral, not necessarily a risk  
11 mitigation. What we're trying to achieve here,  
12 especially for these longer-lived wastes, is that  
13 people are making good decisions to achieve risk  
14 mitigation and not just risk deferral, and not just  
15 shifting of the risk in time, but the risks are  
16 actually reduced.

17           They explained it in words there in B  
18 better than I could explain, so I just left it in  
19 the slide and you can read it. But we agree with  
20 this example. This is a good example. It applies  
21 to a lot of the arid sites. It can also apply to  
22 humid sites, which are using engineered barriers.  
23 So this is the example Jose talked about earlier  
24 with, well you wouldn't want somebody designing the  
25 facility for 10,000 years and in 10,001 then it

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 fails.

2           You wouldn't want somebody designing an  
3 engineered barrier that can give you 1,000 years of  
4 protection that just pushes the risk out, so that  
5 after 1,000 years you see this big impact. These  
6 requirements that we have are intending to prevent  
7 that sort of situation.

8           Now could somebody push it out past  
9 10,000 and then see a big impact after 10,000? I  
10 guess that's true in theory. But that other  
11 criteria is meant to allow a stakeholder and  
12 especially Agreement State regulators to look at  
13 that information and make a decision about those  
14 really long term doses, if you had a situation like  
15 that.

16           So the other point related to this is  
17 think about this. If you designed your facility for  
18 the first case at 1,000 years and you were achieving  
19 something close to 25 millirem, you would never want  
20 to do that. You'd want some margin of safety. Well  
21 that would mean that facility, if you designed it in  
22 that way, could produce something on the order of 10  
23 rem in the 10,000 year -- between the 1,000 and the  
24 10,000 year time frame.

25           I don't think that's good design, and I

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 don't think if the criteria would result in people  
2 doing those sorts of things, it's the type of  
3 criteria that we would want.

4 Next slide, please. So internationally,  
5 we considered what people do in this area, and this  
6 was difficult. It's hard to find this information.  
7 A lot of this information in some form or another is  
8 in the joint convention reports. But there's also  
9 information scattered throughout various documents,  
10 some of it in other languages that some of us may or  
11 may not have been fluent in.

12 But the summary of it is contained on  
13 this slide, and that is that most countries either  
14 do not allow near surface disposal of long-lived  
15 waste, or they place limits on it. Some countries  
16 put all their waste in deep geology, whether it's  
17 short-lived, long-lived, whatever. They say we're  
18 not going to mess with near surface uncertainty;  
19 we're just going to put it deep.

20 Others, many of them determine some sort  
21 of limits that are placed and then they say okay,  
22 the short-lived stuff is good for near surface. The  
23 long-lived stuff we're going to put in some other  
24 facility, intermediate level waste facility, deep  
25 geologic, i.e., something like a high level waste

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 facility.

2 In most cases these limits are not  
3 determined by site-specific analyses, but rather  
4 they're set by the regulators and/or lawmakers. So  
5 they come from some other mechanism rather than the  
6 site-specific analyses.

7 In this rulemaking, what we're hoping to  
8 achieve if the rule goes forward, is that somebody  
9 does the proper site-specific technical analyses to  
10 determine these limits based on their specific site.  
11 The last point here, even though many countries do  
12 place limits on say even the long-lived alpha, they  
13 still will assess, do some sort of assessment of  
14 what they consider to be peak hazard.

15 It might be a radiological ghost, it  
16 might be flux limit, it might something else. But  
17 they do some sort of assessment to look at well over  
18 the very long time, what do I think is going to  
19 happen with this radioactive waste.

20 Next slide, please. An important  
21 distinction between some of the international  
22 communities and our programs in the U.S. is that  
23 they have, in my opinion, a better waste  
24 classification system and this creates some  
25 advantages. They classify waste on both activity

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 and half life, and what that allows them to do is  
2 what I just talked about, design their facilities  
3 for their particular waste.

4           Whereas low level waste in the U.S. is a  
5 mixture of long-lived and short-lived. So you have  
6 this difficulty in designing requirements and/or  
7 designing systems to manage that waste. The last  
8 three points here are all specific to depleted  
9 uranium. It's just if you look at large quantities  
10 of depleted uranium from an IAEA perspective and  
11 some other international groups, they've -- I can't  
12 say for certain, but it looks to me like they would  
13 at least put it in intermediate, as an intermediate  
14 level waste disposal facility, or possibly even  
15 deeper.

16           CHAIRMAN BLEY: Doug, when you have -- I  
17 know you've had a whole long history of meetings  
18 with people. Was there any feeling that for future  
19 sites, reclassification would make a lot of sense,  
20 so that we don't get into these kind of problems?

21           MR. ESH: There are some people that  
22 have -- yeah. There are some people that agree that  
23 changing the classification system would have some  
24 advantages. A lot of the engineers that I know feel  
25 that it would have a lot of advantages. A lot of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the policymakers or that type of group realize the  
2 challenges associated with that.

3 So our, excuse me, waste classification  
4 system affects a lot of things, and it's in laws  
5 that you would have to have Congress rewrite. It's  
6 in the way our compact system is set up and, you  
7 know, the receipt and acceptance of waste. It's in  
8 some state laws. It affects a lot of things.

9 So if you're -- if you're trying to have  
10 minimal impact from your regulatory activity,  
11 changing the waste classification approach and  
12 system would have many impacts, many practical  
13 impacts and things that would need to be worked on  
14 and changed in order to achieve that. Technically,  
15 I believe it would be a very good idea.

16 VICE CHAIRMAN CORRADINI: Let me say it  
17 another way. If you were going to operate a new  
18 site, you could operate within our current  
19 classification. But you could do the kind of things  
20 you were talking about with your own site and divide  
21 the short and the long-lived and store them  
22 differently and live within the current rules, but  
23 make it a lot easier for yourself, I would think.

24 MR. ESH: Right. With this -- with this  
25 approach in the regulation, as you'll see you can

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 develop waste acceptance criteria based on your  
2 site-specific analysis. So that is essentially a  
3 site-specific waste classification system, if you  
4 will. We have not, for the reasons I just  
5 described, removed or eliminated the existing waste  
6 classification system because it's used by so many  
7 people for a lot of reasons.

8 But we did want to start progressing  
9 towards this idea that the more modern way of doing  
10 it, and this is what the Department of Energy does,  
11 is they analyze their system and based on the  
12 analysis of the system it determines what waste can  
13 go in there. There isn't some analysis done by the  
14 regulator. They're self-regulating, but in our case  
15 it's an NRC and our Agreement State licensees. NRC  
16 did analyses to develop the waste classification  
17 system in Table 1 and Table 2 of 61.55.

18 So next slide, please Gary. So here's  
19 an example from comments. One thing we ran into is  
20 that some people provided information that may have  
21 been somewhat limited and didn't give the whole  
22 picture of what we think is portrayed. So if you  
23 hit the button again, Gary.

24 So this is the full language associated  
25 with the site ICRP guidance. So you heard this at

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the end of the subcommittee meeting by some of the  
2 commenters. I think it's designed, at least the top  
3 part of it, to give the impression that we're being  
4 inconsistent with ICRP guidance.

5 I would argue we're not being  
6 inconsistent with ICRP guidance. I'd say if you  
7 read the full text here, what we're attempting to do  
8 in this rulemaking is consistent with ICRP guidance.  
9 This wasn't my attempt to set a record for the most  
10 words on a slide in an ACRS briefing, but I may have  
11 done that.

12 MEMBER POWERS: You're not even close.

13 MR. ESH: Okay.

14 (Laughter.)

15 MR. ESH: So they are not saying, they  
16 being ICRP here, do not calculate these doses and do  
17 not use them for regulatory analysis. That's not  
18 what they're saying at all, at least my  
19 interpretation of it. You can of course make your  
20 own interpretation. They're saying though you need  
21 to be careful how you talk about this information  
22 and not portray it as something it's not.

23 Those are two different things. They're  
24 not saying the information is useless. They're  
25 saying use is cautiously, and that's -- and this

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 regulatory analysis and this approach to rulemaking,  
2 that's what we're attempting to do, because remember  
3 our standard, overall standard for when you're  
4 making a decision is reasonable assurance, and that  
5 is a subjective decision-making criteria for how you  
6 view all these things.

7 At one of the previous subcommittee  
8 briefings, I had figures that had output of  
9 performance assessment models, and I tried to get  
10 examples out. You might have curves that are way  
11 below the limit, and I could still say when I do my  
12 regulatory review now, I'm not granting you this  
13 application because you have all these problems with  
14 your analysis and so on and so forth.

15 Likewise, you may have analyses that are  
16 probabilistic analyses where a number of the results  
17 go above the limit, and I could say this is  
18 acceptable because I can explain to the stakeholders  
19 where all the conservatisms are in your analyses and  
20 why I believe the results demonstrate, make a safety  
21 demonstration.

22 So next slide please Gary. So here's a  
23 couple more giving comments on time frames. One,  
24 this top one is basically trying to say that low  
25 level waste is benign. After 1,000 years, you can

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 just forget about it, and the bottom part was this  
2 idea that by using a long compliance period, i.e.  
3 say 10,000 years for significant quantities of long-  
4 lived waste, you're not going to be able to license  
5 anything.

6 So hit the button, Gary. So the first  
7 one here, this statement is generally true for  
8 61.42, which is protection of the intruder. That  
9 just shows that the intruder protection performance  
10 objective and waste classification system works as  
11 it should. But it's generally not true for 61.41.

12 The risks associated with 61.41, which  
13 is like release, leaching from the facility and  
14 transport through groundwater, those are driven by  
15 phenomena and processes that aren't really amenable  
16 to reducing to a single concentration to put in the  
17 limit.

18 So I can't say if iodine is one curie  
19 per cubic meter that that's safe. It depends on the  
20 site. It's extremely dependent on the site. One  
21 curie per cubic meter might be completely safe at  
22 Site A and be greatly above the performance  
23 objective at Site B. So for 61.41, you have all  
24 that's needed in Part 61 to do technical analysis,  
25 to determine whether you're meeting the criteria or

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 not.

2 All four of our existing agreement, the  
3 existing sites are in Agreement States, and all four  
4 of the facilities in the Agreement States have  
5 already been licensed, one in the process of being  
6 reviewed. So I don't want to mischaracterize Utah.  
7 Utah originally used a 500 year analyses, but they  
8 issued rules to deal with concentrated depleted  
9 uranium or concentrated uranium more generally,  
10 where they require a 10,000 year analyses and then  
11 look beyond.

12 It's almost identical to what we have in  
13 our proposed rule here. But at the time, right now  
14 in terms of licensing basis, they have used a 500  
15 year compliance period. But the other facilities,  
16 as I discussed earlier, used 2,000, 10,000 and  
17 50,000 and they've all been licensed. So I don't --  
18 I don't think this argument that if you look at  
19 longer times, you're going to not be able to license  
20 things is valid, because the real experience shows  
21 that they've already been licensed using analyses  
22 like this.

23 In addition to that, we have experience  
24 in the area of waste incidental through processing.  
25 So that's basically the clean up of the tanks

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 containing material from the weapons program, to put  
2 it generally. The material in those tanks and in  
3 many cases can be -- or at least in some cases can  
4 be less than say a lower classes of low level waste.

5 In some cases it may be more or at least  
6 comparable. They can contain significant amounts of  
7 long-lived radioactivity. In Idaho and in Savannah  
8 River, the Department of Energy has already made  
9 waste determination decisions where they've  
10 submitted analyses over those time frames to the NRC  
11 that we've reviewed and made technical evaluation  
12 reports documenting our findings.

13 So I don't think even in that area these  
14 long or longer compliance periods would be an  
15 impediment to making any decisions.

16 Now say if you decided well, all right  
17 Dave. You're rambling on and I don't agree with  
18 you. I think you should only use 1,000 year  
19 compliance data. What is that going to impact?  
20 Well right now, there is very little support in our  
21 rulemaking, I mean really maybe only one stakeholder  
22 or possibly two, that agreed with the Compatibility  
23 B designation for the significant components of the  
24 rule, such as the compliance period definition.

25 Almost everybody agreed with making it

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Compatibility C, which affords flexibility to the  
2 Agreement States. So what that means, and the  
3 Agreement States communicated to us in this  
4 rulemaking process is we would like to preserve our  
5 current approaches. So my guess is that if this  
6 rule goes forward and even if NRC were to reduce the  
7 compliance to 1,000 years, those facilities in the  
8 Agreement States are still going to use the criteria  
9 they already use. It's not going to impact them  
10 whatsoever.

11 In the incidental waste space, by the  
12 time this rulemaking is done, Idaho is going to be  
13 finished, and it will have been finished using the  
14 analyses of 10,000 years. Savannah River would be  
15 well underway, but I don't even know if you would  
16 characterize it as half finished, because they have  
17 a lot more tanks, and Hanford, as I had indicated  
18 earlier, the requirements for the Hanford cleanup  
19 are determined by the other stakeholders, not just  
20 the Department of Energy, and they ask for a longer  
21 analyses whenever they make those decisions.

22 So I don't know what you would achieve  
23 by, you know, say for instance reducing the  
24 compliance period to 1,000 years. Also, I don't  
25 think it would lead to effective decision-making for

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       how you're managing the long-lived activity,  
2       especially in the case of say depleted uranium,  
3       which was our direction that we were given for even  
4       doing this activity.

5               Next slide, please. So this figure was  
6       presented to the -- either the full Committee or the  
7       subcommittee before, and I thought it was a good  
8       figure to revisit because it's addressing the top  
9       bullet on the previous slide, which is that the low  
10      level waste is inherently riskless once you get to  
11      1,000 years.

12             Low level waste in the U.S. contains a  
13      lot of different isotopes. Yes, a lot of the  
14      activity is short-lived, such as the strontium,  
15      cesium and tritium and cobalt-60. But there are a  
16      variety of isotopes that are very long-lived, and  
17      many of those are at levels such that you do need  
18      performance of the system to get them down to values  
19      that you would meet the performance criteria.

20             Out on the far right-hand side of this  
21      figure, of course, is uranium and thorium, and those  
22      kind of really stand out, because as you go in the  
23      direction of the arrow here, that's increasing  
24      challenge. If it's longer-lived and you have more  
25      of it, it's harder to manage.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           So this proposal from industry to  
2 dispose of large quantities of depleted uranium,  
3 it's even many orders of magnitude above what these  
4 other figures represent here. So it's really  
5 stressing the system and the regulatory requirements  
6 to address this material.

7           Next slide, please. A few other  
8 comments that we got were that uncertainty makes the  
9 results meaningless, and then also that don't apply  
10 the burdensome requirements for long-lived waste to  
11 traditional waste. So the first one, this is  
12 something I tried to stress and I'll continue to  
13 stress, and NRC will always stress is that these  
14 performance assessments are not predictions of the  
15 future.

16           They're regulatory analysis that are  
17 used for regulatory decision-making. I don't  
18 believe that uncertainty is a suitable basis in and  
19 to itself to reduce safety arguments. If that's the  
20 only thing that you're really relying on, then that  
21 doesn't really make sense. It doesn't resonate with  
22 me. I think that that argument could be made by any  
23 licensee in any NRC regulated activity.

24           So say you're interested in plant life  
25 extension, and you're looking at some coupled

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 process related to stress corrosion cracking of  
2 piping. I can imagine a licensee could come in and  
3 say hey, this is so uncertain I'm not going to do  
4 anything with it. That's essentially what the  
5 argument that was put forth here with the waste  
6 disposal is at some point in time it's so uncertain  
7 I just -- I shouldn't even consider it.

8 And I think based on what we know today,  
9 you should bring the full value of the information,  
10 even if it is uncertain into play whenever you're  
11 making your decisions about these facilities.

12 MEMBER MARCH-LEUBA: Let me agree with  
13 you on the record on that, because what this  
14 calculation do, it is not the prediction of what  
15 will really happen in the year 10,016. But they're  
16 showing that there's at least one path that could  
17 happen that leads to success.

18 MR. ESH: Right.

19 MEMBER MARCH-LEUBA: Whereas if you run  
20 the calculations, you cannot find a path that leads  
21 to success, then just say well that one is a bad  
22 one.

23 MR. ESH: Right.

24 MEMBER MARCH-LEUBA: But if you can at  
25 least find one path, you can have more confidence.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 So you're not predicting what would happen in the  
2 year 12,000.

3 MR. ESH: We're not. These performance  
4 assessments should not be viewed as predicting what  
5 exactly is going to happen and what exactly is going  
6 to be the radiological impacts to somebody. It's a  
7 tool to make the regulatory decision today using  
8 information to the best of your ability.

9 MEMBER MARCH-LEUBA: You should frame it  
10 on this part. At least it is a path that leads to  
11 success.

12 MR. ESH: Right.

13 MEMBER MARCH-LEUBA: To give you  
14 confidence that you're totally succeeding.

15 MR. ESH: So I was really baffled by  
16 certain commenters that have taken this tact,  
17 especially there's some that their businesses are  
18 based on doing performance assessments, and then  
19 you're going to turn around and say uncertainty  
20 makes the results meaningless. Well, why you are  
21 even doing that? What's your business model here,  
22 and it's kind of baffling to me, but anyway.

23 The other thing here at the bottom was  
24 don't apply the burdensome requirements for long-  
25 lived waste on traditional waste. Now we do not

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 believe the requirements are burdensome. That's the  
2 first part, but we understood this comment and so we  
3 made the change in this proposed final to try to  
4 bifurcate it, so that somebody could make something  
5 because some people do view their requirements as  
6 burdensome.

7           Somebody could make a decision to use  
8 the shorter compliance period for "traditional  
9 waste," and use the longer compliance period for  
10 when they truly have the problem that creates more  
11 long term risk. So that's something we agreed with,  
12 and that's what's reflected in the proposed final  
13 rule.

14           VICE CHAIRMAN CORRADINI: So just to  
15 clarify, because I think Dana asked something and  
16 then Margaret asked it. Are we really talking less  
17 than a handful of sites that are going to be  
18 affected by the 10,000 year rule?

19           MR. ESH: Yeah. So I'm going to get  
20 through talking about significant quantities here,  
21 and then let's ask it again if I don't address it,  
22 so -- so here, the significant quantities, how do  
23 you determine if you have significant quantities?  
24 Well, what we advocate is that you start simple and  
25 if necessary introduce complexity.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           You're going to do screening based on  
2           inventory. That's the simplest thing. You know the  
3           inventory or should know the inventory. You can  
4           look at how much long-lived radioactivity you have  
5           and compare that, and the -- compare that to we have  
6           information in the guidance document for 61.41 and  
7           61.42.

8           The problem is for 61.41, as I discussed  
9           earlier, the concentration that you may need to use  
10          on a generic basis to assure safety for 61.41 might  
11          be significantly different for Site A compared to  
12          Site B. So it's really hard. It's a high  
13          dimensional problem that you're trying to reduce  
14          into a single dimension, and it's very difficult.

15          I don't think it's necessarily risk-  
16          informed to even do that. But some sites may have  
17          very limited inventory, and so they would be done  
18          here if they just do this comparison of inventory  
19          and say look, here's my inventory. It's limited,  
20          boom. I'm going to use the 1,000 year compliance  
21          period. I don't have to consider the other, the  
22          longer compliance period or the performance period.

23          But as I indicated, in some cases you  
24          may have situations where that inventory comparison  
25          is not good enough, and then you have to move to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 maybe a simple five dose assessment. In that case,  
2 it would be basically a PA light, which you could  
3 use as a basis to determine whether you need to do a  
4 more substantial performance assessment based on  
5 your projected risk from your PA light.

6 That is an important component of  
7 performance assessment and it is generally an  
8 iterative analysis. So this iterative concept  
9 within determining significant quantities is very  
10 much in line with overall how we view performance  
11 assessment. Then ultimately you may get into a  
12 complicated analysis, to try to determine if you  
13 have significant quantities.

14 But generally I think if you get into  
15 that situation, you should just do the longer  
16 analyses. If you have to spend a lot of effort on  
17 trying to justify you don't need to do the analyses,  
18 just do the analyses and support them. That seems  
19 like the practical approach to me.

20 VICE CHAIRMAN CORRADINI: Dave, these  
21 are kind of straightforward. Is there any  
22 particular criteria on blended waste, or do you just  
23 use these same criteria?

24 MR. ESH: Yeah. On blended waste, it  
25 wouldn't be different. It would still be based on

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       how much of that -- of the different isotopes you  
2       have, yeah so -- next slide, please Gary.

3               MEMBER REMPE:   So before you leave that  
4       slide, at the end of the subcommittee meeting, one  
5       of the members of the public said something about  
6       why do we have to treat, and I thought they said  
7       radon as part of the dose assessment.   Typically,  
8       it's treated as a FLEX, and could you -- are you  
9       still planning to clarify that point later?   I just  
10      haven't gotten to it.

11             MR. ESH:   Yes, yes.

12             MEMBER REMPE:   Okay, sorry.

13             MR. ESH:   I have two slides on it.

14             MEMBER REMPE:   Okay.   I thought I looked  
15      through your package and I didn't -- okay.

16             MR. ESH:   Okay.

17             MEMBER CHU:   Dave, you know, another  
18      topic the committee is very interested in is the  
19      grandfathering of sites.   So later on I would like  
20      you to --

21             MR. ESH:   I have two slides on that too.  
22      So I'll start moving faster.

23             MEMBER CHU:   Okay.

24             CHAIRMAN   BLEY:       May   I   interrupt?  
25      Margaret, are you going to ask for a break or -- do

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       you have an objection to a break? No, this is yours  
2       to run. I think we'll take a break at this time.

3               MR. ESH: Okay.

4               (Off mic comment.)

5               CHAIRMAN BLEY: Then you stay Charlie.  
6       We'll be recessed for a break. Come back at 4:25.

7               (Whereupon, the above-entitled matter  
8       went off the record at 4:08 p.m. and resumed at 4:27  
9       p.m.)

10              MR. ESH: So this is definition for what  
11       long lived means. You need that as part of this  
12       approach. And we wanted this definition to be  
13       generic so that if, for instance, agreement state  
14       chose to do a different approach with their analysis  
15       timeframes, they understand conceptually how it was  
16       supposed to work.

17              Because we were trying to account for  
18       the long lived parents with the long lived progeny  
19       and the radiation physics associated with the waste.  
20       And we think this definition does that. Next slide  
21       please.

22              MEMBER MARCH-LEUBA: If you're using the  
23       phrase UF6, for example, it doesn't have any  
24       radionuclide. This is the case in two of the other  
25       daughters. How do you apply that? There is

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 radioactivity of product.

2 MR. ESH: Well I have a table here that  
3 I'll show you, I think next slide. So this is from  
4 the guidance. So the determination of long lived  
5 includes both long lived parents and, say, long  
6 lived progeny.

7 And say, for instance promethium-147, it  
8 only has a 2.62 or 52 or 62 half life. So it's not  
9 long lived from the parent perspective. But it can  
10 decay into samarium-147 which has a 100 billion year  
11 half life, I guess.

12 So you would want to consider how much  
13 samarium you have in your facility. Or how much  
14 promethium because it decays into the samarium. Now  
15 that's not a great example because those things  
16 generally aren't present in the low level waste  
17 inventories.

18 So we took it a step further. And have  
19 this column in the table that identifies the  
20 particular isotopes that generally you would expect  
21 to see in a low level waste inventory. This gives  
22 some guidance to licensees and agreement state  
23 regulators when trying to look at this situation of  
24 how much long lived inventory they have. And  
25 therefore, what sort of compliance period should

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       they use.

2                   VICE CHAIRMAN CORRADINI:   But as a rule  
3       of thumb, if there's depleted uranium it's long  
4       lived.

5                   MR. ESH:   Yes.   The depleted uranium,  
6       the uranium isotopes are long lived.  And then they  
7       decay into some other things that are also long  
8       lived according to this definition.

9                   VICE CHAIRMAN CORRADINI:   And what I'm  
10      trying to understand, by making a general do you  
11      pick up something that would have been missed by  
12      uranium and not uranium?

13                  MR. ESH:   Yes.   So say like neptunium-  
14      237, that's long lived.  So if a site had a waste  
15      stream that was loaded with neptunium-237, you would  
16      want them to be doing a longer term analysis just  
17      like you would if they had a lot of depleted  
18      uranium.

19                  VICE CHAIRMAN CORRADINI:   But from a  
20      practical nature that doesn't occur yet, it just  
21      might.

22                  MR. ESH:   From a practical standpoint,  
23      most of the low level waste facilities, I believe,  
24      have somewhat limited amounts of most of the long  
25      lived activity outside of uranium.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           It's important to understand that all of  
2           the existing sites have taken depleted uranium  
3           already -- outside of Texas, they're newly operating  
4           and they haven't taken any yet. But they've  
5           licensed the facility to take it.

6           The other operating facilities, I think  
7           it might be South Carolina might have disposed of  
8           around 7,000 metric tons. Utah has disposed of  
9           around 50,000 metric tons. And Washington, I  
10          believe, has disposed of 14,000 metric tons. But  
11          I'll check my numbers here in a few slides.

12          So that table is in guidance. And this  
13          example is from guidance or something similar to it  
14          of how somebody can go about determining, if you're  
15          just looking at the inventory, do I have significant  
16          quantities or not? And the guidance steps through  
17          this in more detail than I think is deserving right  
18          now. But if you have questions about it, I think we  
19          can revisit it.

20          That's the end of the timeframes  
21          material that I had. I'm thinking that we can  
22          certainly take comments now. I should try to get  
23          through most of the other material. And then if you  
24          want to talk about things related to timeframes, we  
25          can jump back at it.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER SKILLMAN:     So David, back on  
2     Slide 20 the title is quantities. But you jump on  
3     21 to the definition of long lived. Where is the  
4     yard stick for quantity?

5                   MR. ESH:    So what I tried to convey is  
6     the quantity is going to be very much site  
7     dependent, what is significant. And so, the  
8     guidance document outlines the approach of how to  
9     determine if you have significant quantities.

10                  In there is a table that you can use  
11     with respect to 61.42 to determine if you have  
12     significant quantities. There's also a table with  
13     respect to 61.44 that you can determine to compare  
14     your waste to and do some calculations and use the  
15     sum of fractions. That's how you go about doing it.

16                  MEMBER SKILLMAN:     I understand now.  
17     Thanks.

18                  MR. ESH:    So in the U.S. who would  
19     perform these technical analyses we're talking  
20     about? Well it would be the four operating sites  
21     that are shown here, the U.S. Ecology site in  
22     Hanford and the Energy Solutions sites in Clive,  
23     Utah and Barnwell, South Carolina. And then the  
24     Waste Control Specialist in Andrews, Texas.

25                  There's some additional information on

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the side of this figure about the types of the waste  
2 they can take and the compact restrictions they  
3 have. Next slide please.

4 So this is in the area of the  
5 grandfathering type discussion, I think. Who will  
6 perform these technical analyses? As the draft  
7 final requirements are set forth right now, these  
8 requirements apply to all facilities that will  
9 operate after the regulations go into effect.

10 That does not mean that the requirements  
11 are going to apply to closed facilities. So there  
12 are some facilities that were closed in the U.S.  
13 The Beatty facility, the other ones were closed  
14 prior to the promulgation of Part 61 or around the  
15 time of it. So these requirements wouldn't apply to  
16 those closed facilities, only the ones that want to  
17 continue to operate.

18 We did have commenters express the idea  
19 that you should not apply the requirements to  
20 facilities that are only taking waste similar to  
21 what they have taken in the past. The issue with  
22 that that we ran into is that the waste that has  
23 been taken in the past not only must be, the waste  
24 must be similar to what has been taken in the past,  
25 but the waste that has been taken in the past must

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 be similar to what was analyzed in development of  
2 Part 61.

3 So if an existing facility may have  
4 taken waste that differs from what was analyzed in  
5 Part 61, that's the reason why these requirements  
6 are being put forth. If the waste classification  
7 tables were totally generic that could handle any  
8 type of waste, then we wouldn't need this rule  
9 making.

10 So this rule making is needed to address  
11 situations where wastes are in some ways different.  
12 And we didn't have a belief that there was a public  
13 health and safety basis provided to justify  
14 applying it to only new waste, for instance. Or to  
15 apply it to a portion of a facility.

16 Because the requirements and the public  
17 dose limits are based on consideration of all waste  
18 and all pathways. We thought it would be very messy  
19 to try to separate out old waste from new waste.  
20 And then why would you even do that?

21 So if your requirement is to meet say 25  
22 millirem from, say, your uranium, why would you say  
23 well the uranium I disposed of up until 2016 I'm  
24 going to leave out of the dose calculation but the  
25 new uranium I'm going to show meets 25?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 I think that all of your uranium --  
2 maybe I should have used a different isotope or  
3 element. If all of it contributes to your potential  
4 public health and safety impact, then all of it  
5 should be included in the analysis if you want to  
6 continue to operate.

7 But now with that said, there may be  
8 situations where you could consider waste that is in  
9 some portion of the facility and doesn't combine or  
10 contribute to the impacts in another portion of a  
11 facility. Then it would be appropriate to look at  
12 the differences between how those wastes contribute  
13 to a potential receptor. And the new waste might be  
14 a bigger impact than the old waste for instance.

15 So in many cases for these waste  
16 disposal facilities, the impacts are likely to  
17 combine. Because usually you don't have complicated  
18 hydrogeology with different directions of the rate  
19 of nuclides flowing. But you usually have a plume  
20 that will go in one direction.

21 So all the source term of the facility  
22 is going to contribute to that plume. How would you  
23 separate out which portion is contributing to what  
24 in the plume? It didn't make sense to use from a  
25 regulatory perspective or even from a technical

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 perspective to try to do those sorts of separations.

2 And as indicated to the subcommittee,  
3 and I'll reiterate here, there are no backfit  
4 provisions in 10 CFR Part 61. So that's coming at  
5 it from the legal perspective. That represents my  
6 extent of understanding about backfit. So if you  
7 have questions about it, I will call on someone to  
8 answer them.

MEMBER CHU: I think we  
9 mentioned the last time, it sounds like you suspect  
10 quite a bit of long lived stuff in the existing  
11 three. Because Texas is different, you know, it's  
12 new. Those three, is that the reason?

13 MR. ESH: Well the existing sites, for  
14 the most part, the waste that has been received  
15 looks and smells like traditional low level waste in  
16 that it's dominated by the short lived activity, it  
17 does have some long lived isotopes. But generally  
18 those long lived isotopes are in limited  
19 concentrations -- either they're dilute and there's  
20 a lot of it or they might be more concentrated but  
21 there's limited amounts of it. Or it might be in a  
22 form that makes it limited from a dispersibility  
23 standpoint.

24 And that's where this approach comes  
25 into play determining the significant quantities.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 You may well be able to make arguments that none of  
2 those existing facilities as of yet have significant  
3 quantities of long lived waste.

4 But it depends on their inventories if  
5 you're doing an inventory comparison approach. If  
6 you're doing the next step in the process which is  
7 to try to look at how much do I have that could,  
8 from a screening analysis, contribute to potential  
9 impacts? That requires you to have all the site  
10 specific information that the licensees and the  
11 agreement state regulators in those states would  
12 have.

13 So we don't, I'm not trying to prejudge  
14 how that may turn out. But overall, I would expect  
15 that it is a limited set of circumstances where you  
16 would determine that a site has significant  
17 quantities. That should be the exception and not  
18 the rule.

19 MEMBER CHU: So you expect most of the  
20 three only have to do a 1,000 year performance  
21 assessment?

22 MR. ESH: Right. And the compliance  
23 periods though, so what's put in this regulation, I  
24 would say those are the minimum values that you  
25 should be using. And so, as I indicated earlier,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the agreement states in almost all cases already use  
2 values that are above what we would say are the  
3 minimum values you should use.

4 So even if the agreement state, say in  
5 Texas, determined I don't have significant  
6 quantities, they are in all likelihood still going  
7 to apply their standard which is usually using 1,000  
8 years or peak dose, whichever is more.

9 MEMBER CHU: Do you expect any of the  
10 four will not be able to comply with the new rule?

11 MR. ESH: Well the demonstration of  
12 compliance with the -- let's step back a second  
13 first. The performance objective in 61.42 and 61.41  
14 have always been there from the promulgation of Part  
15 61. 61.41 has always required an analysis of the  
16 impacts of the waste that you dispose. It's silent  
17 on the compliance period. But it's always required  
18 a technical analysis to demonstrate unique  
19 compliance.

20 61.42 has always required that you  
21 protect the inadvertent intruder. And it says for  
22 all times. So both of those have been in place  
23 since 1982. And they remain in place now.

24 MEMBER CHU: But there's no 500  
25 millirem?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. ESH: There's no 500 millirem for  
2 the 61.42 performance objective. But the 61.42  
3 performance objective was developed for certain  
4 types of waste. It is was assumed that the waste  
5 were going to be within this certain envelope.

6 So if you took waste that was outside of  
7 that envelope, then what have you done to show that  
8 you've met the 61.42 performance objective? In at  
9 least two of the cases in our agreement states,  
10 they've done the intruder analysis anyway. Or in  
11 three cases are in the process of doing the intruder  
12 analysis. I think only in one case did they not do  
13 the intruder analysis even though they may have  
14 taken waste that was outside the envelope.

15 So how do you handle that situation?  
16 You know, that's where we felt there wasn't a public  
17 health and safety basis to say you should treat them  
18 differently because they didn't do the analysis when  
19 they took waste that was outside the envelope  
20 potentially.

21 MEMBER CHU: You know, the intruder  
22 scenario, my understanding is really the depth of  
23 burial, right?

24 MR. ESH: Right.

25 MEMBER CHU: So suppose one of the four

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 sites have buried some depleted uranium way back  
2 close to the surface. So if you do the scenario of  
3 the intruder analysis, you have to dig up certain,  
4 you know, for your construction scenario. I think  
5 it's probably going to maybe it's going to violate  
6 under millimeter.

7 See we're just trying to figure out what  
8 is the next step? What are the remedial actions  
9 available to them? You know, because --

10 MR. ESH: Right. And I understand that.  
11 And so we tried to think of if that situation did  
12 occur, what should somebody do? That is spelled out  
13 in Section 9.5, I believe, of your guidance  
14 document.

15 So we looked at if somebody was in that  
16 situation, what would we want them to do? Well the  
17 last thing you would want somebody to do is to dig  
18 it up. That is the last thing you would want  
19 somebody to do.

20 You would want them to first start with,  
21 do you have conservatisms in your calculation that  
22 you could look at and maybe reduce that would still  
23 allow you to demonstrate that you can meet the  
24 criteria? Because in many cases, these calculations  
25 can have some conservatisms in them because they are

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 model rich and data poor.

2 So one way that people mitigate the  
3 issue of not having much data is they'll choose to  
4 be conservative. And that's appropriate from a  
5 regulatory standpoint. We're okay with people being  
6 conservative if they don't have much information.  
7 It's one way to mitigate that uncertainty or to  
8 mitigate the impact of that lack of information.

9 Secondly then, if you're in a situation  
10 where a facility is having a difficulty in meeting  
11 the criteria, that isn't any different with respect  
12 to this new rulemaking than it would be with an  
13 operating facility without the rulemaking.

14 We have defined approached for people to  
15 look at what they would want to do and what they  
16 could possibly do including cost benefit analyses,  
17 consideration of impact to workers. You know, you  
18 basically go through those analyses and say what is  
19 it could I reasonably expect to do?

20 And it would depend on well, do you  
21 believe you are going to be way above the standard?  
22 Or are you going to be close to the standard? You  
23 know, it's not unforeseen in these waste disposal  
24 systems that what the engineers think whenever the  
25 facility was initially developed turns out to not be

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 true.

2 And a good operator will ensure that  
3 they have proper margin in their facility so they  
4 don't get themselves into that situation. But it  
5 isn't necessarily always the case. And especially  
6 over a long operating timeframe of 30 to 50 years,  
7 you know, our understanding of how all these things  
8 work could change significantly in some areas. And  
9 those impacts may be significant to what was done 30  
10 or 50 years prior.

11 So that's kind of in a general sense  
12 what we would expect to happen. You'd have to look  
13 at the Section 9.5 of the guidance that walks  
14 through what we would want people to consider if  
15 they're in that situation.

16 MS. YADAV: Just a quick correction  
17 Dave, it's actually 9.3. It's called mitigation.

18 MR. ESH: Oh sorry.

19 MS. YADAV: I just see Dr. Chu writing  
20 it down. It's 9.3.

21 MR. ESH: Thank you.

22 MS. YADAV: Dave is just saying 9.5.  
23 It's actually Section 9.3.

24 MR. ESH: Too much to remember. Do we  
25 want to talk about this further or move on? All

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 right. Next slide please.

2 The performance assessment, here's the  
3 definition that we have. We feel it's pretty  
4 consistent with our definition in high level waste  
5 because performance assessment is not different from  
6 one to the other. It's an analysis technique that  
7 you're using. You're developing the scope of the  
8 analysis. You're trying to evaluate potential  
9 radiological doses to make a regulatory decision.  
10 And you want people to consider uncertainties in the  
11 analysis.

12 Now it is important to consider that  
13 the, we want evaluation of realism if possible. But  
14 as I just talked about, in some cases people may  
15 elect to use some conservatism. But there is kind  
16 of a misconception that the regulator wants  
17 everything to be conservative and be overly  
18 conservative.

19 We don't want that at all. If you can  
20 come in with a great scientifically justifiable  
21 analysis supported by a lot of information, that's  
22 what we would want to see.

23 But what you run into is that, in many  
24 cases the information supporting the performance  
25 assessment is sparse. There may be limited support

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 for some of the models or conceptual models.

2 In those cases then, people may elect to  
3 use conservatism. But that can be difficult to do  
4 in a complex model. So we don't even really like  
5 that. If possible, we really want to see people  
6 have adequate information if at all possible. Next  
7 slide please.

8 Here's a picture of what performance  
9 assessment is in more generic terms. Performance  
10 assessment is not a new topic. This is a renaming  
11 of technical analysis in the existing regulation.

12 And we do have some new requirements  
13 under 61.13 related to scope, uncertainty, and model  
14 support. But those things, we believe, are also  
15 implicit that are now made explicit. Those are  
16 parts of any modern performance assessment. And if  
17 I was reviewing a performance assessment and they  
18 didn't do well on those items, I would reject it.

19 So those requirements should not be  
20 onerous to meet considering it is part of what is  
21 done in the performance assessment process. There  
22 is a requirement to update the performance  
23 assessment at closure. And we did modify the siting  
24 characteristics to be consistent with the disposal  
25 of long lived waste.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   So just to give an example, in 61.50  
2           there's       requirements       associated       hydrologic  
3           performance of the site such as the site cannot be  
4           located in 100 year flood plain. Well if you're  
5           looking at a 10,000 year analysis, how difficult  
6           would that be to justify that the site is never  
7           going to be in a 100 year flood plain? That might  
8           be onerous.

9                   And so, what we've done is those  
10          requirements       associated       with       hydrologic  
11          characteristics, they are required to either be  
12          present or absent for the first 500 years. Because  
13          we thought that was practical that somebody could  
14          demonstrate it.

15                  But after 500 years then, you get to use  
16          a more risk informed performance based approach of  
17          how do those things, if they are present, impact the  
18          performance objective? So we thought that was a  
19          reasonable way to handle these siting  
20          characteristics that are part of the existing  
21          regulation.

22                  The little figure at the bottom there,  
23          the performance assessment is not different than  
24          many other technical analyses. You start with data,  
25          you develop a conceptual model. That gets converted

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 into a numerical model. And then you can calculate  
2 some results and you iterate, if possible, until you  
3 demonstrate that you meet the criteria.

4 It is very much a learning process  
5 though. It's about understanding what's going on  
6 with your site. Next slide please.

7 So why would you do site specific  
8 analyses instead of just NRC doing an analysis and  
9 developing something similar to the waste  
10 classification tables? Well here's a good example  
11 why.

12 On the left are retardation coefficients  
13 assumed in the technical analysis under which 10 CFR  
14 Part 61 was developed. And it gives you an idea,  
15 they were trying to assess different sites. They  
16 being NRC, being me of course.

17 And they selected point values,  
18 deterministic point values to do the analysis. Well  
19 on the right here are some data from this Sheppard  
20 and Thibault reference which was a general  
21 compendium of distribution coefficients developed  
22 for different soil types.

23 And what you is, say, look at the  
24 uranium value. The minimum is two mil and the  
25 maximum is 21,000 geometric mean. The GM there is

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 70. That's quite a bit of variance compared to even  
2 the variance that was considered in the basic  
3 analysis.

4 Now this could have a big impact for a  
5 particular analysis. If the retardation or the  
6 distribution coefficient is two, the uranium might  
7 be mobile enough to basically get to the receptor in  
8 a, you know, reasonably short period of time.  
9 Whereas if it's 21,000, it might not get there in  
10 hundreds of thousands of years depending on the site  
11 hydrology.

12 So from a regulator standpoint, if we're  
13 trying to develop criteria, what do we choose here  
14 to do our analysis? Do we choose 2 or do we choose  
15 21,000 or do we choose 70? Do we choose the whole  
16 range?

17 You know, you basically get this very  
18 complicated result that you have to try to distill  
19 down into a single point. And I think it's not  
20 being fair to the reality of the problem which is  
21 many of these things are highly variable and site  
22 specific. Next slide please.

23 The performance assessment guidance,  
24 these figures are from it. It's to communicate  
25 basically what a performance assessment is all

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 about. You start with a real system, the pictures  
2 on the left at the top.

3 And then you develop a conceptual model  
4 of your site including maybe conceptual models of  
5 individual components. So the performance  
6 assessment is really models within a model. It's a  
7 whole combination of different models that feed  
8 together to produce a common result.

9 One thing that we do stress though is  
10 that in many cases licensees may use abstracted  
11 hydrologic models and abstracted models in general.  
12 This is a simplification of a more complex model  
13 that you may be able to justify adequately  
14 represents your system that you can use to estimate  
15 performance.

16 So a performance assessment has lots of  
17 both depth and breadth. But it also depends on the  
18 complexity of your problem, what you should be doing  
19 with your performance assessment.

20 And the regulators need appropriate  
21 expertise to review these things. They can be  
22 pretty large and in some cases pretty complicated.

23 So if something came to NRC, I believe  
24 we definitely have expertise among all the great  
25 people I work with. And the agreement states, I

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 believe they also have expertise. But in some cases  
2 they may be more limited. Because they can't just  
3 have staff sitting around waiting for performance  
4 assessments to come in and then periodically working  
5 on them.

6 So in those cases, they may have to hire  
7 contractors. Or they also are available to work  
8 with the NRC. We do technical assistance requests  
9 to provide support to our agreement states. Next  
10 slide please.

11 Okay. Now onto radon finally. So this  
12 was a question at the end of the subcommittee  
13 meeting. Or a comment that was made, what are you  
14 doing with radon and why?

15 The Department of Energy stated that  
16 they felt radon, we should be using a flux limit for  
17 radon. And they are accurate indicating that some  
18 regulations do have radon flux limits.

19 MEMBER MARCH-LEUBA: What is a flux  
20 limit?

21 MR. ESH: 20 picocuries per meter  
22 squared seconds. So amount per unit area per unit  
23 time. So some regulations specify a flux limit.  
24 Others specify include it in the dose calculation.

25 EPA under 40 CFR 61 has a whole bunch of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 different cases for radon. Some of them listed here  
2 at the top for DOE, for phosphogypsum stacks,  
3 uranium mill tailings disposal, they apply a radon  
4 flux limit.

5 In other cases within 40 CFR 61, they  
6 say include the radon as part of the public doses at  
7 10 millirem per year. The examples given here are  
8 for uranium mines and non NRC federal facilities.

9 So what would say with respect to radon  
10 is we really can't in this rulemaking resolve the  
11 different treatments of radon that's done in  
12 different regulatory environments.

13 But what we can ensure is that what we  
14 do within Part 61 and within the NRC in general is  
15 internally consistent. So that's on the next slide.

16 So currently in Part 61, only limited  
17 amounts or small quantities of uranium were  
18 considered. And therefore, uranium was not an issue  
19 and there was no comment on the issue.

20 When this issue came up about disposing  
21 of potentially large quantities of depleted uranium  
22 or other uranium bearing waste, the existing  
23 guidance that was put forth in the year 2000 was to  
24 include radon in the dose assessment. There wasn't  
25 a reason to not include it in the dose assessment.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           And part of the reason for that is under  
2           Part 61 we have two different types of receptors for  
3           the two different performance objectives. You may  
4           have a offsite receptor that's at the site boundary  
5           and that's evaluated under 61.41. And then we have  
6           this intruder, i.e. unexpected accident type  
7           scenario that could be located on the site at some  
8           time in the future.

9           The flux limits that you would apply for  
10          the intruder, for instance if they constructed a  
11          home and had a basement, would be a lot different  
12          than the flux limits that you would want to apply  
13          for somebody at the boundary that's say standing at  
14          the site boundary.

15          So what value would you calculate? And  
16          would you calculate a different value for the  
17          intruder compared to the offsite receptor? And one  
18          would be overly restrictive. The other would be  
19          overly permissive.

20          So there was a practical aspect to  
21          applying a flux limit within 10 CFR Part 61. In  
22          addition to that, our public dose limit under 10 CFR  
23          Part 13.01 includes all pathways and all  
24          radionuclides.

25          So we would have to change 10 CFR Part

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 20 to specify don't include radon in that for a low  
2 level waste facility in some manner. I don't know  
3 how exactly that would work if we were to apply a  
4 flux limit under Part 61.

5 Under 10 CFR Part 40, the offsite  
6 public, you do include radon for the offsite public.  
7 You don't include the -- you include a radon flux  
8 limit for the cover on a mill tailings facility.  
9 Because those facilities have perpetual control.

10 There's no intruder assessed because the  
11 government is supplying money or it's provided  
12 upfront and the Office of Legacy Management manages  
13 it. They provide continual control to ensure that  
14 you aren't going to have the intruder scenario for  
15 as long as you need to for those types of materials.

16 So it's materially different than this  
17 waste disposal problem with the institutional  
18 control period. And the fund is only established to  
19 achieve the post closure operations and maintenance  
20 and the institutional controls. You don't have a  
21 continual funding mechanism from Congress, for  
22 instance, to do perpetual control at low level waste  
23 sites which you do for the uranium mill tailing  
24 disposal facilities.

25 In addition, 10 CFR Part 20 Subpart E

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       for decommissioning under restricted release, we  
2       don't include or we do include radon there for  
3       restricted release. We do not include it for  
4       unrestricted release.

5               But the commission, in the statement of  
6       considerations, explained that. That's because when  
7       you're unrestricted release, you're looking at  
8       uranium and thorium, radium, and the other materials  
9       that are accessible in the environment.

10              And so, the criteria that you calculate  
11       to how much you can leave in the environment is  
12       going to be more limiting than what you get from a  
13       release of radon to the environment. And therefore,  
14       you don't need to evaluate radon in 10 CFR Part 20  
15       unrestricted release.

16              VICE CHAIRMAN CORRADINI: That last part  
17       I didn't, you said it quickly. Can you say it again  
18       please?

19              MR. ESH: All right. So in  
20       decommissioning, there's two ways you can go in  
21       decommissioning. You can do unrestricted release  
22       which means, you know, you have contamination at a  
23       facility. You know, something that processed rare  
24       earths in the past or a closed reactor or whatever  
25       the situation might be. You have some sort of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 radioactivity in the environment.

2 And you go in and in decommissioning  
3 space you do a dose assessment to determine how much  
4 of that radioactivity you can leave in the  
5 environment. And we have screening values and new  
6 regs and tables that you can use.

7 Or you can do a dose calculation.  
8 Basically it's like the calculation that was done  
9 for 10 CFR Part 61, the waste classification tables.  
10 But you're doing it for a contaminated site.

11 So you determine how much you can leave  
12 there. You don't need to include radon there  
13 because that material is in the environment and it  
14 gets represented in the dose calculation in the  
15 ingestion of soil and the growing of plants and the  
16 ingestion of water and all the other pathways that  
17 you do in the calculation.

18 Those concentrations, because of the  
19 dose conversion factors that you need to limit the  
20 uranium and radium and thorium and all those things  
21 to in the unrestricted release calculation, are  
22 effectively limiting enough that you don't need to  
23 include the radon that you can get from those  
24 materials. So that's the general logic of why you  
25 don't include radon in unrestricted release.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   In restricted release you may have  
2 situations where that activity that's in the  
3 environment is not readily accessible to the  
4 receptors that are potentially there. And you  
5 provide perpetual controls to if they do get on the  
6 site.

7                   So in that case, you can have a  
8 situation where the quantities of the uranium,  
9 thorium, radium, et cetera, that you're going to  
10 leave at the site might be much larger than under  
11 the unrestricted release calculation.

12                  And therefore, the consideration of  
13 radon is more important and can be more significant.  
14 So that's why it's done differently in those two  
15 parts of 10 CFR Part 20 Subpart E. Chris, do you  
16 have anything to add on that?

17                  MR. MCKENNEY: The only other thing from  
18 the commission was was the high uncertainties for  
19 trying to figure out what type of buildings and  
20 other things that would multiply the radon dose.  
21 What way would be so speculative for the small  
22 amount of dose that you would be allowed when you're  
23 talking about a small fraction of the 25 millirem  
24 when you account for the fact of how much of the  
25 uranium and radium and everything else would be in

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       this unrestricted case.

2               All those things would be -- since you  
3       were already limiting it by the radium and the  
4       uranium and thorium, that it was not necessary to  
5       calculate the radon dose in that case.

6               MR. ESH:    So in summary, radon is a  
7       complicated picture here obviously when you look at  
8       all of this.   So to make this approach of including  
9       it in the dose assessment is most straightforward.  
10      It shouldn't apply for most of our low level waste  
11      facilities if they aren't taking the significant  
12      quantities of the uranium bearing waste.

13              And also, it's really not a large  
14      consideration at a humid site.   Because at the humid  
15      site, the radon and it's daughter products have  
16      short half lives.   But they don't make it out of the  
17      system when the site is humid.   The transport rate  
18      is strongly influenced by the saturation state of  
19      the system.

20              In arid sites the radon can transport  
21      much more readily through the subsurface.   And it  
22      gets out into the, either the home or the  
23      environment much more easily.

24              MEMBER REMPE:   So coming from a place  
25      where we used to worry about high radon days because

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 it would get on your polyester clothes.

2 MR. ESH: Couldn't get out of the  
3 facility sometimes if you wear a wool coat.

4 MEMBER REMPE: But I just am wondering  
5 are you missing something because it's more  
6 appropriate to do a flux limit because of the  
7 characteristics of the radon? I understand your  
8 consistency argument. And it would be difficult to  
9 do this.

10 This is more a theory question. But is  
11 that why the EPA went that way on some of their  
12 requirements, is that they thought it was a more  
13 suitable way of characterizing it or anything?

14 MR. ESH: I don't know the rationale for  
15 why EPA chose to do it certain ways for some types  
16 of situations and the other way for other types of  
17 situations. But I'm sure they had a rationale for  
18 it.

19 Just like the NRC picture may look a bit  
20 muddled. But when you actually dig into it, I don't  
21 think it is all that muddled. I think it's fairly  
22 consistent what they're trying to achieve.

23 In situations where like, say in the  
24 uranium mill tailings where you have a mechanism to  
25 ensure perpetual control and limit access to the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 material, then a flux limit is appropriate.

2 But you're still including radon at the site  
3 boundary of those facilities in the dose assessment.  
4 That makes sense to me. Why wouldn't you do that?

5 In the situation for the waste disposal  
6 facility, you are taking a disposal action. Now one  
7 of the challenges is that, of course, radon is  
8 ubiquitous in our environments and in our homes and  
9 everything else.

10 So you'd say well, are you providing a  
11 requirement that's much more stringent for the radon  
12 from waste than you would for radon from natural?  
13 And I don't think that is the case because for the  
14 onsite receptor, we are using a 500 millirem dose  
15 limit for the intruder receptor.

16 And the average person gets about 250  
17 millirem from radon in their home. Now that can  
18 vary widely depending on how much radon they have in  
19 their home. The variance in radon concentrations  
20 can be like 2 to 3 orders of magnitude. So the  
21 average person gets about 250 millirem. But there  
22 are rare circumstances where people can get much  
23 more nationwide.

24 CHAIRMAN BLEY: Does that include the  
25 places that make you vent your basements if you have

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       it? Seriously, I just sold a house in Virginia last  
2       year. And they measure that stuff. And if it's a  
3       little high, then you've got to put a fan system in  
4       and pump it out.

5               MR. ESH:       And that's very locality  
6       specific. So EPA have guidelines if you're above  
7       four picocuries per liter in your home, then you  
8       should install a system. But it's not a  
9       requirement.

10              And that makes sense because depending  
11       on the estimates that you see, it's somewhere  
12       between 6 and 15 percent of the homes are above four  
13       picocuries per liter. So what's the dollar value of  
14       that if you're requiring 6 to 15 percent of the  
15       homes to install a radon mitigation system? That's  
16       an enormous amount of money.

17              VICE CHAIRMAN CORRADINI:       You're  
18       switching units on me. So what's that dose 4 to 6  
19       picocuries --

20              MR. ESH:   Four picocuries per liter, so  
21       I think it's about on the order of 4 to 800 millirem  
22       is around that.

23              VICE CHAIRMAN CORRADINI:   Per year?

24              MR. ESH:   Per year. Right, if you live  
25       in that concentration. That's the point, if you

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 live in that concentration. And the flux in the  
2 natural environment is around 1 to 2 picocuries per  
3 meter squared seconds.

4 So if you have a 20 picocuries per meter  
5 squared seconds, that's about ten times the value  
6 that you expect from natural sources. What does  
7 that mean for a dose calculation and a dose  
8 assessment? It would depend on the specific  
9 circumstance and the receptors and everything.

10 But it would be, in my opinion, quite a  
11 bit larger than what you see from natural impacts.

12 MEMBER CHU: But David, isn't this what  
13 DOE's concern was last time when they came to the  
14 public comment?

15 MR. ESH: Well their concern is that you  
16 should be using the flux limit. But what I'm saying  
17 --

18 MEMBER CHU: But I think their point was  
19 you include the radon in your dose. And then  
20 because depleted uranium you're going to have quite  
21 a bit of radon coming off. So make the 25 millirem  
22 very restrictive because a lot of it's going to be  
23 taken up by radon.

24 MR. ESH: Okay. So this topic we didn't  
25 hear from pretty much any other stakeholders on. It

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 was only DOE and DOE employees that made this  
2 comment about the radon. So it was a limited set of  
3 commenters.

4 But if I understand their point is they  
5 believe that you should be using a flux limit for  
6 the evaluation of radon in these disposal  
7 facilities. You should not be including it in the  
8 dose assessment.

9 The flux limit, I would say, creates  
10 challenges with these different receptors, number  
11 one, in the low level waste analysis. And it's a  
12 lot more permissive than if you include it with the  
13 dose assessment. So if you took it to its end, you  
14 take that flux and actually convert that flux into a  
15 dose for your receptor scenarios, it ends up in  
16 doses that would be a lot more than the current  
17 performance objectives.

18 You know, I think it's going to apply in  
19 limited circumstances under Part 61. And the fact  
20 that you have this intruder performance objective  
21 which is quite a bit larger than the public dose  
22 limit -- I mean, if you're getting 25 millirem  
23 offsite from radon from a disposal facility, you  
24 probably have something pretty bad going on with  
25 your disposal facility. That should be a difficult

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 number to generate.

2 Now whether you could generate 500  
3 millirem onsite -- the big thing with depleted  
4 uranium or uranium bearing waste, the solution to  
5 mitigating radon is very simple, depth. You only  
6 have to increase the depth. And it's a very non-  
7 linear function of depth what the radon flux rate  
8 is.

9 You can look at our reg guide 3.64 which  
10 is used to develop covers for uranium mill tailings.  
11 And you can look at that and see how strong that  
12 non-linear relationship with depth and also moisture  
13 is for the radon flux rate.

14 So I understand there's some concern  
15 from DOE's standpoint about including it. But the  
16 engineering solution to mitigate that concern is so  
17 simple. I mean, why would you not do that?

18 MEMBER MARCH-LEUBA: So radon has a four  
19 day half life. So roughly how many meters of earth  
20 do you need to have a four day delay?

21 MR. ESH: So for wet material it might  
22 be on the order of inches to feet. For dry material  
23 you could be talking five meters, ten meters, et  
24 cetera.

25 MEMBER MARCH-LEUBA: It's not 1,000

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 meters? We're talking five meters?

2 MR. ESH: Right. You're talking like --  
3 for the concentrated depleted uranium, if you get 20  
4 meters of desert soil, it basically takes the radon  
5 away.

6 MEMBER MARCH-LEUBA: There is more than  
7 12 days of delay?

8 MR. ESH: Right. It's a complicated  
9 phenomenon because it is affected by discrete  
10 pathways just like it is in your home. You know,  
11 you have joints around your sump pump or, you know,  
12 other fractures in your concrete or all that sort of  
13 thing. That's where it comes in through mostly.

14 The diffusion rate through concrete and  
15 those sorts of things is generally so slow that not  
16 a lot makes it through those types of materials.  
17 Yes, you can seal materials if you needed to. Next  
18 slide please.

19 So inadvertent intruder assessment is  
20 similar to the performance assessment. This first  
21 item except receptor scenarios, I don't think that's  
22 particularly correct. I was reducing some materials  
23 in the slides. And that's not accurate because you  
24 do consider receptor scenarios in the performance  
25 assessment as well as the intruder assessment.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   The differences come on that the  
2                   inadvertent intruder is somebody that unknowingly  
3                   accesses the site and engages in normal or  
4                   reasonably foreseeable activities. And so it's an  
5                   onsite exposure.

6                   We use a 500 millirem or would use a 500  
7                   millirem dose limit if the proposed final rule goes  
8                   forward. It's precluded during the institutional  
9                   control period of up to 100 years.

10                  So this is not an anticipated scenario.  
11                  It is more of an accidental occurrence. And I think  
12                  David Coker put it well in one of our early meetings  
13                  that the inadvertent intruder assessment can be  
14                  viewed as a form of defense in depth.

15                  And where he was going with that was,  
16                  and I agree with it, is that the inadvertent  
17                  intruder assessment provides some restrictions on  
18                  the type of material that you can put in your  
19                  facility.

20                  Now as I talked about earlier, it may be  
21                  less restrictive than your 61.41 calculations  
22                  depending on your site. It also may be more  
23                  restrictive. But it is another part of the  
24                  calculation to ensuring what you're putting in the  
25                  near surface is appropriate.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           The 61.42 performance objective requires  
2           assessment now instead of just relying on the  
3           tables. The tables were based on assumptions about  
4           particular types of waste that may and in fact are  
5           no longer valid. And the tables also, I would  
6           argue, are not site specific and they are not risk  
7           informed.

8           So the tables had to use particular  
9           point estimates for particular sites. And so, they  
10          may have used parameters appropriate for a humid  
11          site to do the analyses when then you're applying  
12          those tables in an arid site. And those changes to  
13          the data and the calculations can have a big impact.

14          Now this issue about the tables and the  
15          analysis and what we're requiring, it's not a new  
16          issue. It was documented earlier in NRC documents  
17          especially in NUREG-1573, our guidance on  
18          performance assessments for low level waste.  
19          There's a footnote 7 in there that describes this  
20          issue.

21          So you know, if somebody has this issue,  
22          they've had 16 years to take some action on. And it  
23          shouldn't be that NRC's rulemaking now is causing a  
24          problem for them.

25          MEMBER POWERS:    When I look at this

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 issue, I come along and I say this is equivalent of  
2 an accident. You get an intruder in there. And you  
3 have a half millirem dose limit on this. So  
4 I'd say what's the rate? Well we assume there's an  
5 intruder over 1,000 years so it's like  $10^{-3}$  per year.  
6 So I come up with an expected dose of half a  
7 millirem.

8 If I look at 10CFR Part 100 and I say  
9 here I have an accident. I have a dose limit of 25  
10 rem at the site boundary. And what are accidents  
11 that would release something to the site boundary is  
12 like  $10^{-4}$  per year. So I come up with an expected  
13 dose of 2-1/2 millirem.

14 In other words, five times higher than  
15 what you've selected here. I don't understand why  
16 are those aren't consistent.

17 MR. ESH: Right. I think there's a  
18 conceptual issue that maybe I need to explain here.  
19 The inadvertent intruder is not expected but can't  
20 be eliminated with all certainty.

21 MEMBER POWERS: You don't expect severe  
22 accidents either.

23 MR. ESH: Right. But the fact that you  
24 analyze an intruder for say 1,000 years or 10,000  
25 years doesn't mean that the probability of the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 intrusion happening is  $1e^{-3}$  or  $1e^{-4}$ .

2 What it's saying is the integrated  
3 probability over that timeframe of an intrusion  
4 occurring is, in this case because you're using 500  
5 millirem and our dose limit for the offsite receptor  
6 is 25, it's saying that probability is around five  
7 percent, that integrated probability of an intrusion  
8 occurring over these long timeframes.

9 MEMBER POWERS: My analysis assumes it's  
10 one.

11 MR. ESH: Assumes it's one? Right.  
12 Okay.

13 MEMBER POWERS: Yes. Because I mean,  
14 you have to take care of the -- so you're sure that  
15 it's going to occur once in a thousand years.  
16 Sounds very plausible.

17 MR. ESH: I understand.

18 MEMBER POWERS: But once I stipulate  
19 that intruders can occur, having once in a thousand  
20 years does not seem to be an unwarranted assumption.

21 MR. ESH: So I think the difference is  
22 that the protection standard for the inadvertent  
23 intruder is the annual 500 millirem in a year to an  
24 individual. And so that individual in that  
25 particular year for the inadvertent intrusion does

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 not have a  $1e^{-3}$  frequency associated with it.

2 You're not weighting the dose calculated  
3 by a frequency of occurrence in this type of  
4 evaluation.

5 MEMBER POWERS: You almost reproduced my  
6 point. There doesn't seem to be a consistency here.

7 MR. MCKENNEY: One other thing they have  
8 different between like, for active facilities and a  
9 passive facility for a long term waste disposal  
10 facility is the fact that in waste disposal for  
11 like, the purpose of an inadvertent intrusion  
12 calculation is the fact that the reason you have an  
13 upper threshold is the fact that you don't want  
14 incidents to occur that would require active  
15 measures to have to take place.

16 Because you're assuming that, one of the  
17 assumptions is that you cannot rely on the fact that  
18 radiation protection authorities are aware of the  
19 site at the time and are aware of the incident  
20 occurring to be able to take the measures that are  
21 prudent to reduce the doses.

22 So therefore, you may not be willing to  
23 have as high of individual exposures that you would  
24 be potentially to be calculated under what we would  
25 be under an active situation where you can also rely

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 on active measures to also be put into place to  
2 reduce those controls.

3 MEMBER POWERS: But haven't you already  
4 taken that into account to get to your assumption  
5 that there will be an inadvertent intruder? Haven't  
6 you already counted for that?

7 MR. MCKENNEY: What?

8 MEMBER POWERS: That the authorities are  
9 not aware that this is here.

10 MR. MCKENNEY: Right. But that's also  
11 why I don't want to have a five rem dose. I don't  
12 want to put a five rem dose out there, put a  
13 concentration out in space.

14 VICE CHAIRMAN CORRADINI: Can you say  
15 what you said again? I didn't understand. What did  
16 you mean? What kind of dose?

17 MR. MCKENNEY: A five rem dose.

18 VICE CHAIRMAN CORRADINI: Oh, five rem.

19 MR. MCKENNEY: So if you're saying that  
20 I'm too low of a dose compared to 100 is the fact  
21 that if I raise my dose limit here to be  
22 corresponding, then that would become, that I'd be  
23 allowing a much higher individual dose limit to  
24 somebody when I don't have any radiation protection  
25 controls to have active measures come in and

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 actually reduce those controls.

2           Whereas when we have an active facility,  
3 those people can come in and we can take protective  
4 measures.

5           VICE CHAIRMAN CORRADINI: But if I just  
6 use your analogy then, we don't require any  
7 protective measures or any sort of protective action  
8 until two rem. So wouldn't two rem, at the very  
9 least, be an appropriate consistent value?

10           MR. MCKENNEY: In international space,  
11 yes. There's international guidance, there has been  
12 discussions between 500 and 2 rem as being the  
13 possibilities of making selections in that type of  
14 field.

15           MR. ESH: So if we could go to the next  
16 slide please. So the dose limit of 500 millirem or  
17 5 millisieverts, it's higher than 10 CFR Part 41 and  
18 it's higher than the NRC public dose limit.

19           But as you're getting at there, well why  
20 isn't it 2 rem? 500 millirem is what was used to  
21 develop the waste classification tables in Part 61.  
22 So if you set the intruder dose limit at something  
23 higher, say for other isotopes, you're regulating  
24 some isotopes to 500 millirem and you're regulating  
25 some of them to 2 rem.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           So you'd have to redo the waste  
2       classification tables to make it consistent, in my  
3       opinion. And we had asked the commission if they  
4       wanted us to redo the waste classification system  
5       early in this rulemaking process. And they said no,  
6       don't redo the waste classification system. Delay  
7       that until after this rulemaking is done and then  
8       we'll consider it.

9           But that doesn't mean they're going to  
10      do it. They're just going to consider it at that  
11      time whether it makes sense to redo the waste  
12      classification system.

13           VICE CHAIRMAN CORRADINI: But just so  
14      that I'm clear, without taking any protective action  
15      2 rem would seem consistent with what would happen  
16      in a reactor facility.

17           MR. ESH: Yes.

18           VICE CHAIRMAN CORRADINI: For example.

19           MR. MCKENNEY: Yes. That is much more  
20      consistent with the upper bound of that of that  
21      range, yes.

22           MR. ESH: I don't know which came first.  
23      You know, but the 500 millirem was not pulled out of  
24      the air. It was evaluated when the initial  
25      rulemaking in the early 1980's was completed. And

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       there was a series of public meetings where they  
2       talked about institutional control periods and dose  
3       limits and all these sorts of things. And that was  
4       the output of that rulemaking process.

5               So I'm just giving you some color of  
6       where it comes from. It doesn't answer your  
7       question about well should it be 2 or should it be  
8       500. But I'm explaining why it is the 500.

9               MEMBER KIRCHNER: Dave, can I ask a  
10      variant on these questions? Is this going to wind  
11      up being for the four sites that exist? The  
12      dominant, or the most costly is a different way to  
13      put it, part of this rule set.

14              VICE CHAIRMAN CORRADINI: I asked that  
15      in a similar way earlier.

16              MR. ESH: So technically limiting from a  
17      meeting the criteria standpoint is different than  
18      how much it costs, for instance. So the intruder  
19      calculations from a cost and effort standpoint are  
20      way less resources than the performance assessment  
21      calculations for 61.41.

22              For 61.41 they are in many cases  
23      complicated combinations of models with hydrology  
24      and geochemistry and everything else going on. The  
25      intruder calculations are very stylized calculations

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       that you can do in a spreadsheet almost.

2               MEMBER KIRCHNER: I didn't care how much  
3       effort went into the calculation. I was more  
4       interested in what happens when you actually design  
5       and build the repository, excuse me, the waste site.  
6       Does that become a dominant concern in closing the  
7       site, for example?

8               MR. ESH: And that's what I attempted to  
9       answer earlier is that it depends on the site and  
10      the waste whether 61.41 is going to cause you  
11      greater restrictions or whether 61.42 is going to  
12      cause you greater restrictions.

13              It also depends on the isotopes. So  
14      maybe plutonium is going to be limited by your  
15      intruder calculation because it's very immobile in  
16      the environment. And so, it doesn't cause risk  
17      impacts from 61.41 type calculations. But it will  
18      in the intruder calculations.

19              So it'll even be isotope and element  
20      specific which one is more limiting for which  
21      performance objective.

22              MEMBER KIRCHNER: But generally you're  
23      not expecting large plutonium disposal in these  
24      kinds of sites, I would guess. So of the more  
25      common components of waste that are being put in

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       these sites --

2                   MR. ESH:  So if you look at the --

3                   MEMBER KIRCHNER:  Is intruder analysis  
4       going to be a bigger factor in the design and  
5       construction and hence cost than the other?

6                   MR. ESH:  Yes.  For many of the isotopes  
7       that are causing dose in the performance  
8       assessments, there are greater restrictions  
9       associated with 61.41 than there are with 61.42.  
10      And you can see that in the tables that are in the  
11      guidance document.

12                   The concentrations that are in the  
13      tables with respect to 61.42 are much higher than  
14      what you would need from a generic standpoint to say  
15      things are going to be okay from a 61.41 standpoint.

16                   MEMBER KIRCHNER:  So here's a different  
17      take on this.  To the extent that this inadvertent  
18      intruder part of the new rule would dominate things,  
19      is it practical to consider marking the site  
20      accordingly?

21                   I think pragmatically that's what the  
22      states will do anyway.  And it's not impractical in  
23      engineering terms to mark something for 1,000 years.  
24      We have pyramids that are much older than that.  I'm  
25      not suggesting building a pyramid on top of the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 site.

2 CHAIRMAN BLEY: Of course we've had  
3 towns disappear in 300 or 400 years as well.

4 MR. ESH: So we have some material in  
5 the guidance document associated with markers. And  
6 yes, markers are required under Part 61 to have at a  
7 facility.

8 The issue becomes the long term  
9 durability or effectiveness of those markers. And  
10 there was an interesting example from, I think it  
11 was a site in the southwest that they did maybe a  
12 small weapons test. It's in the guidance document.

13 But they put a marker up to provide  
14 people information about the location of this. And  
15 that marker has moved a number of meters over the  
16 years because cows use it as a scratching post. So  
17 there are other examples of these markers that --

18 MEMBER KIRCHNER: For the record, I was  
19 considering much more substantial structure. As a  
20 hiker I can tell you that usually the geodetic  
21 survey markers on mountain tops disappear on a  
22 regular basis.

23 MR. ESH: And that's the other issue, is  
24 theft, vandalism, all the other things that  
25 teenagers and some other people like to do. That

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 comes into play when you're dealing with markers.

2 And there have been studies of markers  
3 of, you know, how do you develop them to make them  
4 durable and not attractive and warn people, what  
5 languages you use, symbols, all those sorts of  
6 things.

7 So that is a consideration. But the  
8 effectiveness of the markers to deter an intrusion  
9 event is limited over long periods of time. We just  
10 don't have the experience base for it totally.

11 Now we did look at land disturbance  
12 values in trying to evaluate is it reasonable to use  
13 a 500 millirem dose with its effective implied  
14 probability of there's going to be a five percent  
15 chance that the intruder accesses the material at  
16 any time over the compliance period.

17 So this was done with GIS. We looked at  
18 the disturbances in the U.S. And we got roughly 2-  
19 1/2 percent of the land area has been disturbed to a  
20 depth greater than one meter over the course, I  
21 believe it was over the last ten years. Roughly one  
22 percent of the land area has been disturbed greater  
23 than three meters over the last ten years.

24 So what you're talking about is  
25 integrating those sorts of numbers over 1,000 years

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 or over 10,000 years. The other thing you can look  
2 at is, say, drilling in Texas for instance. Well  
3 200 years ago the number of oil wells drilled in  
4 Texas was zero. In 1860 it was one. Today there's  
5 like about 190,000 wells in Texas. And over the  
6 course of the history of Texas there's been about  
7 1.5 million oil wells drilled in Texas.

8 If you take the area of Texas and  
9 compare it to the area of its disposal facility and  
10 the number of wells that have been drilled, you end  
11 up with roughly a two percent chance that a well  
12 would be put through the disposal facility.

13 And that's based on history to date. If  
14 population increases and energy usage increases, the  
15 frequency of well drilling is going to increase.  
16 That probability would go up. And you're talking  
17 about integrating it over a much longer period of  
18 time.

19 So you know, five percent 500 millirem  
20 dose limit, I think is a fairly reasonable number  
21 considering what you're dealing with. You are  
22 talking about something that is really difficult to  
23 quantify. And you really shouldn't go beyond like  
24 this sort of level of analysis with it, in my  
25 opinion.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER RICCARDELLA:     Could I ask a  
2                   question just for my understanding? To have a dose  
3                   limit like that for an intruder, is there some  
4                   assumption about the length of time that the  
5                   intruder is there?

6                   MR. ESH: So in NRC space, we look at it  
7                   as an accident, an unexpected scenario albeit an  
8                   accident. But if it occurs past the institutional  
9                   control periods, so 100 years from now, there's no  
10                  limitation on the time it's going to happen.

11                  Because there's nobody there, besides  
12                  their knowledge of that they might dig into  
13                  something metal and say I found some metal here or I  
14                  hit a waste container, there's not going to be an  
15                  entity to come and tell them you've made this  
16                  mistake.

17                  VICE CHAIRMAN CORRADINI: So they start  
18                  living there?

19                  MR. ESH: They could potentially live  
20                  there. But that's part of the inadvertent intruder  
21                  --

22                  MEMBER RICCARDELLA: Is that a permanent  
23                  dose limit? Or is that a limit per year?

24                  MR. ESH: It's an annual dose limit,  
25                  yes.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER   RICCARDELLA:           And   so   the  
2   assumption is the intruder lives there?

3                   MR. ESH:   They could potentially.   If we  
4   go to the next slide, we look at normal activity  
5   such as dwelling construction, agricultural,  
6   drilling for water.   There may be locations where  
7   those things are not reasonable.

8                   You know, one of the existing sites is  
9   in a very remote location.   The water is not  
10   potable.   You generally can't use it even for  
11   agriculture.   So the intruder scenarios that you  
12   would look at in that site might be quite different  
13   than the ones you would look at generically.

14                  And that's why in this proposed rule you  
15   can consider reasonably foreseeable activities  
16   consistent with the activities in the vicinity of  
17   the site when the assessment is developed.

18                  So you can bring in more realism to what  
19   you think are the intruder scenarios.   I just  
20   caution people as I think that's a slippery slope.  
21   Because any time you've dealt with stakeholders,  
22   they can be very imaginative and come up scenarios  
23   that maybe you don't envision but that they think  
24   are very reasonable.   And give basis like my uncle  
25   does that, you know, he lives close to there and

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       that's what he does.    So you're telling me that's  
2       impossible?

3                So you've got to be careful of dealing  
4       with receptors.    Sorry, go ahead.    He's okay.    So  
5       next slide please.

6                So what do these activities look like?  
7       Well this is the agriculture, dwelling construction,  
8       and drilling for water.    Those are the types of  
9       scenarios that were looked at when the regulation  
10      was developed.

11              And we still think if you want to be  
12      reasonably conservative or more than reasonably  
13      conservative and not deal with speculation about the  
14      receptor scenarios, then this is probably the way to  
15      go.    If you can demonstrate you can meet the  
16      criteria using these sorts of scenarios, then why  
17      would you try to use other scenarios?    That seems  
18      like you're asking for punishment that you don't  
19      want to receive.    Next slide please.

20              So we do have the guidance on site  
21      specific scenarios.    This was developed by Chris  
22      Grossman.    It's in Chapter 4 of our guidance  
23      document.

24              We do believe it's appropriate to  
25      constrain exposure scenarios for the normal or the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 reasonable foreseeable activities based on  
2 consideration of physical information such as, you  
3 know, the waste is too deep. You can't put a house  
4 foundation into it. Or the water is not potable so  
5 you can eliminate the groundwater pathway.

6 You can also consider cultural  
7 information but that's much softer as we talked  
8 about with the uncertainties and the societal  
9 component. It's more difficult to argue that over  
10 the longer timeframes.

11 MEMBER RAY: Can I interrupt for just a  
12 second? You may this comment about not potable a  
13 couple of times. I just have to observe that we  
14 just recently went through an operating license  
15 review in which it used deep well injection for  
16 liquid radwaste.

17 And in that case the staff did assume  
18 drilling inadvertent intrusion into non-potable  
19 water. So it seems a little inconsistent here to  
20 say you don't need to consider here and we did  
21 consider it there. I don't have any other comment  
22 than that. We did consider it in that case.

23 MR. ESH: I mean, that's a good comment.  
24 And I don't want to confuse you. Here I'm talking  
25 about, say, elimination of the drinking water

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 pathway because the water is not potable. But not  
2 the fact that somebody might try to drill.

3 So somebody might still try to drill and  
4 get impacted from the drill cuttings and everything  
5 that goes in the drilling scenario. But if the  
6 water is not potable, then we don't say we're going  
7 to assume they drink it anyway when it's at like,  
8 you know, a couple hundred thousand milligrams per  
9 liter chloride, for instance. So just so we're  
10 clear, that's what I'm talking about here. Next  
11 slide please.

12 So site stability is another component  
13 under the 61.44 performance objective. It is a  
14 cornerstone of disposal according to the regulation.  
15 And that's because a lot of the problems in early  
16 facilities were associated with stability.

17 The site stability is required for the  
18 compliance period but it may be performance based.  
19 So we had this comment from people saying why do you  
20 even have this? And the answer is because of the  
21 problems that were experienced by facilities and  
22 because we also have a requirement that the facility  
23 must be capable of being modeled and analyzed.  
24 That's an existing requirement in the regulation.

25 In some circumstances, if you have a

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 very unstable site, say from a geomorphological  
2 standpoint or otherwise, it may make it prohibitive  
3 to model that facility, for instance.

4 And in those cases, we do see cases  
5 where, you know, engineers can calculate anything.  
6 But does the number mean anything? So engineers I'm  
7 sure, even in the most unstable site, can generate  
8 some numbers.

9 But the agreement state regulator may in  
10 some instances say, fine you calculate that under  
11 these scenarios the doses are going to be very  
12 small. But this is such a speculative uncertain  
13 scenario that I'm still going to say this does not  
14 meet the stability performance objective. And  
15 therefore, is not an action you should take.

16 So that's why it's a stand alone  
17 performance objective. The guidance talks about  
18 design and model based approaches. So there are  
19 models out there, Child and Siberia for instance,  
20 that can be used for these for these long term  
21 geomorphological calculations.

22 And we also, NRC has existing guidance  
23 on using designed based approaches such as used in  
24 uranium mill tailings. I worked with our two  
25 experts that developed that guidance. One of them

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 is retired and one is now mostly retired, I would  
2 say, to ask them the question of well you developed  
3 to apply for uranium mill tailings for 200 to a goal  
4 of 1,000 years, how would you extend that to apply  
5 for beyond 1,000 years up to 10,000 years?

6 And so, you start considering the  
7 mineralogy of the rocks a lot more. But in either  
8 of the design based approaches, whether it's for a  
9 shorter timeframe or a longer timeframe, it's still  
10 based on the PMP and the PMF. So the probable  
11 maximum precipitation and the probable maximum  
12 flood.

13 And if you ever have an opportunity in  
14 your life to go see one of those facilities, I  
15 encourage you to do so. They've very impressive,  
16 these facilities and these rock covers that are  
17 designed from them. It's hard to imagine how they  
18 would go anywhere based on looking at them. Next  
19 slide please.

20 This is just some information from the  
21 guidance that we do have that you should consider  
22 the scale of your problem. And that's going to be  
23 determined by primarily your waste. If your waste  
24 is simpler, shorter lived, then you look narrow in,  
25 make sure you don't have subsidence in the facility,

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       that sort of thing.

2               If you have longer lived waste, then you  
3       have to consider what's going on around the facility  
4       in addition to maybe what you've done in  
5       geomechanical design of your facility and your  
6       trenches.

7               On the right is kind of the evaluation  
8       process.       It's similar to the performance  
9       assessment.    It's just tailored to site stability.  
10      And there's a lot of additional information on site  
11      stability provided in our NUREG-2175.   That's in  
12      Chapter 5.

13              So waste acceptance requirements are  
14      provided in the regulation.   So that was the end of  
15      kind of the technical analyses.   It feeds into the  
16      waste acceptance requirements.   Or it can feed into  
17      them.

18              The waste acceptance requirements are  
19      basically how to determine if the actual waste that  
20      you have received is in line with the analyses.   And  
21      the three components are the characterization, the  
22      criteria, and the certification.   Next slide please.

23              So the waste acceptance criteria have  
24      components such as the allowable limits on  
25      radioactivity, the waste form characteristics, and

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 container specifications and restrictions and  
2 prohibitions.

3 These things are very important to low  
4 level waste disposal and all waste disposal. When  
5 you have problems in these modern facilities, it's  
6 usually associated with something going on  
7 associated with the waste. It's usually not  
8 associated with something going on external to the  
9 facility and external to the waste. Next slide  
10 please.

11 Our waste acceptance approach in this  
12 proposed or draft final regulation has considerable  
13 flexibility to the licensees. Because they can  
14 develop site specific waste acceptance criteria.  
15 They can also use the 61.55 limits that are in the  
16 regulation. Or they can do a combination of both to  
17 develop their waste acceptance criteria.

18 But either way the licensees must  
19 demonstrate that the criteria will demonstrate the  
20 performance objectives are met. Next slide please.

21 NUREG-2175 the guidance document, it  
22 provides a lot of information that we hope is  
23 helpful and can ensure some consistency for all  
24 these activities that are going to be undertaken  
25 within the agreement states.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           We tried not to just have all text and  
2 pages and pages of information to put you to sleep.  
3 But it does have a considerable amount of text as  
4 well as other things like flow charts and tables.

5           It does provide guidelines for what the  
6 licensees or applicants should include. And what  
7 regulators should review for each of the types of  
8 analyses. There are suggested references, screening  
9 tools, and case studies.

10           Priya Yadav who is here and you heard  
11 from earlier, she was our Project Manager on this.  
12 And has hopefully helped us get out a very high  
13 quality document. This document, of course, you  
14 were provided. And it's also available on the link  
15 provided at the bottom of this slide. And I think  
16 that's it.

17           MEMBER CHU: Thank you. We have DOE.

18           CHAIRMAN BLEY: Yes. Mr. Tonke from DOE  
19 wanted five minutes. Is he in the room? It's your  
20 turn.

21           MR. TONKE: Thank you. I'm Douglas  
22 Tonke. I'm the Waste Disposal Office Director with  
23 the Department of Energy's Environmental Management  
24 Program.

25           I think most of you are familiar with

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 DOE and we've talked about us today. So I won't go  
2 into what we're about. But we self regulate our low  
3 level waste program. And are doing a lot of  
4 performance assessments and composite analysis.

5 We not only do them for our own  
6 facilities but we have a policy that allows us to  
7 use several of the facilities but that Dr. Esh  
8 showed on the chart, some of the commercial  
9 facilities particularly in Clive and in Texas.

10 We're also touched by the fact that it  
11 went into the one chart we are, NRC reviews for our  
12 high-level waste tank closures and applies the staff  
13 guidance. So this is very applicable to us for  
14 that.

15 So consequently we've had significant  
16 interest. We've provided letters. I appreciate the  
17 committee allowing me to talk at the subcommittee  
18 meeting and a few minutes here, just to continue to  
19 push some of our points.

20 Last week the NAS hosted a low level  
21 waste workshop. I attended it and was frankly  
22 surprised by the amount of discussion there that the  
23 participants had on this particular rule. So  
24 there's a lot of interest out there. And I think  
25 they view it as being a bit complex.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   So I do appreciate Dr. Esh and the  
2 additional slides he added today to address some of  
3 our comments. And the fact that the full committee,  
4 a lot of the questioning went along the points that  
5 we've been making.

6                   I boil it down at this point into sort  
7 of two areas. The first one is the compliance  
8 period. I think I can say that the Department is in  
9 line with the 1,000 year. And we've been in line.  
10 And we've noted that the Commission directed at one  
11 point the 1,000 year compliance period.

12                  This committee pointed out about the  
13 significant uncertainties in the performance  
14 analysis beyond that roll in for millenia, et  
15 cetera.

16                  Our folks believe that the time of  
17 compliance should also consider intergenerational  
18 equities and allocation of resources. You know,  
19 these are equal to or just as important as PA  
20 projections. And maximizes the benefits to the  
21 government. Or to future generations from today's  
22 resources.

23                  Dr. Esh's chart showed that there are  
24 other programs using the 1,000 year at most  
25 requirements. And we saw those on the chart. Some

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 of the programs that had higher levels in the 10,000  
2 range were siting a pile of OH facilities, et  
3 cetera.

4 So we appreciated see those. And as he  
5 pointed out, mill tailings are being, the standard  
6 being applied there is 1,000 or at least 200 years.

7 So in light of that, you know, we'd  
8 prefer to see the annual dose limit to 1,000 years.  
9 We do long term performance assessment and  
10 calculations. But we see it going, you know, we do  
11 it long term. But our compliance period is 1,000  
12 years.

13 The other area I'll bring up is radon.  
14 And I think there were excellent questions there  
15 about radon. So I don't think I need to really go  
16 into it. I think our issue is the contribution of  
17 the radon when it's combined into the small factor.

18 We do separate radon calculations  
19 against the flux limits on the side. So it's, you  
20 know, within 25 millirem limit proposed. And out  
21 there a ways it's sort of uncertain at this point  
22 how that will all play out.

23 So to establish more restrictive  
24 limitations in the context of an extended  
25 performance assessment entails significant and

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       irreducible uncertainties that we don't think would  
2       be particularly unwarranted.

3               And likewise, we echo the comments about  
4       the comparison to the, you know, the other agencies  
5       and the indoor air for radon alike.

6               Finally I'll point out that the draft  
7       that DOE -- although we do inadvertent intruder  
8       analysis, we do not apply a dose limit to those. We  
9       appreciate the discussions you had.

10              One thing to consider is, I think it was  
11       brought by the gentleman about plutonium, the  
12       guidelines are applied to our high level waste tanks  
13       which do have plutonium in them.

14              So I'll stop there. We just had a few  
15       days to look at the guidance. But thank you again  
16       for the opportunity to sort of reiterate our views.  
17       We appreciate it. Thank you.

18              MEMBER CHU: Thank you. Anybody on the  
19       line public?

20              CHAIRMAN BLEY: The way it's working  
21       now, ask for comments from the phone line. And see  
22       if anyone -- does anybody on the phone line care to  
23       make a comment?

24              MS. GRAY: This is Erica Gray from  
25       Richmond, Virginia. Can you hear me?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   CHAIRMAN BLEY:     We can.     Please go  
2 ahead.

3                   MS. GRAY:    So I guess when you're saying  
4 comments, am I allowed to ask any questions at all?

5                   CHAIRMAN BLEY:   No.    We don't have an  
6 interaction.   This is just an information gathering  
7 session for the committee.   So we invite people to  
8 make comments, about five minutes if you have that  
9 many.   And that's all at this point.

10                  MS. GRAY:    Okay.    So when I do have  
11 questions, who do I ask them to?

12                  CHAIRMAN BLEY:   You can send questions  
13 to the NRC staff.

14                  MS. GRAY:    Which staff?    The ACRS or  
15 who?

16                  CHAIRMAN BLEY:       No,    the    Nuclear  
17 Regulatory Commission staff.

18                  MS. GRAY:    There's got to be somebody in  
19 particular that's managing that's in oversight of  
20 this particular waste issue.   Is there not?

21                  CHAIRMAN BLEY:       Derek, do you have  
22 anybody we can point this person to?

23                  MR. WIDMAYER:   Well I would say Gary at  
24 this point in time.

25                  MR. COMFORT:   Yes, you can send them to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 me, Gary Comfort. I'm at gary.comfort@nrc.gov. So  
2 G-A-R-Y.C-O-M-F-O-R-T@nrc.gov.

3 MS. GRAY: Okay.

4 CHAIRMAN BLEY: And for the ACRS Derek  
5 Widmeyer is our staff lead for this Part 61 work.  
6 So you could address a letter to him too.

7 MS. GRAY: I'm sorry. Who was the  
8 second person?

9 MR. WIDMAYER: It's Derek Widmayer. My  
10 email is derek.widmayer@nrc.gov.

11 MS. GRAY: Okay. Well I guess the one  
12 comment I guess I would have to say that it is  
13 really quite startling to hear about how big this  
14 problem has gotten. And I will obviously have to  
15 write and ask questions.

16 Because you know, this idea of depleted  
17 uranium -- and obviously it looks like it's going to  
18 be classified as low level waste. But it could  
19 actually peak in one or two million years. It'll  
20 actually go past A to a C value as it goes for  
21 waste. So this is going to increase.

22 So it'll very interesting to find out  
23 how, with just these four sites, these four  
24 agreement states have agreed to take on something  
25 like 100 million tons and counting. If I understood

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       correctly, that was only counting for the depleted  
2       uranium.

3               So I'd be very curious to find out, you  
4       know, how much low level waste we've already  
5       created. And how much we create annually. I'm  
6       extremely disturbed. We obviously have a huge  
7       problem.

8               But it sounds like we also need to look  
9       at how we can possibly stop making more of this  
10       waste. But since I can't ask any questions, I will  
11       be writing to the two fellows you all gave me names  
12       for. Thank you very much.

13              CHAIRMAN BLEY: Thank you. Is there  
14       anybody else on the line who would like to make a  
15       comment please? Anyone in the meeting room? Okay.  
16       Margaret are we finished? Okay. Thank you.

17              Thanks for the presentations. We will  
18       be getting together and trying to write a letter. I  
19       know you have interest in what we might say on the  
20       guidance. We'll have to discuss that among  
21       ourselves.

22              But it was a heroic effort today to get  
23       us through a lot of that that we didn't talk about  
24       before. And we appreciate it. And I think on the  
25       other side though -- I don't know until we talk to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 each other how many people have had a chance to  
2 really study that small document you sent. Thank  
3 you.

4 We are at almost 6:00. I know we have -  
5 - I do. Thank you. At this point we're going to go  
6 off the record.

7 (Whereupon, the above-entitled matter  
8 went off the record at 5:48 p.m.)  
9  
10  
11  
12  
13

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

**North Anna**

**3**

# **North Anna Unit 3 COLA**

**Meeting with Full Advisory  
Committee on Reactor Safeguards**

**November 3, 2016**

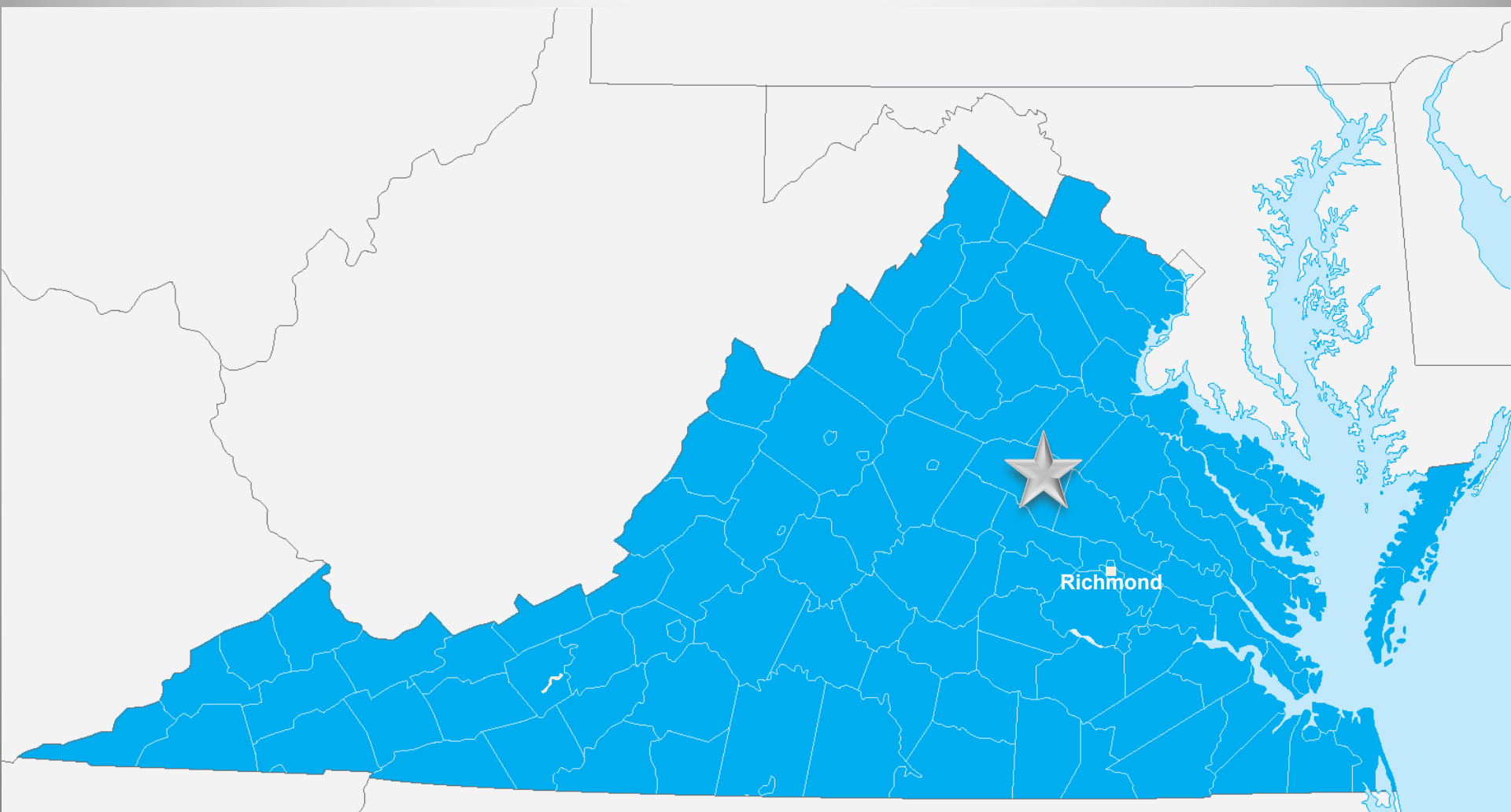
# Agenda

---

- North Anna Unit 3 (NA3) site
- NA3 licensing history
- COLA changes
- Conclusions

# North Anna Site Location

---

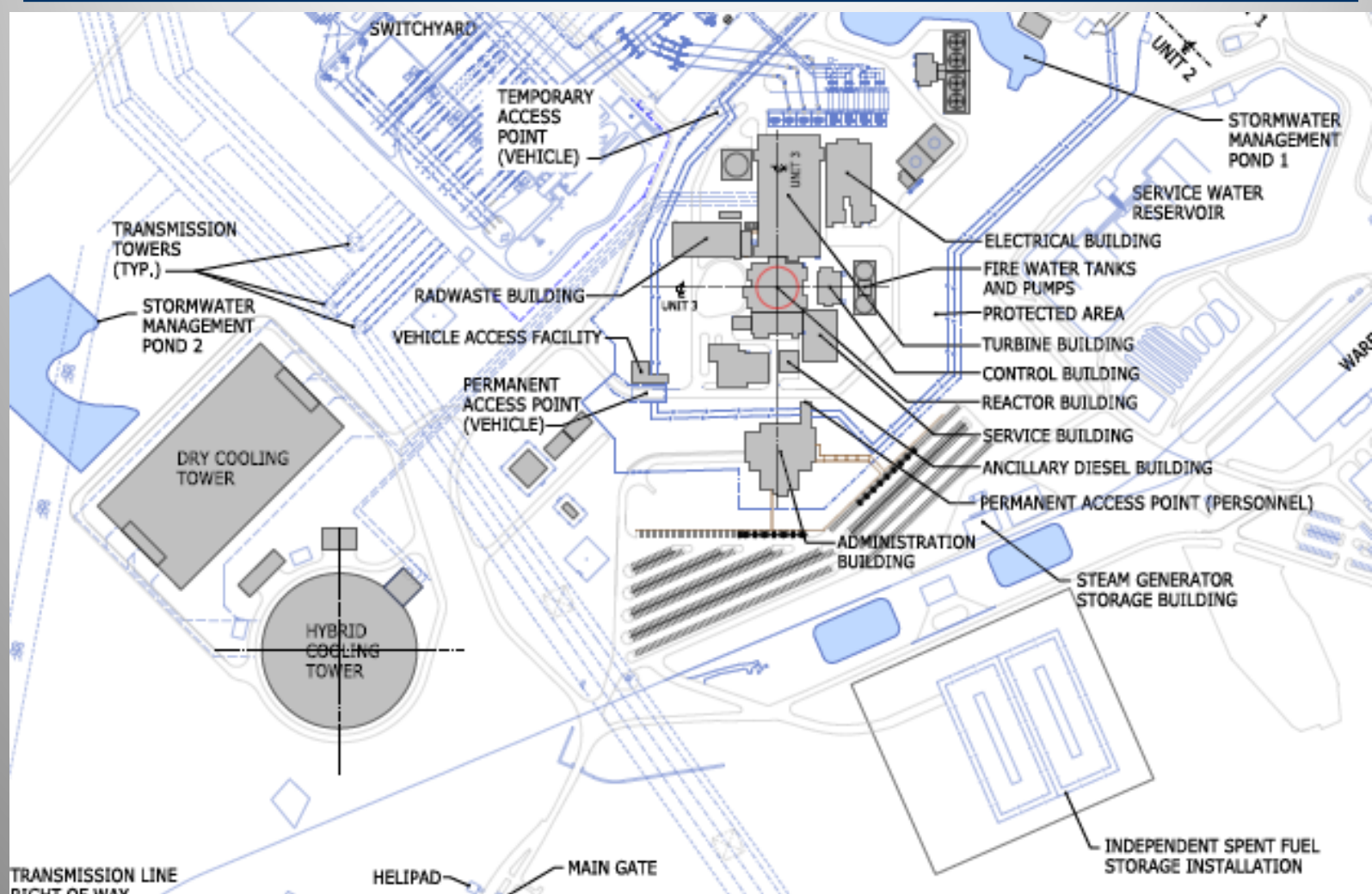


# North Anna Site with Unit 3

---



# NA3 Plan View



# NA3 History

---

- ESP

- ESP Application submitted September 2003
- EIS issued December 2006
- ESP issued November 2007

- COLA (as ESBWR)

- COLA submitted November 2007
- ACRS Subcommittee meetings June, July, August 2009
- ACRS Full Committee meeting October 2009
- ACRS Letter October 2009
- Supplemental EIS issued February 2010
- ACRS Subcommittee meeting October 2016

- Technology Changes

- Changed to APWR technology May 2010
- Reverted to ESBWR technology April 2013

# Approach to Post-2009 COLA Changes

---

- Standardized content with ESBWR DCD and R-COLA (Fermi 3) through design-centered working group approach
- Relied, as much as possible, on site-specific COLA content from previously reviewed NA3 ESBWR COLA

**Most COLA content is consistent with information previously reviewed by ACRS**

# Hazardous Chemicals Analyses (Section 2.2)

---

- Evaluation of Potential Accidents
  - Accident categories considered included:
    - Explosions
    - Flammable vapor clouds—delayed ignition
  - Analysis demonstrated that blast effects would not exceed peak overpressure of 1 psi at any safety-related structure with exception of storage and transport of liquid hydrogen

# Hazardous Chemicals Analyses (Section 2.2)

---

## Liquid Hydrogen

- Storage of liquid hydrogen - two 6,000 gallon capacity tanks
  - Actual distances from tanks to nearest safety-related structures exceed the calculated minimum safe distance
  - Therefore, storage of liquid hydrogen would not adversely affect safe operation or shutdown of NA3 (including the Radwaste Building)
- Transport of liquid hydrogen - 13,000 gallon capacity truck
  - Probabilistic analysis concluded probability of an accident involving delivery truck is less than  $10^{-6}$  per year, which is acceptable per NRC guidance

**No design-basis events were identified with respect to storage or transport of chemicals**

# Local Intense Precipitation (Sec. 2.4.2)

---

- Maximum inundation flood levels resulting from local probable maximum precipitation (PMP) are bounded by DCD site parameter value of 0.3 m (1 ft) below plant grade
- Sheet flow analysis:
  - Flow directions for runoff from roof tops are stipulated in FSAR
  - Transitory sheet flow depths at 3 locations are above floor elevations at entrances to safety-related buildings
- FSAR commits to place curbs at these entrances, or raise their thresholds, to prevent water from entering these buildings

**Site grading and structure configuration precludes flooding of safety-related buildings during a local intense precipitation event**

# Accidental Releases of Liquid Effluents (Sec. 2.4.13)

---

- Design includes mitigating features to preclude accidental release of liquid effluents
- Nevertheless, per SRP 11.2, analysis of accidental releases of liquid effluents into environment was performed
- Condensate Storage Tank (CST) was assumed to be source of release, based on ranking of tanks

**An accidental release of liquid from CST to environment would result in radionuclide concentrations and dose well below 10CFR20 limits**

# Radwaste Discharge Piping Departure (Sections 11.2 & 12.3)

---

- NA3 operational goal is zero liquid release plant - Liquid Waste Management System (LWMS) designed to recycle all processed water
- FSAR 11.2 - Liquid radioactive releases will be discharged using the liquid radwaste effluent discharge pipeline to the discharge canal and not into the circulating water system's cooling tower blowdown line
- FSAR 12.3 - LWMS discharge line will be run underground in guard pipe or is accessible via trench or tunnel

**Dedicated discharge pipeline complies with 10 CFR 20.1406 to minimize, to the extent practicable, contamination of facility and environment**

# RG 1.221, Design-Basis Hurricane Winds and Hurricane Missiles

---

- Seismic Category (SC) I structures will be designed to withstand loads due to DCD tornado wind speed and missile spectrum
  - DCD wind and missile demands bound NA3 site-specific tornado and hurricane wind and missile demands
- SC II structures and structures housing Regulatory Treatment of Non-Safety Systems (RTNSS) structures, systems, and components will be designed to withstand DCD and RG 1.221 hurricane wind and missile demands

**SC I structures meet DCD wind speed and missile criteria. SC II structures and structures housing RTNSS SSCs will meet DCD and NA3 RG 1.221 hurricane wind and missile criteria**

# Drivers of Seismic Revisions

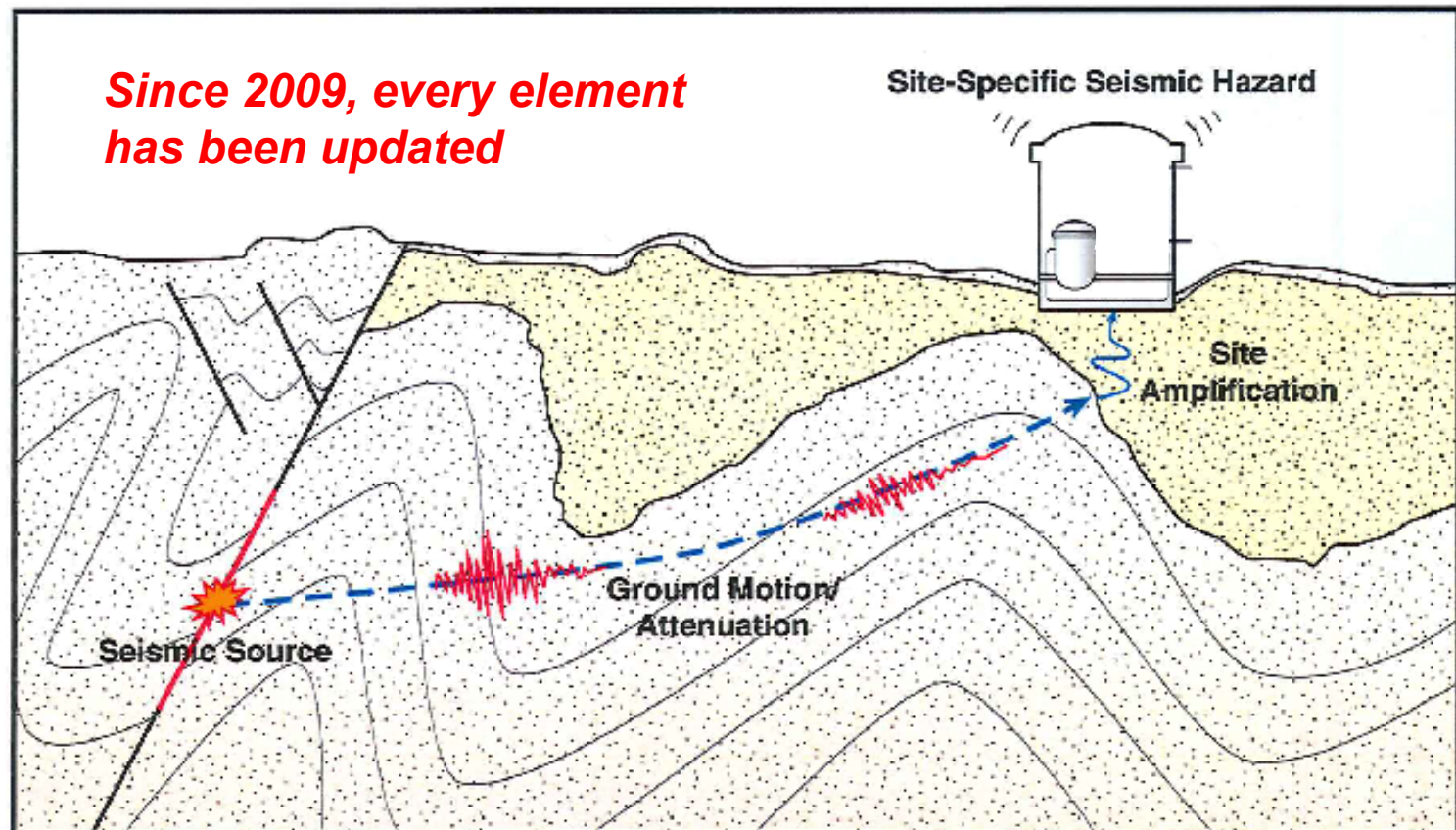
---

Seismic-related FSAR sections revised to address events/guidance changes:

- August 23, 2011 Mineral, VA earthquake
- New Central and Eastern United States-Seismic Source Characterization (CEUS-SSC) (NUREG-2115)
- Updated Ground Motion Model (GMM)
- NUREG 0800, SRP 2.5.2 (Rev. 5), SRP 3.7.1 (Rev.4) , and SRP 3.7.2 (Rev. 4) & DC-COL-ISG-017

# Vibratory Ground Motion Methodology

## Elements of the Site-Specific Seismic Hazard



Graphic Source: SIGMA Project Plan

# Vibratory Ground Motion Methodology

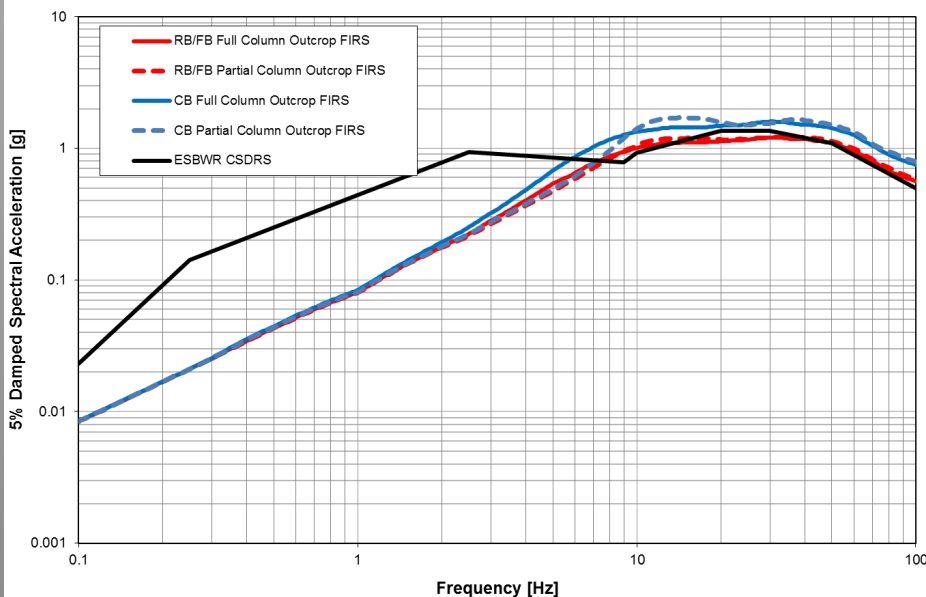
- Updated seismic sources using CEUS SSC and updated seismicity, including 2011 Mineral earthquake
- Revised probabilistic seismic hazards analysis (PSHA), using updated CEUS SSC and EPRI 2013 GMM
- Developed new site-specific response spectra using revised PSHA
- Developed new Ground Motion Response Spectra (GMRS) and foundation input response spectra (FIRS); redefined using new site-specific response spectra and new DC/COL-ISG-017 guidance
- Identified certified seismic design response spectra (CSDRS) exceedances

# Foundation Input Response Spectra

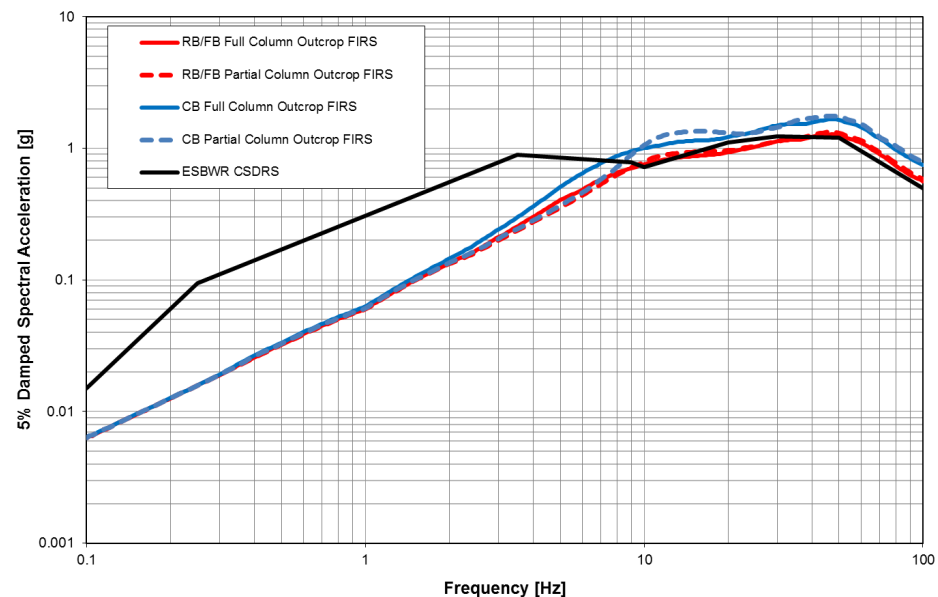
## FIRS for Reactor Building/Fuel Building (RB/FB) & Control Building (CB)

Comparison of Horizontal CSDRS with Unit 3 FIRS for RB/FB and CB

Comparison of Vertical CSDRS with Unit 3 FIRS for RB/FB and CB



FSAR Figure 2.0-201



FSAR Figure 2.0-202

CSDRS exceedances identified

# Seismic Analysis & SC I Structures

---

- Developed seismic design parameters site-specific soil-structure interaction (SSI) input soil profiles and ground motions
- Performed site-specific SSI and structure-soil-structure interaction (SSSI) analyses to evaluate SC I RB/FB, CB, and Fire Water Service Complex (FWSC) structures for site-specific ground motion and soil properties
- Used results of SSI and SSSI analyses to determine site-specific seismic demands
- Performed site-specific analyses of structures and components using site-specific seismic demands
- Methodology and mathematical models for site-specific analyses were consistent with approved ESBWR DCD methodology

# Seismic Analysis & SC I Structures

---

## Results:

- No changes to DCD concrete member properties (e.g., slab or wall thicknesses)
- Minor local changes to shear ties and reinforcement in RB/FB exterior walls, size of CB girder, and rebar and shear ties in FWSC shear keys and basemat
- Slightly increased support saddle bolt size for Passive Containment Cooling System (PCCS) Condenser
- Slightly increased anchor bolt size and corner base plate welds for fuel storage racks in the buffer pool

**Seismic and structural analyses and resulting design enhancements demonstrate capability of structures, systems, and components**

# Conclusions

---

- Dominion implemented design-centered review approach to maximize standardization
- Site-specific topics have been evaluated
- North Anna site is adequate to support construction and operation of NA3



# Acronym List

Acronym		Acronym	
APWR	Advanced Pressurized Water Reactor	LWMS	Liquid Waste Management System
CB	Control Building	MOD	Motor Operated Disconnect
CEUS-SSC	Central and Eastern United States Seismic Source Characterization	NA3	North Anna Unit 3
COLA	Combined License Application	PCCS	Passive Containment Cooling System
CSDRS	Certified Seismic Design Response Spectra	PMP	Probable Maximum Precipitation
CST	Condensate Storage Tank	PSHA	Probabilistic Seismic Hazards Analysis
DCD	Design Control Document	RB/FB	Reactor Building/Fuel Building
EPRI	Electric Power Research Institute	R-COLA	Reference-Combined License Application
ESP	Early Site Permit	RG	NRC Regulatory Guide
FIRS	Foundation Input Response Spectra	RTNSS	Regulatory Treatment of Non-Safety Systems
FSAR	Final Safety Analysis Report	SC	Seismic Category
FWSC	Fire Water Service Complex	SSCs	Structures, Systems, and Components
GMM	Ground Motion Model	SRP	Standard Review Plan
GMRS	Ground Motion Response Spectra	SSI	Soil-Structure Interaction
ISG	Interim Staff Guidance	SSSI	Structure-Soil-Structure Interaction



# **Presentation to the ACRS Full Committee**

**Staff Review of  
North Anna 3 ESBWR  
Combined License Application**

**November 3, 2016**

# North Anna 3 COLA Review

## North Anna 3 Application Summary

- ❖ September 25, 2003, North Anna ESP submittal
- ❖ November 26, 2007, North Anna 3 ESBWR R-COL Application
- ❖ June 28, 2010, Dominion revised its application to the US-APWR
- ❖ March 9, 2011 - NRC staff issued the ESBWR DCD FSER.
- ❖ **August 23, 2011, Mineral Virginia Earthquake**
- ❖ **April 25, 2013, Dominion reverted back to the ESBWR**
- ❖ August 30, 2013, submitted S-COL RAI reconciliation from Fermi R-COL after May, 2010, through May 31, 2013
- ❖ June 24, 2014, Dominion revised application that incorporated by reference the ESBWR DCD, Revision 10
- ❖ **August 16, 2014 - ESBWR DCD Final rule was issued.**
- ❖ **October 22, 2014, Dominion submitted its Seismic Closure Plan (SCP).**
- ❖ June 22, 2016, Dominion submitted Revision 9 FSAR incorporating FSAR markups from RAI responses

## North Anna 3 Post Phase 2 COLA Review Summary

- ❖ **ACRS Phase 2 Letter** - October 23, 2009, ACRS Letter to EDO Phase 2 SER (ML092890370)
- ❖ **Staff SER Phase 2 Confirmatory Items** - Incorporated in FSAR, Revision 6, July 2013 (40 Items) Based on DCD Revision 9.
- ❖ **Staff SER Phase 2 Open Items** - Closed by incorporation of approved RAI response In the North Anna 3 FSAR, Revision 8, June 2014 (71 Items) Based on DCD Revision 10.
- ❖ **Staff SER Phase 4 Completed-9/16** –DCD Revision 10 Staff SER (NUREG-1966)
- ❖ **Staff SER Phase 4 Confirmatory Items** - Staff confirmation in progress in FSAR, Revision 9, June 2016 (34 Items) - Phase 6 FSER
- ❖ **Tier 1 [Fukushima] recommendations SECY-11-0137, as modified in SECY-12-0025** - Applicable to North Anna 3 COL review SER Chapter 20

## North Anna 3 Site-Specific Review Focus

### ❖ Site Specific Non-Seismic Information:

- **Meteorology and Hydrology**
- **Industrial Accidents**
- **Ground Water Accident Release**
- **Hurricane Missiles**

### ❖ Site Specific Seismic Information:

- **Site Ground Motion**
- **Seismic Structures**
- **Fuel Pool Racks**
- **Fuel & Control Rods**

## Section 2.3 - Meteorology

- ❖ 2.3.4 - Short-Term (Accidental) Diffusion Estimates:
  - EAB & LPZ accident  $\chi/Q$  values incorporated from ESP SSAR
  - COL FSAR presented Control Room  $\chi/Q$  values
  - ESBWR Control Room and offsite  $\chi/Q$  values conservatively bound the NAPS site-specific values
- ❖ 2.3.5 - Long-Term (Routine) Diffusion Estimates:
  - NAPS ESP VAR 2.0-1
  - **Updated analysis to incorporate use of both ground-level and mixed-mode releases**
  - ESBWR routine release offsite  $\chi/Q$  and D/Q values conservatively bound the NAPS COL site-specific values
- ❖ Conclusions:
  - All regulatory requirements have been satisfied
  - No “Open Items”

## Section 2.4.3 - Lake Anna Probable Maximum Flood

- ❖ Staff accepted ESP Variance 2.4-4 to raise the normal pool elevation of Lake Anna by three inches (from 249.14 ft to 249.39 ft NAVD88)
- ❖ Staff's confirmatory analysis and review conclusions:
  - PMF on Lake Anna increases by 0.03 ft with the rise in the normal lake elevation
    - Staff accepted ESP Variance 2.4-5
  - **The Lake Anna PMF elevation remains well below the DCD site parameter elevation of 1 ft below design plant grade**
  - The staff concluded that the LIP flood would remain below the ESBWR DCD site parameter for maximum flood level
  - **The staff concluded that under the LIP sheet-flow depths, certain critical doors to safety-related buildings would require flood protection confirmed in FSAR.**
  - The staff confirmed that the ultimate heat sink does not require an external source of safety-related make-up water, and that there are no safety-related issues associated with the intake, the discharge, or low Lake Anna water levels

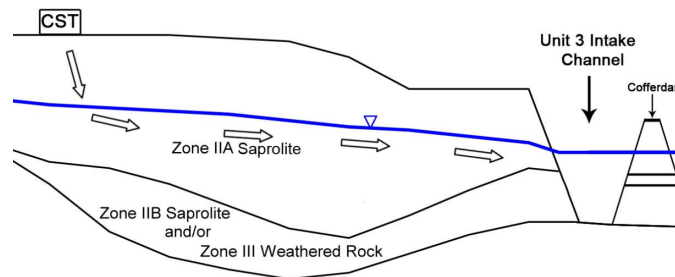
## Section 2.2 - Nearby Industrial, Transportation, and Military Facilities

### ❖ Evaluation of potential accidents:

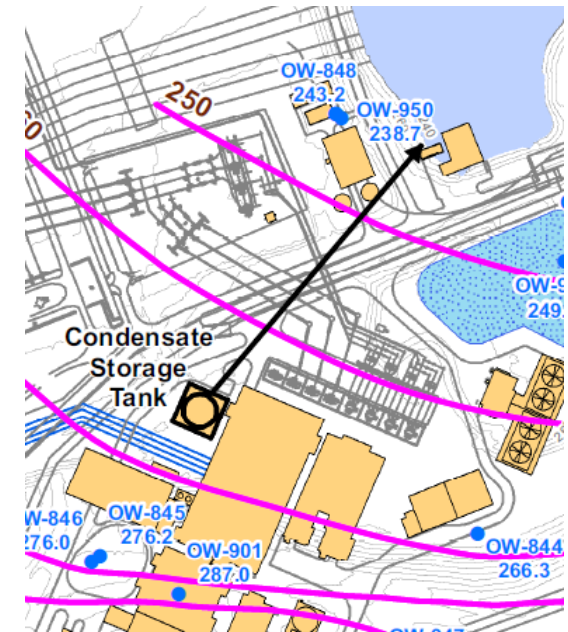
- The staff reviewed whether the applicant addressed the additional site specific evaluations of potential accidents. **Staff also performed independent confirmatory calculations in confirming the applicant's conclusions** that the potential impacts due to potential accidents from these additional sources addressed would not impact adversely the safe operation and safe shutdown of the North Anna 3.
- Based on the review of the applicant provided information, responses to the RAIs, staff evaluations and staff's independent confirmatory analyses.
- The staff found the applicant's conclusions to be acceptable as the evaluations are in accordance with the guidance provided in NUREG-0800 Section 2.2.3, and meet regulatory requirements of 10 CFR 100.20(b).

## Section 2.4.13 - Accidental Release of Radioactive Liquid Effluent in ground and Surface Waters

- ❖ Applicant described features to preclude radioactive releases into potential liquid pathways to satisfy ESP Permit Condition 3.E(3), but nonetheless analyzed an accidental release to groundwater from the condensate storage tank
- ❖ The staff confirmed that the shortest and most plausible pathway was to the Unit 3 intake channel. The staff concluded that:
  - Applicants analysis was appropriately conservative
  - **Maximum radionuclide concentrations were below limits**
  - Radionuclide concentrations would be further diluted in Lake Anna before reaching the exclusion area boundary



Zone IV and III-IV Sound Rock



## Chapter 19 Departures - Staff Conclusion

❖ Staff evaluated Exemption 5 (NAPS DEP 19A-1):

- The staff finds that Exemption 5 and NAPS DEP 19A-1 appropriately considered hurricane missiles from RG 1.221
- The design requirements added by the departure ensure RTNSS structures will be designed to the most limiting hurricane missile

## Sections 2.5.1, 2.5.3 – Seismology Conclusions

- ❖ The applicant's assessment for potential surface expression from the Mineral earthquake was sufficient and appropriate and reveals no measureable surface rupture based on:
  - A suite of geologic maps in consideration with earthquake aftershocks
  - Detailed topographic maps derived from LiDAR data
  - Specific field reconnaissance to determine presence or absence of surface rupture or displacement of numerous river profiles and the South Anna river terrace profile
- ❖ Surface deformation at the North Anna 3 site is negligible:
  - **Fault 'a' was previously found to be a geologically old structure (ESP SER)**
  - **Post Mineral VA earthquake field reconnaissance and examination of high resolution topographic maps reveal no rupture or deformation associated with fault 'a'**

## Section 2.5.2 - Vibratory Ground Motion

### ❖ New and significant information:

- Occurrence of August 23, 2011 Mineral Earthquake
- Publication of the Central and Eastern United States Seismic Source Characterization (CEUS-SSC; NUREG 2115)
- Publication of the new Ground Motion Models (EPRI, 2013)
- Availability of additional site-specific geophysical information

### ❖ Mineral, Virginia Earthquake:

- August 23, 2011
  - M5.8 earthquake approximately 11 mi (18 km) from NAPS Site
  - Located in Central Virginia Seismic Zone (i.e., known region of elevated seismicity, and small to moderate earthquake)
  - Exceeded SSE for currently operating Unit 1 (post-earthquake evaluations found no damage to plant SSCs)
- **Prompted staff to request reassessment of ESP PSHA**
  - **Using CEUS-SSC (NUREG-2115)**

## Section 2.5.2 - Conclusions

- ❖ The applicant adequately addressed new and significant information related to the Mineral, Virginia earthquake, the CEUS-SSC model, and additional pertaining subsurface geologic condition
- ❖ **The site-specific GMRS adequately represents the seismic hazard at the North Anna 3 site and meets the relevant regulatory requirements provided in 10 CFR Parts 52 and 10 CFR 100.23**
- ❖ The site specific vibratory ground motion meets the ESBWR DCD design criteria

## Sections 3.7, 3.8 Departures - Background & Scope

### ❖ Background:

- The site-specific foundation input response spectra (FIRS) exceed the DCD certified seismic design response spectra (CSDRS)
- **The seismic inputs include both the CSDRS and site-specific FIRS for evaluation of RB/FB, CB, and FWSC**
- The applicant performed site-specific seismic analyses and design evaluations to demonstrate the adequacy of the ESBWR standard design at the NA3 site

### ❖ Review Scope:

- The Review of seismic analyses and design evaluations of RB/FB, CB, FWSC, RCCV including PCCS Condenser, CIS, New and Spent Fuel Storage Racks
- Review of applicable Tier 1 and Tier 2 information in the FSAR (NAPS DEP 3.7-1, COL Part 7 Departure Report), technical reports, RAI responses, and supporting calculations (during audits)
- **Confirmatory analyses of the seismic input motions, strain-compatible soil profiles, and SSI effect on FWSC**
- Review of V&V of seismic analysis codes for NA3 application

## Sections 3.7, 3.8 Departures - Staff Review Results

### ❖ Results of Staff Review:

- Staff issued 29 RAIs based on review of FSAR Rev. 7 and Rev. 8
- In response to RAIs, the applicant modified its approach to performing certain aspects of the seismic analysis and developed a Seismic Closure Plan (SCP)
- The applicant performed 18 SSI analysis cases for each of the RB/FB, CB, and FWSC, and 17 SSSI cases, for a total of 71 cases to establish the seismic demand at NA3
- Staff conducted review in two phases with two on-site audits: (a) Phase 1 site-specific seismic demand, and (b) Phase 2 for reviewing the structural evaluation of the standard design for NA3 seismic demand
- **The FSAR Appendix 3G shows that the standard design is adequate to resist the site-specific seismic demand except in a few cases.**
- **The design changes include: modifying the arrangement of some steel reinforcements and shear ties, the size of a steel girder, weld size, and anchor bolt sizes. No changes to the thickness of the concrete walls and slabs were needed**

## Sections 3.7, 3.8 Departures - Conclusions

### ❖ Conclusions:

- As documented in Chapter 3 of the FSER, the staff confirmed that the site-specific seismic design methodology for SSCs is acceptable. At the NA3 site, with the identified changes, the **ESBWR standard design is adequate to meet the site-specific seismic demand**
- The site-specific ISRS that exceed the standard design ISRS, are used along with the standard design ISRS for seismic design and qualification of equipment and components
- The staff has reviewed the NA3 COL application and the relevant information in the ESBWR DCD incorporated by reference and concludes that sufficient information has been provided to satisfy the NRC regulations and guidance

## Fuel Storage Rack Departure - Evaluation

- ❖ Staff evaluated the Fuel Storage Rack (FSR) departure and determined that:
  - Standard design of spent FSRs in the spent fuel pool is adequate
  - For the spent FSRs in the buffer pool deep pit, changes in the size of the anchor bolts and welds were necessary
  - For the new FSR in the buffer pool, changes in the size of the anchor bolts were necessary

## Chapter 4 Departures - Reactor Design

- ❖ Staff evaluated the Seismic Departure on the Fuel and Control Rod Design:
  - Staff confirmed that the methodology used to determine site-specific fuel accelerations was consistent with methods approved in the DCD
  - Staff confirmed that the methodology for combining loads was consistent with the DCD methodology and regulatory guidance
  - Staff assessed applicant's evaluation and agrees that the fuel and control rod capacities are sufficient to bound the site-specific exceedances, and as-built values will be confirmed by ITAAC

## Staff Conclusion

- ❖ Staff has completed a through review of the North Anna 3 COLA
- ❖ Staff has addressed all Confirmatory Items / Open Items from Phase 2 SER.
- ❖ Published Phase 4 AFSE represents the Staff Final Safety Review findings of the North Anna 3 ESBWR COLA.
- ❖ The Phase 6 FSER (December 2016) completes the Administrative final preparation for NUREG Publication of the staff NA3 COL SER.
- ❖ Staff looks forward to the Committee letter following its review of the Staff AFSE.
- ❖ Turnover to ACRS Subcommittee Chairman

## Backup Slides

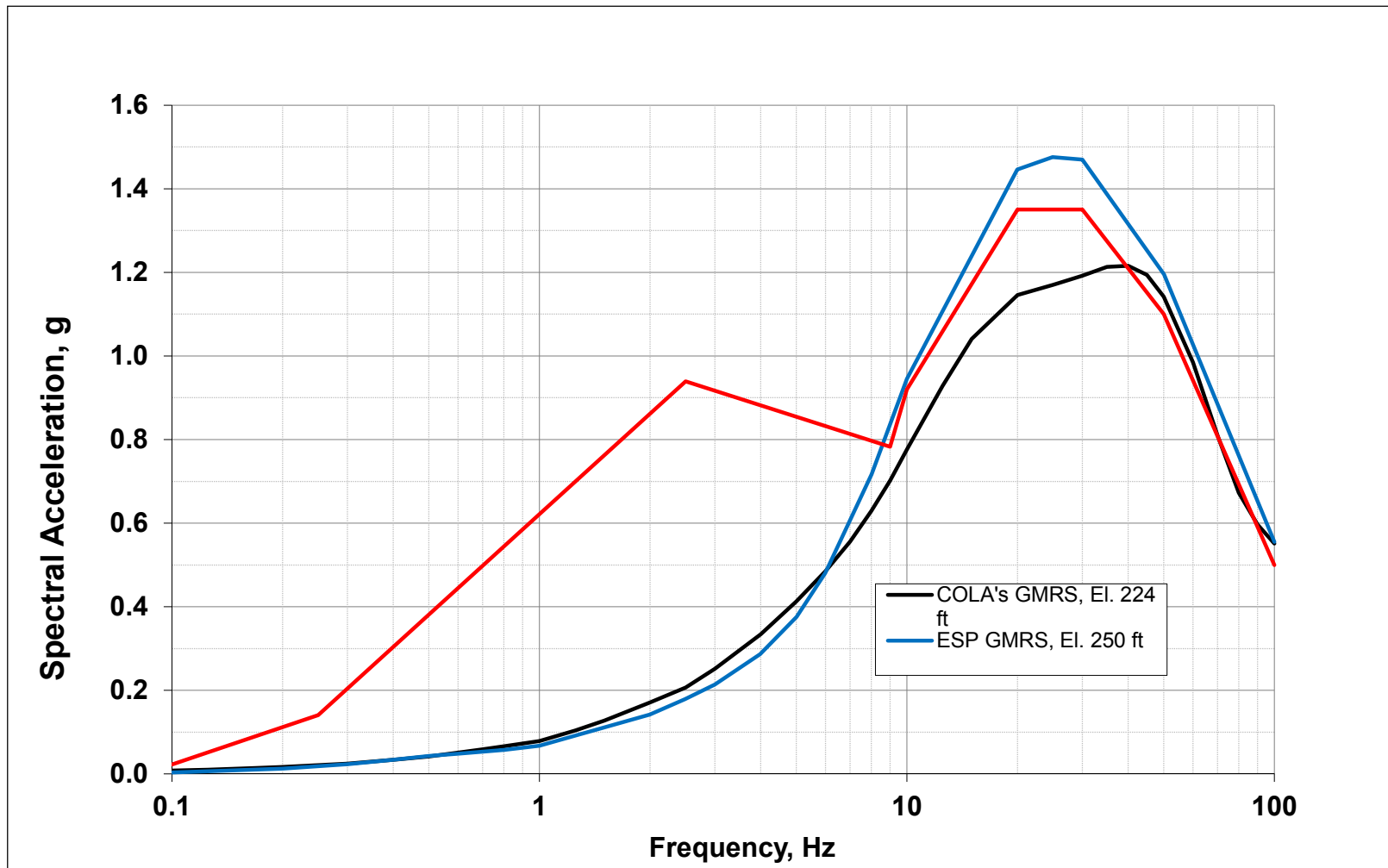
# North Anna 3 COLA Review

## List of Abbreviations Used

- ❖ ACRS – Advisory Committee on Reactor Safeguards
- ❖ ATWS – Anticipated Transient Without Scram
- ❖ BNL – Brookhaven National Laboratory
- ❖ CB – Control Building
- ❖ CCF – Common Cause Failure
- ❖ CEUS SSC - Central and Eastern United States Seismic Source Characterization
- ❖ CIS – Containment Internal Structures
- ❖ COL – Combined License
- ❖ CSDRS – Certified Seismic Design Response Spectrum
- ❖ DBA – Design Basis Accident
- ❖ DCD – Design Control Document
- ❖ DPS – Diverse Protection System
- ❖ EPRI- Electric Power Research Institute
- ❖ ESBWR – Economic Simplified Boiling Water Reactor
- ❖ ESF – Engineered Safety Feature
- ❖ FB – Fuel Building
- ❖ FIRS – Foundation Input Response Spectrum
- ❖ FSAR – Final Safety Analysis Report
- ❖ FWSC – Fire Water Service Complex
- ❖ GDC – General Design Criteria
- ❖ GMRS- ground motion response spectrum
- ❖ I&C – Instrument and Control
- ❖ I/O – Input and Output
- ❖ ICP – Independent Control Platform
- ❖ IEEE – Institute of Electrical and Electronics Engineers
- ❖ ISRS – In-Structure Response Spectra
- ❖ LTR – Licensing Technical Report
- ❖ N-DCIS – Non-Safety-Related Distributed Control and Information System
- ❖ NA3 – North Anna Unit 3
- ❖ NMS – Neutron Monitoring System
- ❖ NRC – US Nuclear Regulatory Commission
- ❖ OBE- Operating Basis Earthquake Ground Motion
- ❖ PCCS – Passive Containment Cooling System
- ❖ PSHA- Probabilistic Seismic Hazard Analysis
- ❖ Q-DCIS – Safety-Related Distributed Control and Information System
- ❖ QA – Quality Assurance
- ❖ RAI – Request for Additional Information
- ❖ RB – Reactor Building
- ❖ RCCV – Reinforced Concrete Containment Vessel
- ❖ SCP – Seismic Closure Plan
- ❖ SRP – Standard Review Plan
- ❖ SSC – Structure, Systems, and Components
- ❖ SSE- Safe Shutdown Earthquake Ground Motion
- ❖ SSI – Soil Structure Interaction
- ❖ SSSI – Structure Soil Structure Interaction
- ❖ V&V – Verification and Validation

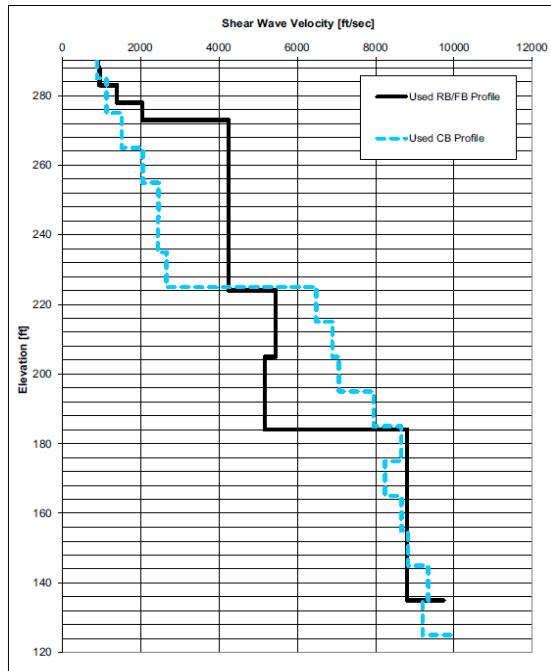
# North Anna 3 COLA Review

## North Anna 3 GMRS and CSDRS



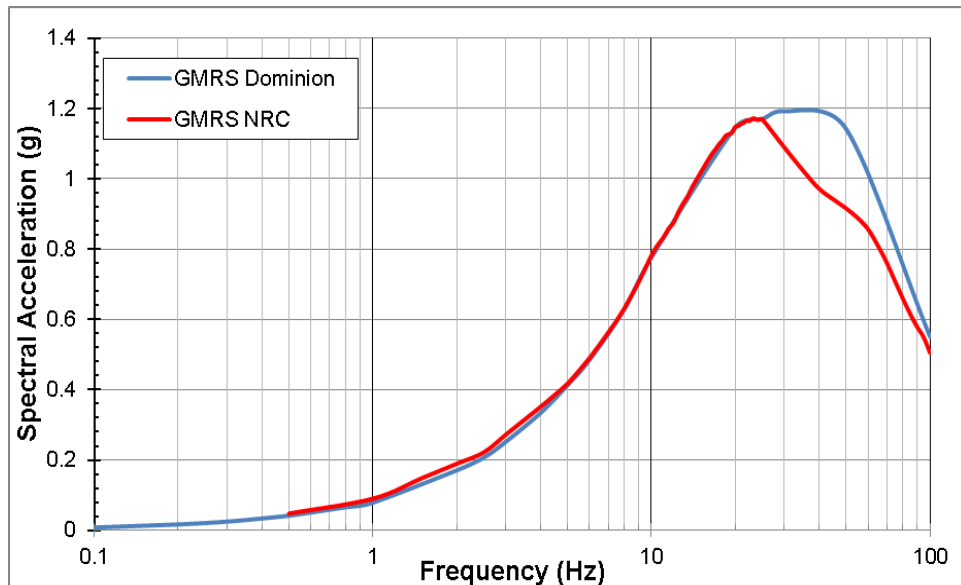
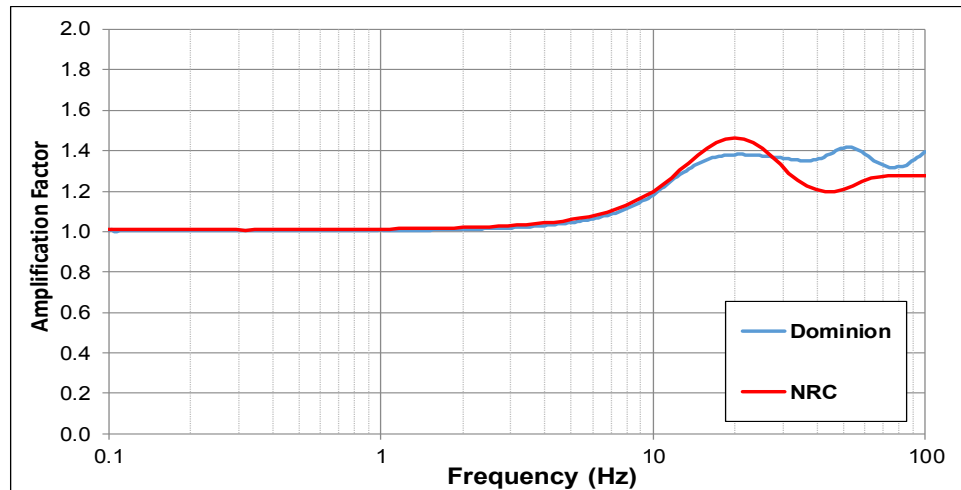
# North Anna 3 COLA Review

## Confirmatory Site Response Analysis



Shear-wave velocity profiles for the RB/FB and CB buildings used for site response calculations (from FSAR Figure 2.5.2-259)

The staff performed an independent site response analysis and confirmed applicant's site amplification and GMRS calculations

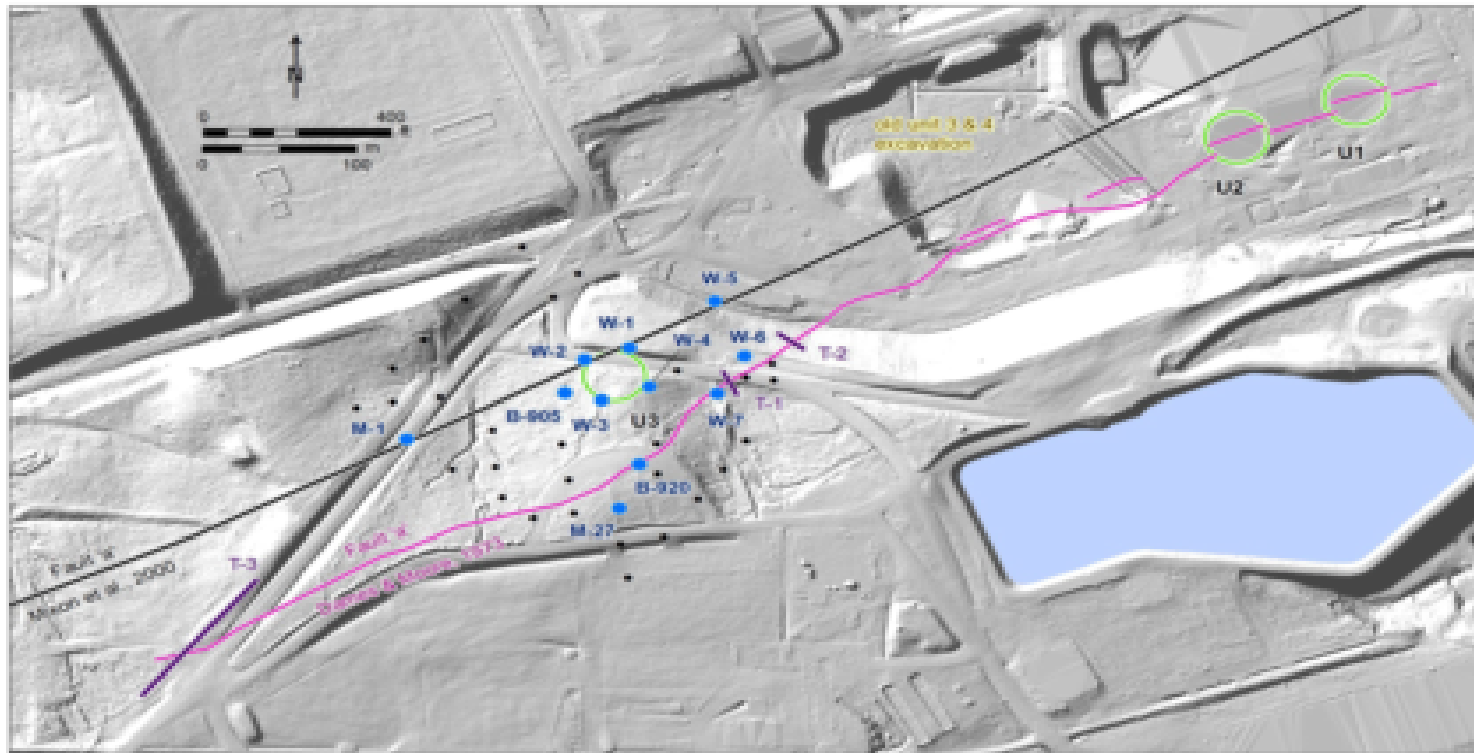


## Section 2.5.1 - Geologic Mapping and Faults

- ❖ Chopawamsic fault:
  - Remapped by Burton et al, 2014
  - Structurally below the aftershock sequence
- ❖ Harris Creek and Roundabout Farm faults:
  - Newly identified by Burton et al, 2014
  - Trenches in soil/ saprolite reveal no quarterly deformation
- ❖ Longbranch fault:
  - Structurally higher than aftershock sequence
- ❖ Fault 'a':
  - No alignment of aftershock data with this fault
  - Field reconnaissance and LiDAR data confirm no reactivation of fault
  - Previous ESP SER concluded fault is certainly older than 1 Ma.

# North Anna 3 COLA Review

## Fault 'a' Near North Anna 3 Site



Map of fault 'a' showing 3 trenches from Dames and Moore, 1973, also reconnaissance level interpretation (Mixon et al, 2000). Basemap LiDAR-derived hillshade map showing locations of key Unit 3 borings. (from NA Response to RAI 7477 Question 2.5.1-6d, Figure 1).



# **Overview of Major Technical Elements of 10 CFR Part 61**

**David Esh, PhD  
Senior Risk Analyst  
United States Nuclear Regulatory Commission**

**Presented to the Advisory Committee on Reactor Safeguards, November 3, 2016**

# Outline

- Part 61 Overview
- Safety Case
- Defense-in-Depth (DID)
- Analysis Timeframes
  - Technical Basis
  - Significant Quantities
- Technical Analyses
  - Performance Assessment
  - Intruder Assessment
  - Site Stability
- Waste Acceptance Requirements

# Part 61 Overview

- Safety case and defense-in-depth protections.
- Site-specific technical analyses (performance assessment, intruder assessment, site-stability).
- Time of compliance considering waste characteristics.
- Site-specific intruder receptors.
- Waste acceptance criteria may be developed based on the results of the technical analyses.
- Modern dose methodologies.
- Consideration of uncertainty.
- Model support.
- Site characteristics consider waste characteristics and are risk-informed, performance-based.

# Safety Case

- Added at direction of Commission. Defined as combination of DID and technical analyses.
- Plain language description of the arguments and evidence to demonstrate the safety of a land disposal facility.
- Describes all safety relevant aspects of the disposal site, the design of the facility, and the managerial control measures and regulatory controls to inform the decision whether to grant a license.
- Includes the same type of information that the original 10 CFR Part 61 required to be submitted as part of a license application (i.e., 10 CFR 61.10 – 10 CFR 61.16).
- The safety case will be updated over time as new information is gained during the various phases of the facility's development and operation.

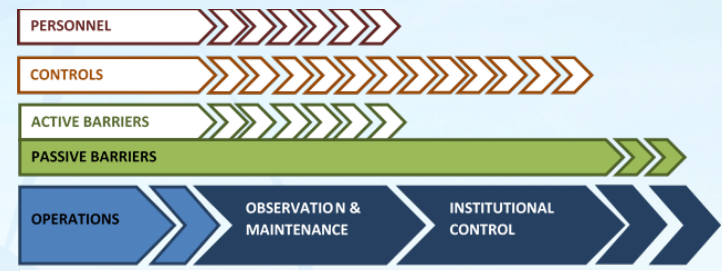
# Defense-in-Depth

- The use of multiple, independent, and, where possible, redundant layers of defense so that no single layer, no matter how robust, is exclusively relied upon.
- Identify defense-in-depth protections commensurate with risks.
- Describe capabilities of defense-in-depth protections.
- Provide a technical basis for capabilities of defense-in-depth protections.

IMPLICIT



EXPLICIT



Note: Lifecycle timeframes not to scale

# Defense-in-Depth for LLW Disposal

- Operations
  - Provide for active and passive safety systems commensurate with the hazard and complexity of the activities.
- Post-Closure
  - Disposal site is a passive system, relying on both natural site characteristics and engineered features.
  - Each layer of defense must make a definite contribution to the isolation of the waste.

# Timeframes

- Throughout the process, significant interest in the analyses timeframes.
- Significant comments received reflecting diverse opinions.
- Staff devoted significant effort to the formulation of the final position.

# Timeframes

## **Existing:**

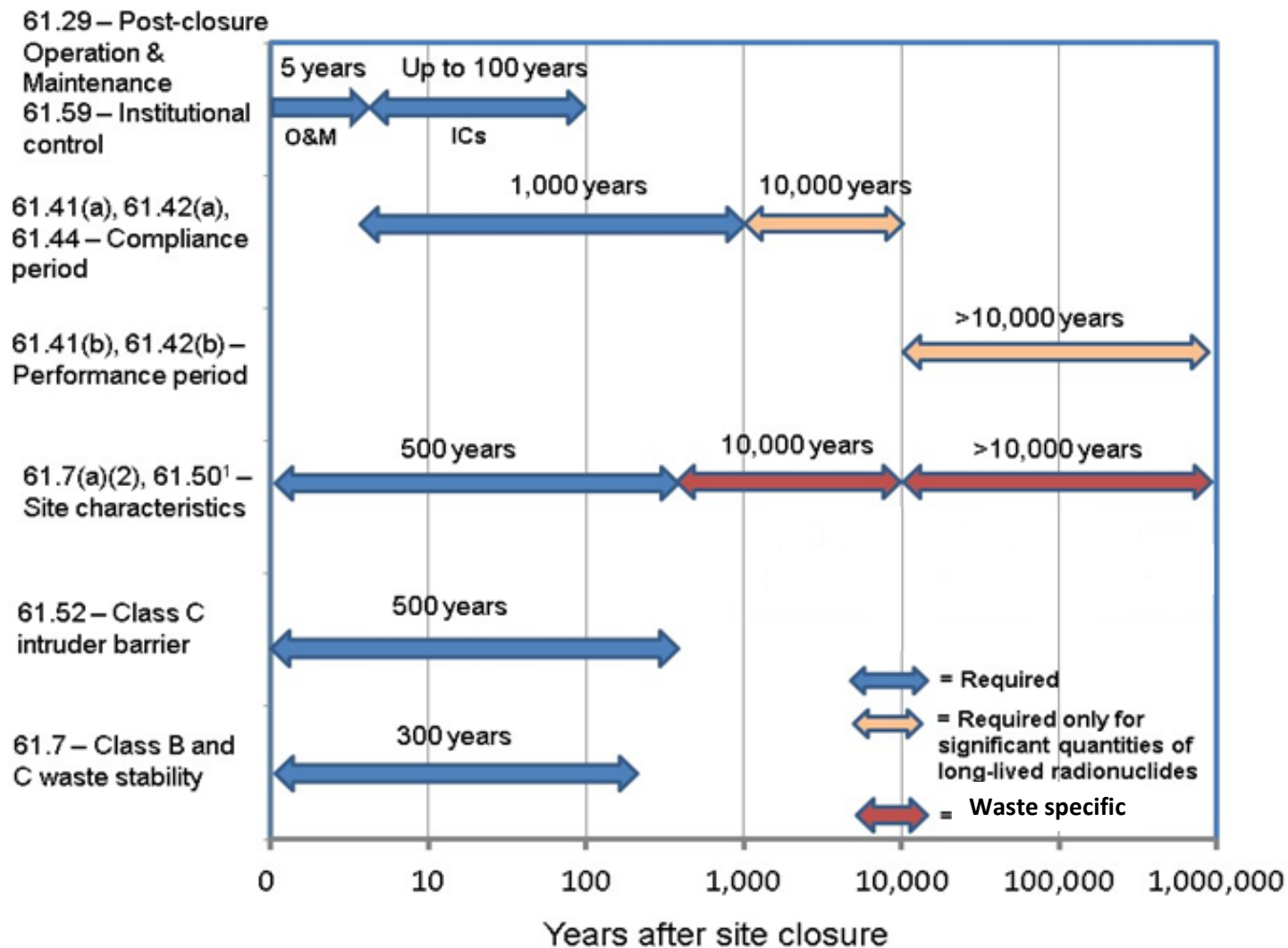
Compliance period not defined for §61.41 and §61.44.  
Inadvertent intruder protected at any time (§61.42).

## **Proposed Final:**

Compliance period is 1,000 years if a site does not contain significant quantities of long-lived waste, otherwise 10,000 years.

Performance period for > 10,000 years only applies if longer compliance period used. Standard is to minimize exposures to the extent reasonably achievable.

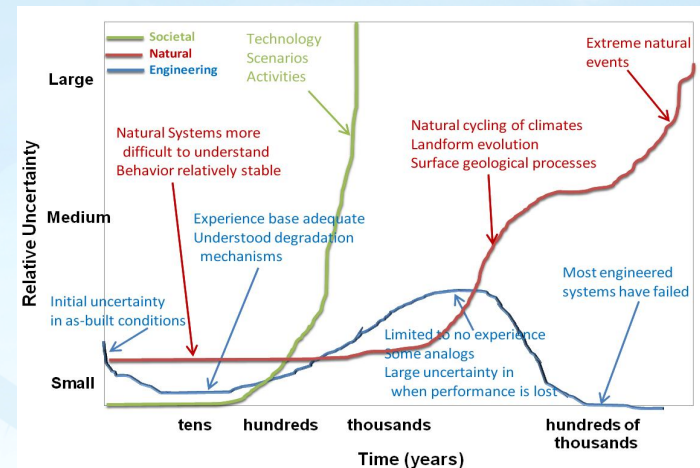
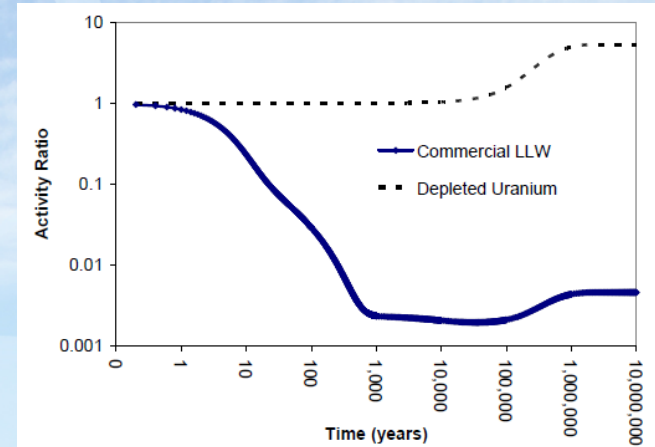
# Timeframes



# Timeframes – Technical Basis

- Waste characteristics
- Domestic experience
- International experience
- Uncertainties
- Policy
- ACRS interactions

“White paper” – ML111030586

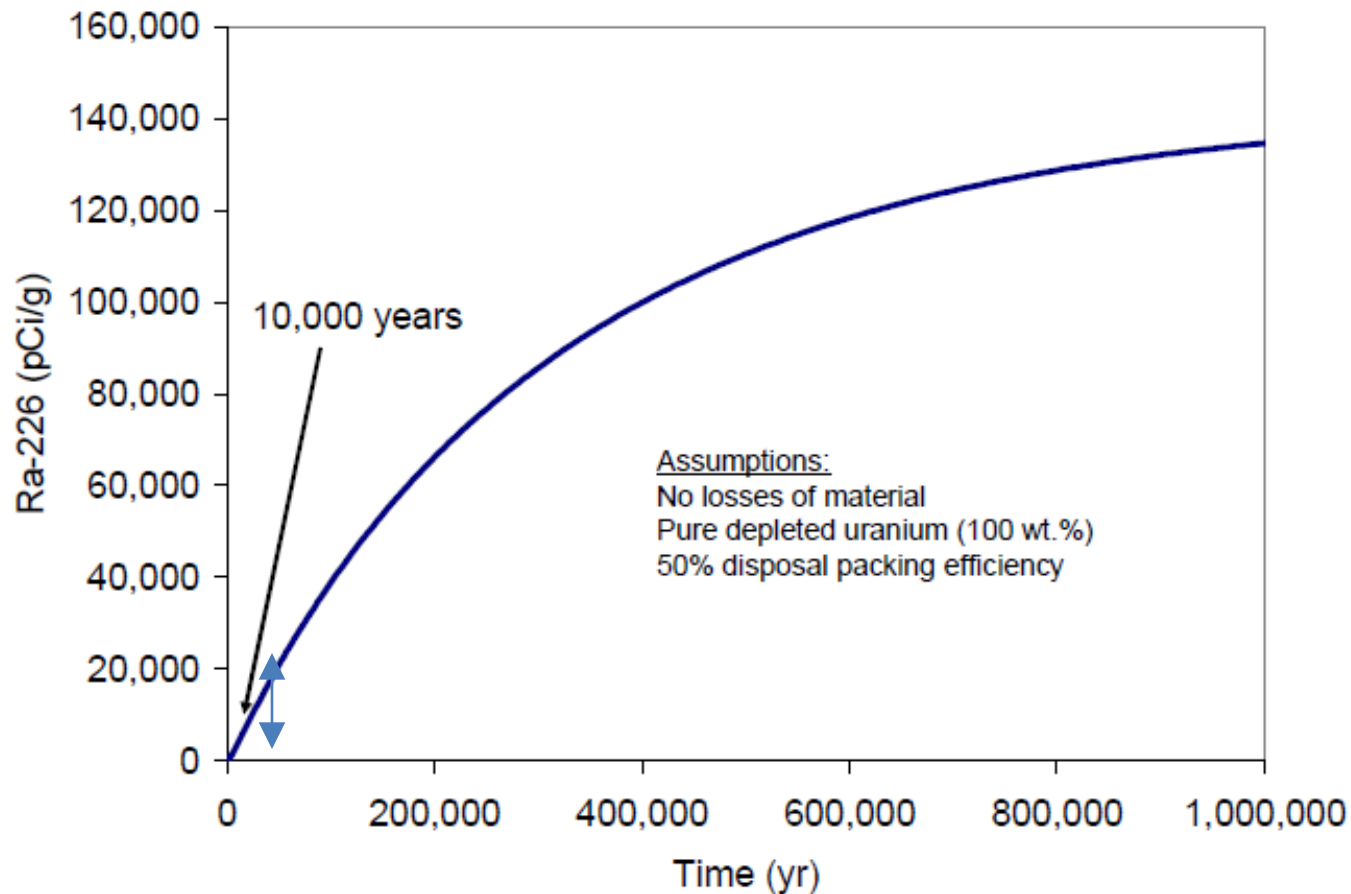


# Timeframes – Domestic

Material	Hazard	Hazard Duration	Action	Compliance Period
EPA RCRA	Chem	∞	Disposal	30+ yrs
Uranium Mill Tailings	Rad	LL	Remediate	200 yrs (<1000 yrs)
Part 20 Decommission Criteria	Rad	VSL	Release	1000 yrs
DOE Order 435.1	Rad	SL	Disposal	1000 yrs
LLW Disposal Facility	Rad	SL	Disposal	[10,000 yrs] <b>Guidance</b>
EPA Underground Injection	Chem	∞	Disposal	10,000 yrs
DOE WIR Determinations	Rad	SL-LL	Remediate	DOE: 1000 yrs NRC: 10,000 yrs
DOE Siting Guidelines (10 CFR 960)	Rad	LL	Screening Action	100,000 yrs
EPA HLW/SNF/TRU Generic Standards	Rad	LL	Disposal	10,000 yrs
EPA HLW/SNF Site-Specific Standards	Rad	LL	Disposal	10,000 yrs – 15 mrem 1,000,000 yrs – 100 mrem

LL = long-lived, SL = short-lived, VSL = very short-lived

# Why not use mill tailings requirements for DU disposal?



Mill Tailings - Falls City TX ~ 180 pCi/g

# Timeframes – Example

Time (Yr)	Radiological Dose Performance Objective	Inventory-Normalized Contaminant Release Rate Limits (ppm/yr)			Basis
		<sup>99</sup> Tc <sup>(a)</sup>	<sup>129</sup> I	NO <sub>3</sub> <sup>-</sup> + NO <sub>2</sub> <sup>-</sup> (as N)	
1,000 <sup>(b)</sup>	25 mrem/yr all-pathways	< 7.2E+04	<1.8E+05	< 4.4E+04	Calculated using 2001 ILAW PA data (Tables 4-1, 4-5, 4-8, and 7-6) and equations (page 7-19)
	4 mrem/yr beta/photon	< 5.2E+04	<7.3E+05		
10,000	25 mrem/yr all-pathways	< 153	< 400	< 93	
	4 mrem/yr beta/photon	< 110	< 162		

- (a) Tc release rate limits calculated from the 2001 ILAW PA base analysis case were divided by 5 to account for the total (100%) estimated Tc inventory to be immobilized.
- (b) Due to long travel times (>5000 years) through the vadose zone underlying the disposal facility, large contaminant release rates can occur without exceeding the dose performance objective during the 1,000 year time of compliance. The 10,000-year release rate limits more accurately reflect the rates required to ensure that the all-pathways dose performance objective is not exceeded at longer times after contaminants have migrated to the groundwater.

# Timeframes – International

- Most countries either do not allow near surface disposal of long-lived (LL) waste or place limits on how much can be disposed.
- Most countries place explicit limits on LL- $\alpha$ .
- Limits are not determined by site-specific analyses but are set by regulators/lawmakers.
- Analyses timeframes are set within this context.
- Many countries assess peak hazard.

# Timeframes – International

- Many countries classify waste on both activity AND half-life, which creates many advantages.
- IAEA waste classification system does not provide numbers but DU is comparable to intermediate level waste (ILW).
- ILW requires deeper disposal.
- OECD-NEA – Based on ethical considerations, long-lived waste requires deep geologic disposal.

# Timeframes – Comments

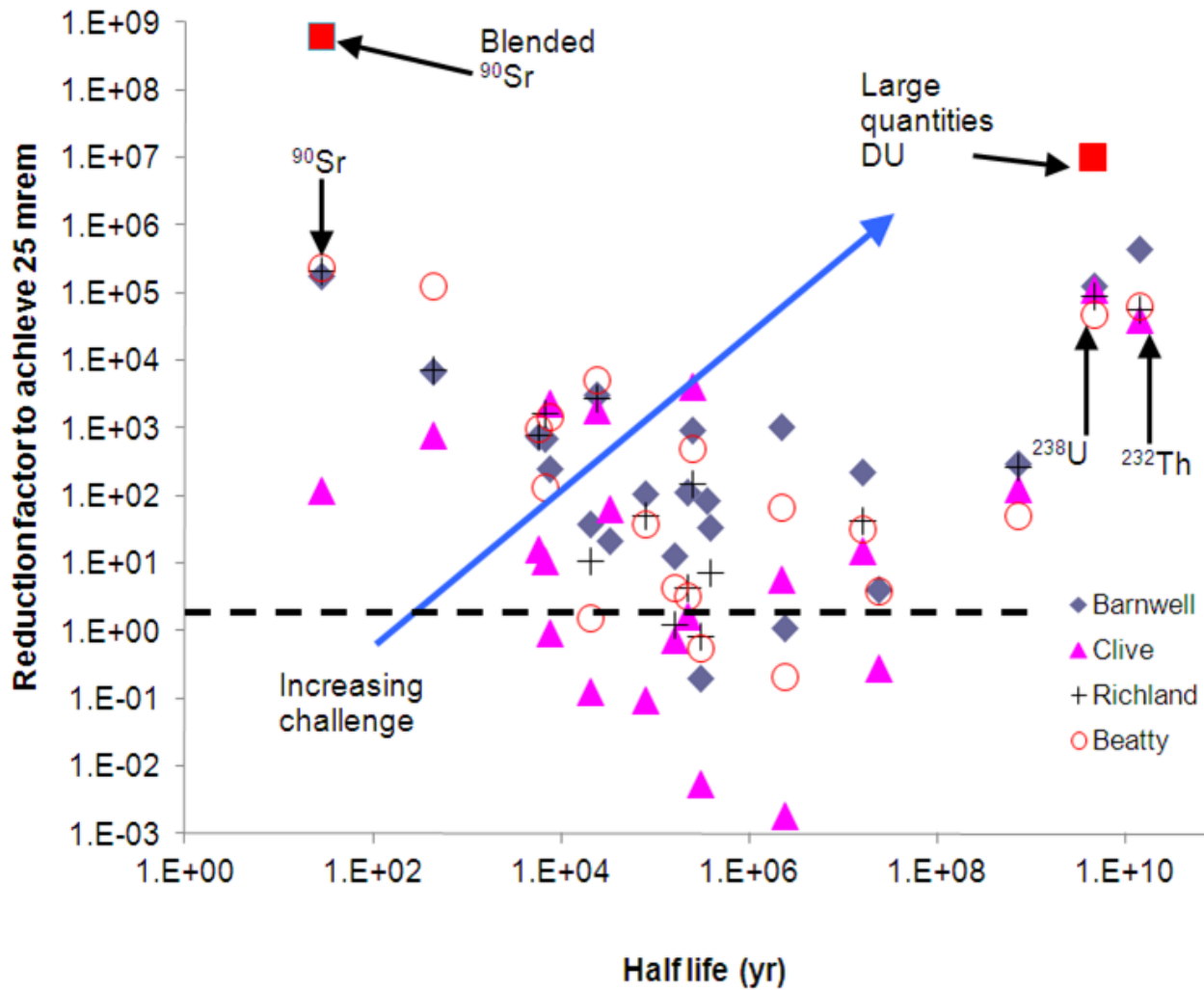
from ICRP 103 - “[D]ose estimates should not be regarded as measures of health detriment beyond times of several hundred years into the future.” Rather they represent indicators of the protection afforded by the disposal system. The commission [ICRP] has given specific guidance for disposal of long lived solid radioactive waste in publication 81 and this guidance remains valid.”

“Nevertheless, the Commission [ICRP] recognizes a basic principle that individuals and populations in the future should be afforded at least the same level of protection from the action of disposing of radioactive waste today as is the current generation. This implies use of the current quantitative dose and risk criteria derived from considering associated health detriment. Therefore, protection of future generations should be achieved by applying these dose or risk criteria to the estimated future doses or risks in appropriately defined critical groups. These estimates should not be regarded as measures of health detriment beyond times of around several hundreds of years into the future. In the case of these longer time periods, they represent indicators of the protection afforded by the disposal system.”

# Timeframes – Comments

- “...research results indicated that after 1,000 years, LLRW generated during the course of the normal operation of a nuclear plant poses little risk to the public”
  - Generally true for § 61.42 but not true for § 61.41. LLW may result in significant impacts for longer timeframes.
- Long compliance period will prohibit future licensing
  - Existing facilities licensed (or in process of being reviewed) with longer than 1,000 year compliance period.

# Timeframes



# Timeframes – Comments

- **Uncertainty makes results meaningless**
  - Performance assessments are not predictions of the future. Uncertainty is generally not a suitable basis to reduce safety requirements.
- **Don't apply burdensome requirements for long-lived waste on traditional waste**
  - Proposed final approach will assign analyses timeframes based on the waste.

# Significant Quantities

How does one determine if they have significant quantities?

- Start simple and if necessary introduce more complexity
- 1. Perform screening based on inventory
- 2. Perform screening based on simplified dose assessment
- 3. Site-specific analysis (case-by-case)

# Long-lived Radionuclides

- *Long-lived radionuclide* means radionuclides:
  - Where more than 10 percent of the initial activity of the radionuclide remains after 1,000 years
  - Where the peak activity from progeny occurs after 1,000 years; or
  - Where more than 10 percent of the peak activity of the radionuclide (including progeny) within 1,000 years remains after 1,000 years

# Significant Quantities - Guidance

**Table 6-1 Long-lived Isotopes Potentially Present in LLW Performance Assessment Inventories**

Isotope	Half-life (yr)	Long-lived		LLW PA Inventory <sup>1</sup>	Isotope	Half-life (yr)	Long-lived		LLW PA Inventory <sup>1</sup>
		Parent	Progeny <sup>2</sup>				Parent	Progeny <sup>2</sup>	
Al-26	$7.17 \times 10^5$	X			U-233	$1.59 \times 10^5$	X	Th-229	Yes
C-14	5,730	X		Yes	U-234	$2.45 \times 10^5$	X	Th-230	Yes
Cl-36	$3.01 \times 10^5$	X		Yes	U-235	$7.038 \times 10^8$	X	Pa-231	Yes
K-40	$1.3 \times 10^9$	X			U-236	$2.342 \times 10^8$	X	Th-232	Yes
Ni-59	$7.5 \times 10^4$	X		Yes	U-238	$4.468 \times 10^9$		U-234	Yes
Se-79	$1.1 \times 10^6$	X			Np-237	$2.14 \times 10^6$	X	U-233	Yes
Zr-93	$1.53 \times 10^6$	X			Pu-238	87.7		U-234	Yes
Nb-94	$2.0 \times 10^4$	X			Pu-239	$2.41 \times 10^4$	X	U-235	Yes
Tc-99	$2.14 \times 10^5$	X		Yes	Pu-240	$6.54 \times 10^3$	X	U-236	Yes
Pd-107	$6.56 \times 10^6$	X			Pu-241	14.4		Np-237	Yes
Sn-126	$1 \times 10^5$	X			Pu-242	$3.76 \times 10^5$	X	U-238	Yes
I-129	$1.6 \times 10^7$	X		Yes	Pu-244	$8.26 \times 10^7$	X	Pu-240	
Cs-135	$3 \times 10^5$	X			Am-241	432		Np-237	Yes
Sm-146	$1 \times 10^8$	X			Am-242m	16 hr		U-234	Yes
Pm-147	2.62		Sm-147		Am-243	$7.38 \times 10^3$	X	Pu-239	Yes
Sm-147	$1.06 \times 10^{11}$	X			Cm-242	0.446		U-234	
Eu-152	13.3		Gd-152		Cm-243	28.5		Am-243	
Gd-152	$1.08 \times 10^{14}$	X			Cm-244	18.1		Pu-240	
Ra-226	1,600	X		Yes	Cm-245	$8.5 \times 10^3$	X	Np-237	
Th-229	$7.3 \times 10^3$	X		Yes	Cm-247	$1.56 \times 10^7$	X	Am-243	
Th-230	$7.7 \times 10^4$	X	Ra-226	Yes	Cm-248	$3.39 \times 10^5$	X	Pu-244	
Th-232	$1.41 \times 10^{10}$	X		Yes	Cf-249	351		Cm-245	
Pa-231	$3.28 \times 10^4$	X			Cf-251	898		Am-243	
U-233	$1.59 \times 10^5$	X	Th-229	Yes	Cf-252	2.64		Cm-248	

# Significant Quantities - Example

**Example** A licensee wishes to dispose of waste at a disposal site that does not have a potable groundwater pathway or any credible mechanisms for release other than from disturbance by inadvertent intruders. The total volume of disposal cells for existing waste is 400,000 m<sup>3</sup>. The inventory of waste located in the facility is comprised of: 50,000 m<sup>3</sup> of C-14 containing waste at 0.2 Ci/m<sup>3</sup>, 200,000 m<sup>3</sup> of waste containing C-14 at 0.1 Ci/m<sup>3</sup> and I-129 at 0.002 Ci/m<sup>3</sup>, and 50,000 m<sup>3</sup> of Tc-99 containing waste at 0.01 Ci/m<sup>3</sup>. The uncontaminated fill and material used to construct the cells represents 100,000 m<sup>3</sup>.

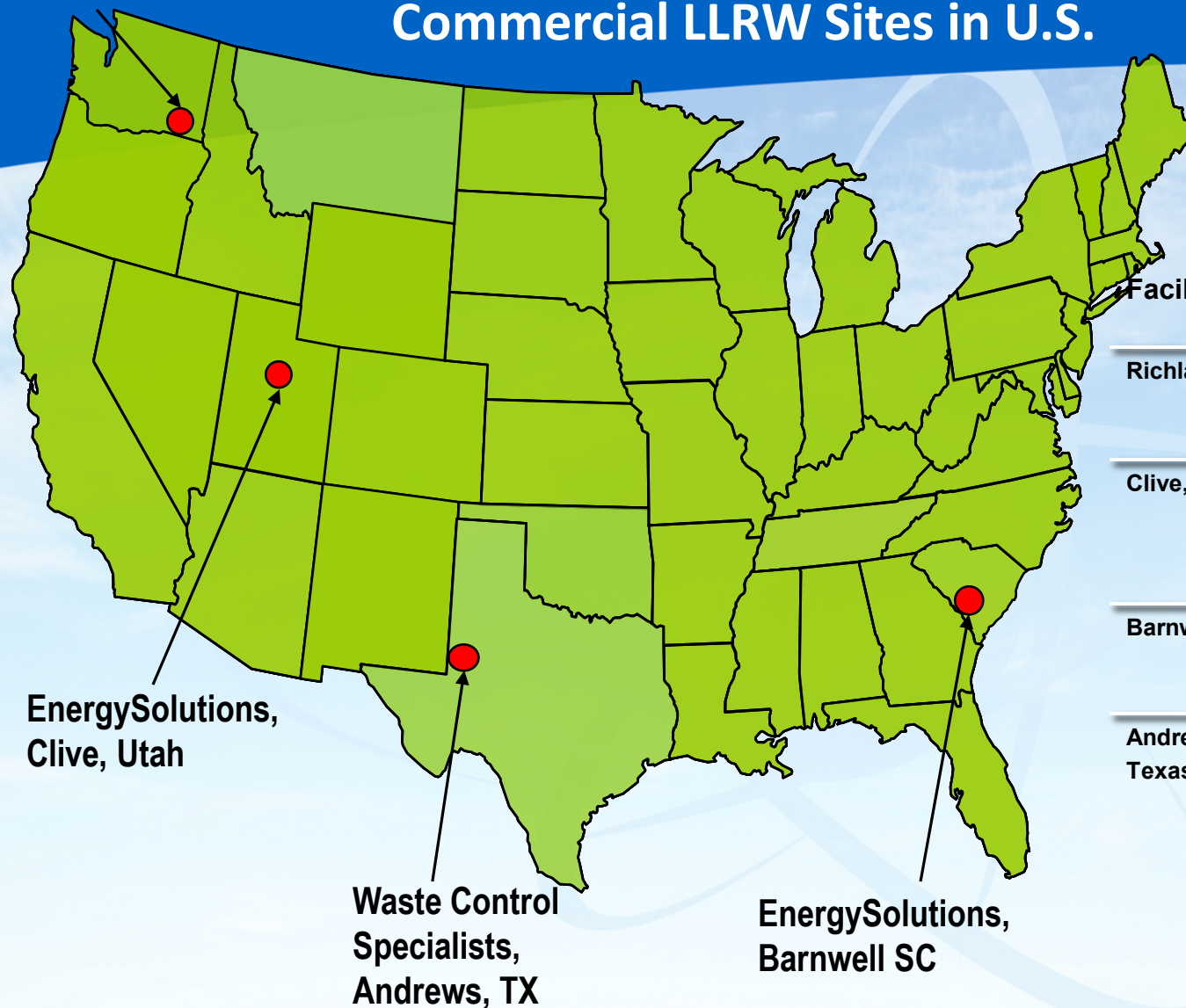
**Conclusion:** The licensee uses the Class A waste concentrations to calculate the volume-averaged sum-of-fractions (SOF) per the following equation. This equation is used to calculate the SOF for  $n$  waste streams containing  $m$  isotopes.  $V$  is the volume,  $C$  is the concentration on a volumetric basis, and  $CA$  is the Class A waste limit for the particular isotope.

$$SOF = \frac{1}{V_T} \sum_{i=1}^n \left( V_i \sum_{j=1}^m \frac{C_{i,j}}{CA_{i,j}} \right)$$

$$SOF = \frac{1}{400,000 \text{ m}^3} * \left( 50,000 \text{ m}^3 \left( \frac{0.2}{0.8} \right) + 200,000 \text{ m}^3 \left( \frac{0.1}{0.8} + \frac{0.002}{0.008} \right) + 50,000 \text{ m}^3 \left( \frac{0.01}{0.3} \right) \right) = 0.223$$

Because the SOF is less than 1, a 1,000-year compliance period can be used and performance period analyses are not required.

# Who will perform these Technical Analyses? Commercial LLRW Sites in U.S.



Facility	Waste	Compact Restrictions
Richland, WA	A, B, C	11 Western states in 2 LLW Compacts only
Clive, UT	A only	None, all US generators OK (Compacts must approve)
Barnwell, SC	A, B, C	SC, NJ, CT only (Atlantic Compact)
Andrews Cty, Texas	A, B, C	Texas and VT (Texas Compact), Others with Compact approval

 Operating facility

# Who will perform these Technical Analyses?

## Commercial LLRW Sites in U.S.

- Requirements apply to all facilities that will operate after the regulations go into effect.
- Requirements do not apply retroactively to closed facilities.
- No public health and safety basis was provided to justify limiting the applicability of the requirements to “new” waste.
- Compliance with public dose limit based on consideration of all waste and all pathways.
- There are no backfit provisions for 10 CFR Part 61.

# Performance Assessment

***Performance assessment*** is an analysis used to demonstrate compliance with 10 CFR 61.41(a) and (b) that identifies the features, events, and processes that could affect the disposal site performance; and estimates the potential dose as a result of releases caused by all significant features, events, and processes including the uncertainties.

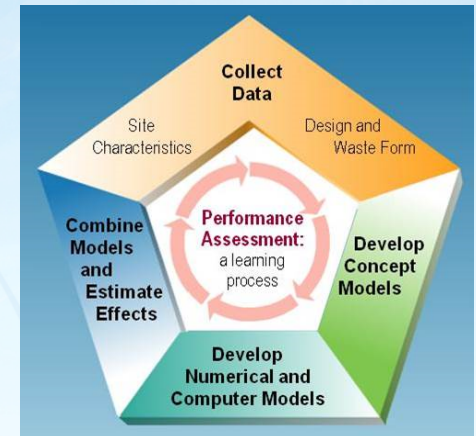
# Performance Assessment

- Performance assessment is not a new topic
  - renaming of technical analyses
- New requirements in §61.13:
  - Scope (features, events, and processes)
  - Uncertainty and variability
  - Model support
- Requirement to update the performance assessment at closure
- Modified siting characteristics consistent with disposal of long-lived waste

IMPLICIT



EXPLICIT



# Low-Level Waste – Site-Specific Technical Data

**Table 10.2 Retardation Coefficients  
Assumed for Regional  
Disposal Facility Sites**

Isotope	Regional Site			
	NE	SE	MW	SW
H-3	1	1	1	1
C-14	10	10	10	10
Fe-55	5,400	2,640	2,640	1,290
Ni-59	3,600	1,750	1,790	860
Ni-63	3,600	1,750	1,750	860
Co-60	3,600	1,750	1,750	860
Sr-90	73	36	36	18
Nb-94	10,000	4,640	4,640	2,150
Tc-99	5	4	4	3
I-129	5	4	4	3
Cs-135	720	350	350	173
Cs-137	7,200	350	350	173
U-235	7,200	3,520	3,520	1,720
U-238	7,200	3,520	3,520	1,720
Np-237	2,500	1,200	1,200	600
Pu-238	7,200	3,520	3,520	1,720
Pu-239/240	7,200	3,520	3,520	1,720
Pu-241	7,200	3,520	3,520	1,720
Pu-242	7,200	3,520	3,520	1,720
Am-241	2,500	1,200	1,200	600
Am-243	2,500	1,200	1,200	600
Cm-243	2,500	1,200	1,200	600
Cm-244	2,500	1,200	1,200	600

MI Sheppard and DH Thibault provides a compendium of distribution coefficients (K<sub>d</sub>'s) *Health Physics*, Vol. 59, No. 4 pp. 471-482 (October) 1990

$$R_f = 1 + \frac{\rho_b K_d}{\theta}$$

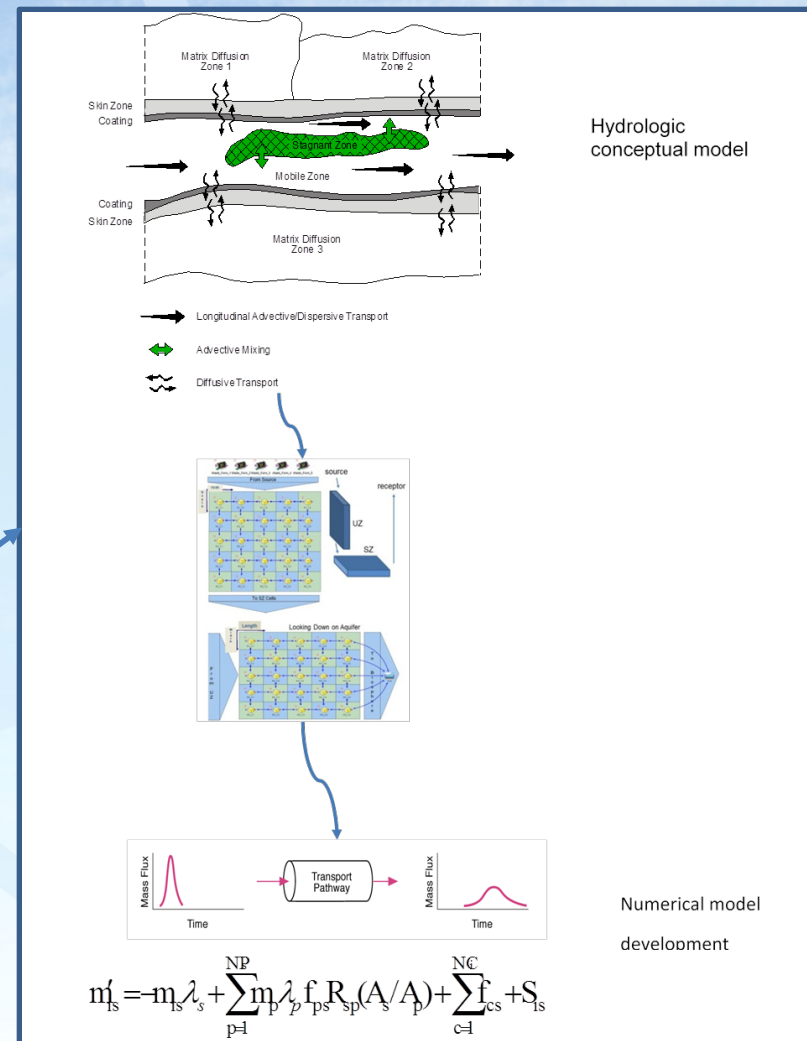
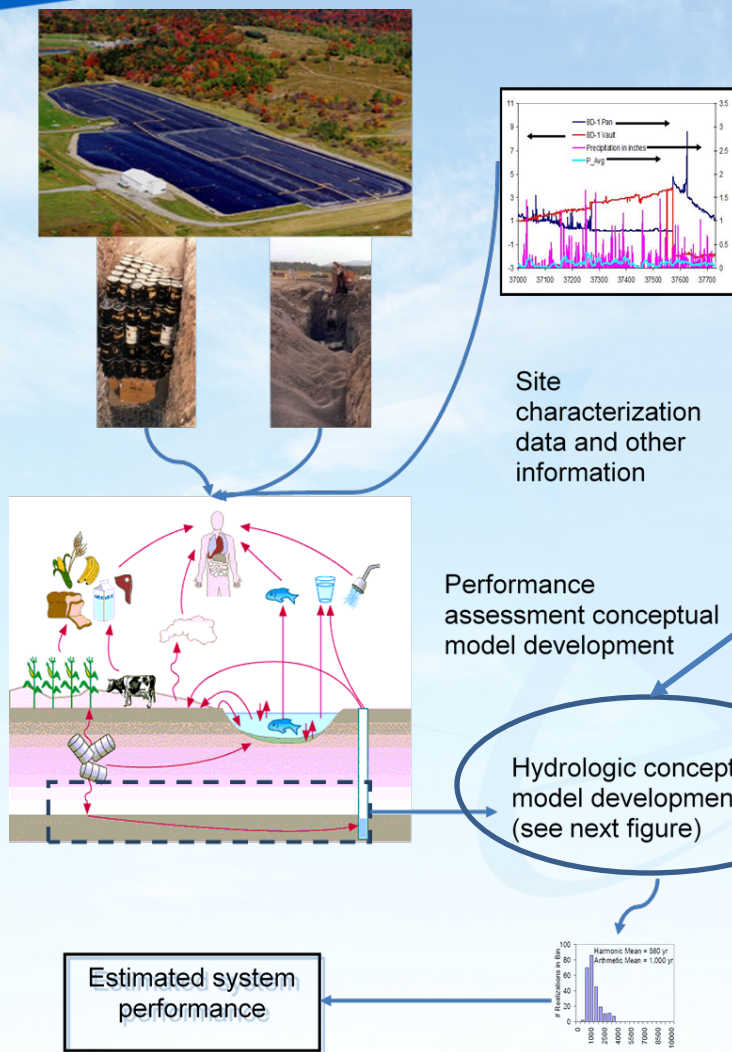
min	max	GM
1	1400	90
1	3	1
2600	280000	21000
2	21000	70
500	30000	5000

Calculated retardation coefficients

$$\rho_b = 1.6 \text{ g/cm}^3$$

$$\theta = 0.35$$

# Performance Assessment - Guidance



# Performance Assessment - Radon

- Some regulations have radon flux limits whereas others include radon in dose limits.
- EPA - 40 CFR 61 in some cases provides radon flux limits (DOE, phosphogypsum stacks, uranium mill tailings disposal) and in others provides standards to include radon as part of public dose limits @ 10 mrem/yr (uranium mines, non-NRC federal facilities).
- Can't resolve the different treatments of radon in regulations in this rulemaking, but can ensure treatment is internally consistent within Part 61 and within NRC in general.

# Performance Assessment - Radon

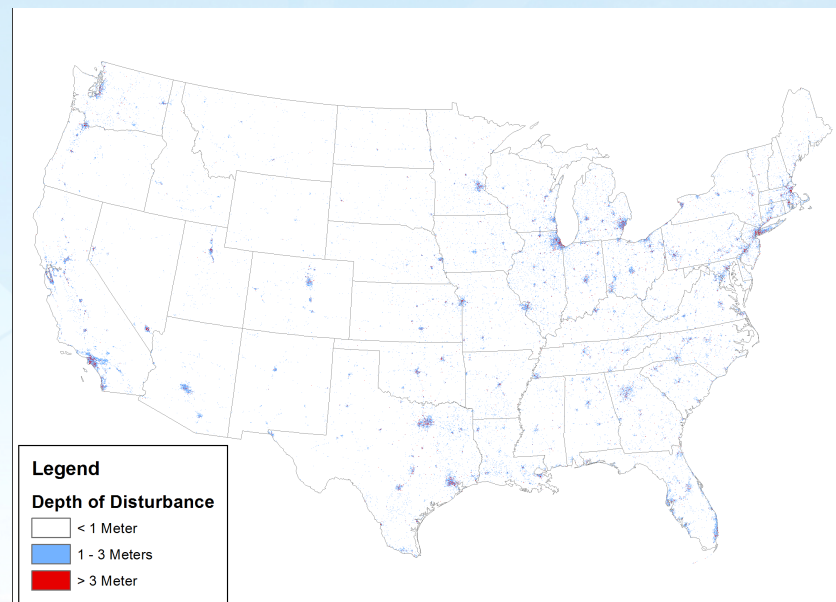
- Current Part 61 considered only small quantities of uranium, therefore radon was not an issue.
- Existing guidance – include radon (NUREG-1573).
- The receptors for different performance objectives (offsite vs. intruder) create practical challenges for application of flux limits.
- NRC public dose limit (10 CFR Part 20.1301) includes all pathways and all radionuclides.
- 10 CFR Part 40 (offsite public) and 10 CFR Part 20 subpart E (restricted release) include radon.

# Inadvertent Intrusion Assessment

- Similar to performance assessment, except:
  - Receptor scenarios
  - Onsite exposures
  - 500 mrem/yr limit
  - Precluded during institutional control period (i.e., 100 yrs)

# Inadvertent Intruder

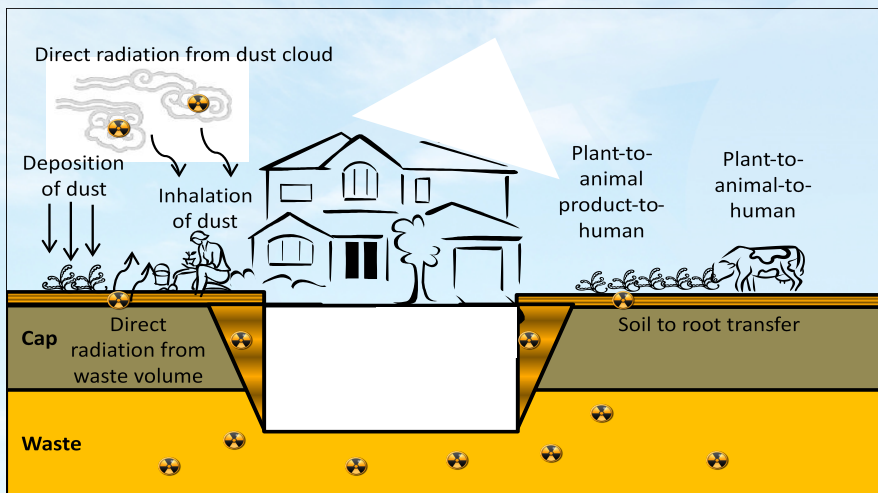
- Dose limit (500 mrem/5 mSv) higher than §61.41 and higher than NRC public dose limit (10 CFR Part 20)
- Intruders unlikely albeit possible
- Staff evaluated current national land disturbance (Esh and Gross, 2014)
  - 2.5% of land area disturbed > 1 m



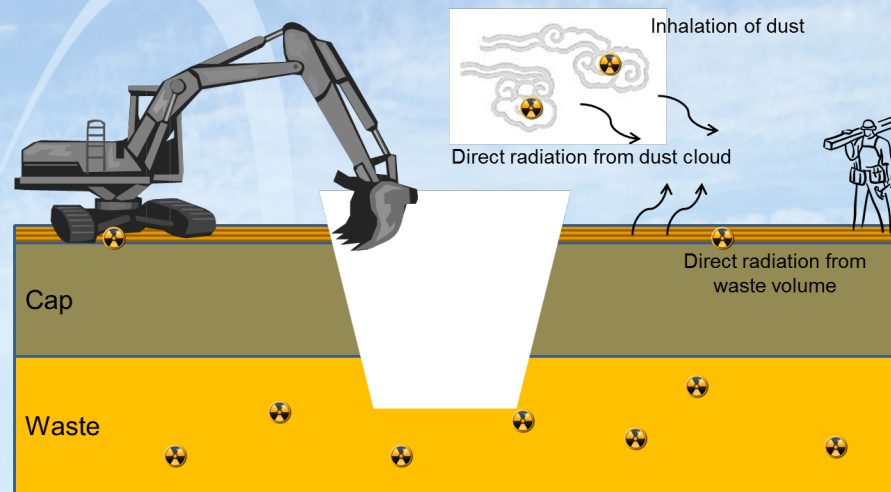
# Inadvertent Intruder Receptor - Guidance

- Normal Activities
  - Dwelling Construction
  - Agriculture
  - Drilling for Water
- Reasonably Foreseeable Activities
  - Consistent with activities in vicinity of site when assessment developed

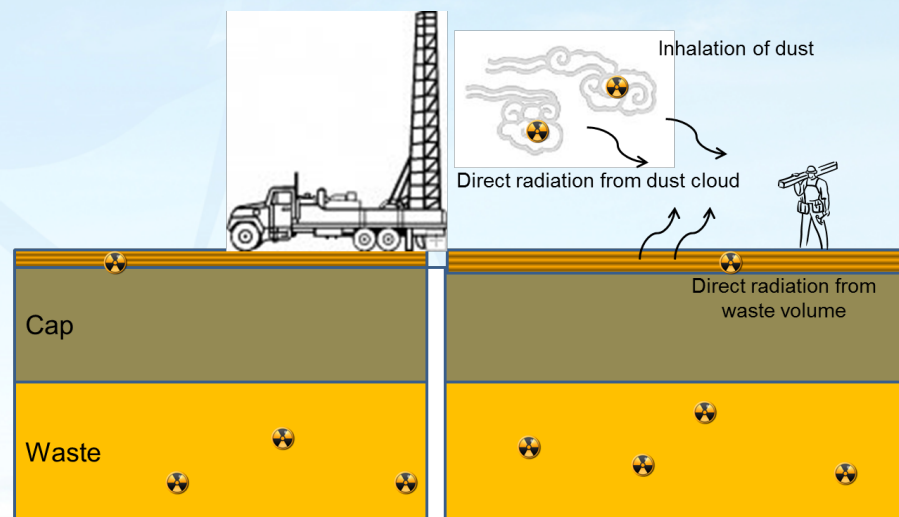
# Normal Activities



Agriculture



Dwelling Construction



Drilling for Water

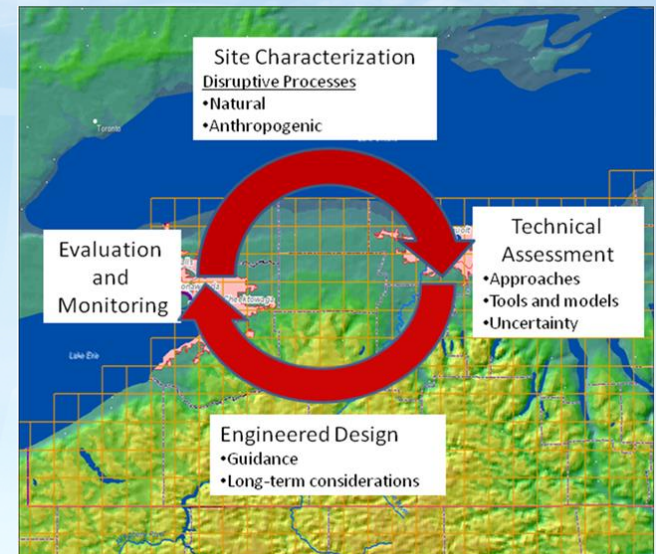
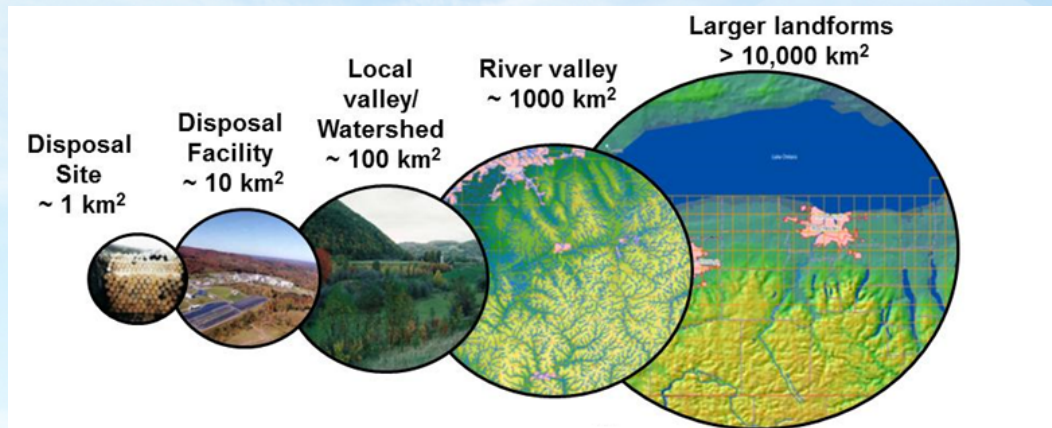
# Site-specific Scenarios - Guidance

- Constrain exposure pathways for normal or reasonably foreseeable activities based on:
  - Physical information
    - Waste characteristics and disposal practices
    - Disposal site characteristics
  - Cultural information (e.g. land use)
- Provide comparison of results from site-specific scenarios to generic scenarios.

# Site Stability

- Consideration of site stability is an important part of the safety strategy.
- Site stability is required for the compliance period but may be performance-based.
- Guidance describes design-based and model-based approaches.

# Site Stability - Guidance



# Waste Acceptance Requirements



- Licensees must review their waste acceptance program at least annually
- Ensures that the program continues to be adequate and is being implemented in a way that continues to protect public health and safety

# Waste Acceptance Criteria



- Allowable Limits on Radioactivity
- Wasteform Characteristics and Container Specifications
- Restrictions and Prohibitions

# Waste Acceptance

- Flexibility to develop site-specific waste acceptance criteria.
- Use §61.55 limits, results of technical analyses, or combination of both to develop criteria.
- Either way, licensees must demonstrate that criteria will demonstrate that performance objectives will be met.

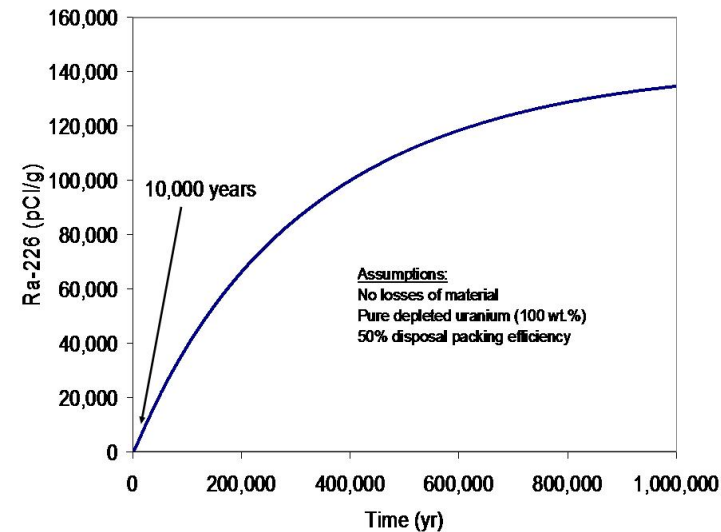
- NUREG-2175 (Guidance for Conducting Technical Analyses for 10 CFR Part 61) provides:
  - Flowcharts, NRC staff recommendations, and examples for how licensees can develop high-quality technical analyses
  - Guidelines for what licensees or applicants should include and what regulators should review for each type of analysis
  - Suggested references, screening tools, and case studies
- DRAFT final version made publically available in ADAMS and on the public website

<http://www.nrc.gov/about-nrc/regulatory/rulemaking/potential-rulemaking/uw-streams.html>

# Backup

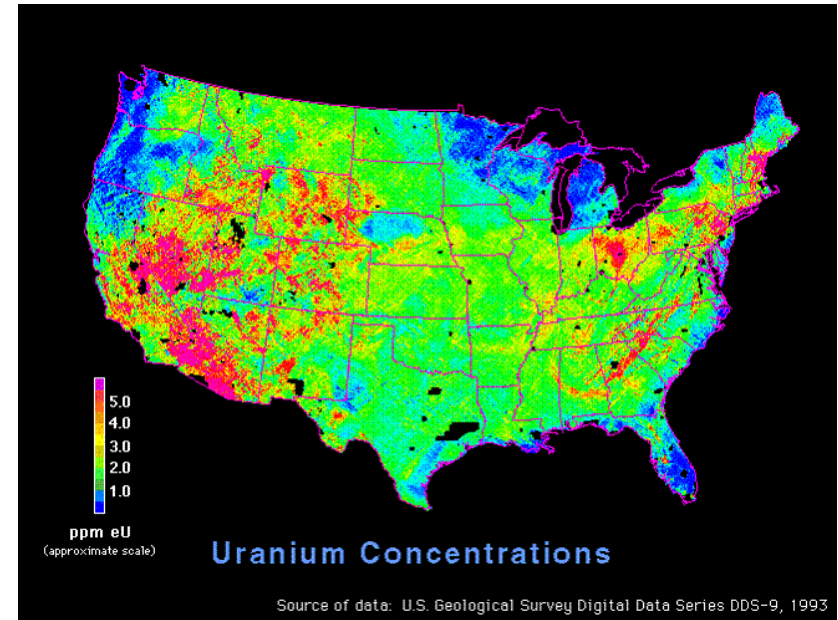
# Depleted Uranium : Source Comparison

- Uranium mill tailings contain:
  - 0.004 to 0.02 weight percent  $\text{U}_3\text{O}_8$ ,
  - 26 to 400 pCi/g  $^{226}\text{Ra}$ ,
  - 70 to 600 pCi/g  $^{230}\text{Th}$
- DU contains:
  - 99.9 weight percent uranium oxide
  - Greater than 300,000 pCi/g  $^{226}\text{Ra}$  and  $^{230}\text{Th}$  (one million years after disposal)
  - Time to exceed upper range of mill tailings concentrations is approximately 1400 years for  $^{226}\text{Ra}$  and 500 years for  $^{230}\text{Th}$



# Uranium in the Environment

- Uranium in surface soils ~ 1 to 5 ppm
- Mean atmospheric radon is ~ 0.25 pCi/L
- Indoor average radon levels ~ 1.5 to 4.2 pCi/L
- Natural radon flux levels ~ 1 to 2 pCi/m<sup>2</sup>-s
- Radon contributes roughly 70% of the average annual dose in the United States (~250 mrem/yr)



# **10 CFR Part 61**

## **“Low-level Radioactive Waste Disposal” Final Rule**

**Gary Comfort**  
**Senior Project Manager**  
**United States Nuclear Regulatory Commission**

**Presented to the Advisory Committee on Reactor Safeguards**  
**November 3, 2016**

# Discussion Topics

- Background
  - Purpose
  - Commission Direction
  - Past ACRS Interactions
- Proposed Rule Comments
- Draft Final Rule
- Technical Elements
- Path Forward

# Purpose of Rule

Problem: Ensuring safe disposal of new waste streams not analyzed as part of original 10 CFR Part 61 regulation

- Depleted uranium (DU)
- Blended wastes
- Future waste streams

# Commission Direction

- SRM-SECY-08-0147
  - Rulemaking for site-specific analysis of DU disposal
- SRM-SECY-10-0043
  - Incorporate blending into rulemaking
- SRM-COMWDM-11-0002/COMGEA-11-0002
  - Use two-tiered approach with compliance period covering reasonably foreseeable future and longer period of performance
- SECY-13-0075 and SRM
  - Latest rule language ACRS reviewed
  - Commission directed significant changes
  - ACRS encouraged to provide independent review

# Commission Direction

## Comparison of Draft Rule in SECY-13-0075 and Published Draft Rule

### SECY-13 -0075

### Publication

Analysis Time Frames (2 – tier)

Performance Assessment

Intruder Assessment

Waste Acceptance Criteria

Updated ICRP Dosimetry Modeling

Compatibility Category C

Analysis Timeframes (3 – tier)

Performance Assessment

Intruder Assessment

Explicit Description of Safety Case

Defense In Depth (DID) Analysis

Site Stability Analysis

Waste Acceptance Criteria

Updated ICRP Dosimetry Modeling

Compatibility Category B



= Minor change resulting from SRM Direction



= Major change resulting from SRM Direction

# ACRS Letter Reports – Key Issues

- Risk-informed based on site-specific, realistic performance assessments with consideration for uncertainties
  - Realistic assumptions for release and fate and transport of DU
  - Realistic likelihood of intrusion
  - Range of site-specific conditions
- Use timeframes determined on a case-by-case site-specific basis rather than defining specific fixed period of performance

# ACRS Letter Reports – Key Issues

- Compliance with performance objectives after institutional control period should be evaluated considering features, events, and processes for a given site for a period commensurate with the site-specific risk
- Protection of inadvertent intruder
  - Large uncertainties associated with human intrusion scenarios will not help decision making
  - Durability and stability should be sufficient
- Previously disposed wastes should not be subject to additional compliance evaluations

# Rule status

- Proposed rule
  - SRM-SECY-013-0075 issued February 12, 2014
  - Published for comment on March 26, 2015 (80 FR 16081)
  - 120 day comment; reopened August 27 – September 21, 2015
- Draft final rule
  - Submitted to Commission September 15, 2016 as SECY-16-0106

# Public Comments on Proposed Rule

- Received 2,401 comment letters (2,300 form)
  - Extensive public outreach
  - Six workshops and webinar
- Represented:
  - Individuals
  - Public interest groups
  - Native American Tribal Governments
  - Industry groups
  - Licensees
  - State and federal agencies
- Over 800 comments binned and responded to

# Examples of Public Comments

- 3-Tier System
  - More complicated than necessary
  - 500 mrem dose goal reduces public health and safety
  - RESPONSE: Changed to new, simplified approach
- Compatibility Category
  - Reduced current health and safety provided by some States
  - Most commenters recommended “C”
  - RESPONSE: Changed compliance period definition and 61.58 to “C”

# Examples of Public Comments (Cont)

- Grandfathering
  - 61.1(a) should allow existing sites to grandfather
  - Already disposed of wastes should not need to be addressed
  - RESPONSE: Staff concluded that grandfathering not appropriate and removed confusing language in 61.1(a)
- Backfit
  - Backfit analysis should be done because of impact on other licensees
  - RESPONSE: No backfit in Part 61; NRC doesn't address passed along costs

# Draft Final Rule Major Changes

## The rule

- Requires a site specific analysis
- Provides a 1,000 or 10,000 year compliance period for protection of the general public
- Adds a new technical analysis for the protection of inadvertent intruders
- Adds a new post-10,000-year performance period analysis
- Adds a new requirement to update the technical analyses at site closure
- Adds a new requirement to identify defense-in-depth (DID) protections

- 61.12 Specific Technical Information
  - New DID requirement added as 61.12(o)
  - Requires identification of DID protections, including a description of the capability of each DID protection relied upon to maintain safety and a basis for the capability of each DID protection
  - Not an analysis

- 61.13 Technical Analyses

- (a) Requires performance assessment for compliance period that:

- Considers features, events, and processes that represent a range of phenomena with both beneficial and adverse effects on performance
    - Considers the likelihood of disruptive or other unlikely features, events, or processes
    - Provides a technical basis for models used
    - Evaluates contaminant transport pathways and processes in environmental media (e.g., air, soil, groundwater, surface water)
    - Accounts for uncertainties and variability in the projected behavior of the disposal site and general environment and in the demographics and behaviors of human receptors
    - Identifies and differentiates between the roles performed by the natural disposal site characteristics and design features in limiting releases of radioactivity to the general population

- 61.13 Technical Analyses (cont)

(b) Requires inadvertent intruder assessment for compliance period that

- Assumes inadvertent intruder occupies the disposal site and engages in normal activities and other reasonably foreseeable pursuits that are consistent with the activities and pursuits occurring in and around the site at the time of development of the inadvertent intruder assessment.
- Is updated prior to closure to reflect any significant changes to the activities and pursuits occurring in and around the site.
- Identifies barriers to inadvertent intrusion that inhibit contact with the waste or limit exposure and provides a basis for the time period over which barriers are effective.
- Accounts for uncertainties and variability in the projected behavior of the disposal site and general environment.

- 61.13 Technical Analyses (cont)

- (e) Performance period analysis

- Only required if 10,000-year compliance period used
    - Assess how disposal site limits the potential long-term radiological impacts during the performance period, consistent with available data and current scientific understanding.
    - Must identify and describe features of the design and site characteristics relied on

- 61.41 Protection of the general population from releases of radioactivity

- (a) Compliance period

- Limits annual dose to 0.25 milliSieverts (25 millirems) to any member of the public
    - Demonstrated through analyses that meet the requirements specified in § 61.13(a).

- (b) Performance period

- Must minimize releases of radioactivity to the general environment to the extent reasonably achievable
    - Demonstrated through analyses that meet the requirements specified in § 61.13(e).

- 61.42 Protection of individuals from inadvertent intrusion.

- (a) Compliance period

- Limits annual dose to 5 milliSieverts (500 millirems) to any inadvertent intruder
    - Demonstrated through analyses that meet the requirements specified in § 61.13(b).

- (b) Performance period

- Must minimize exposures to any inadvertent intruder to the extent reasonably achievable
    - Demonstrated through analyses that meet the requirements specified in § 61.13(e).

# Path Forward

- Commission review, including ACRS input
- If approved for publication
  - Incorporate Commission directed changes
  - Send to OMB for review (~90 days)
  - Send to *Federal Register* for publication
- Effective date: 1 year from publication
- License updates due next renewal or within 5 years of effective date
- Agreement States have 3 years from publication to implement compatible regulations

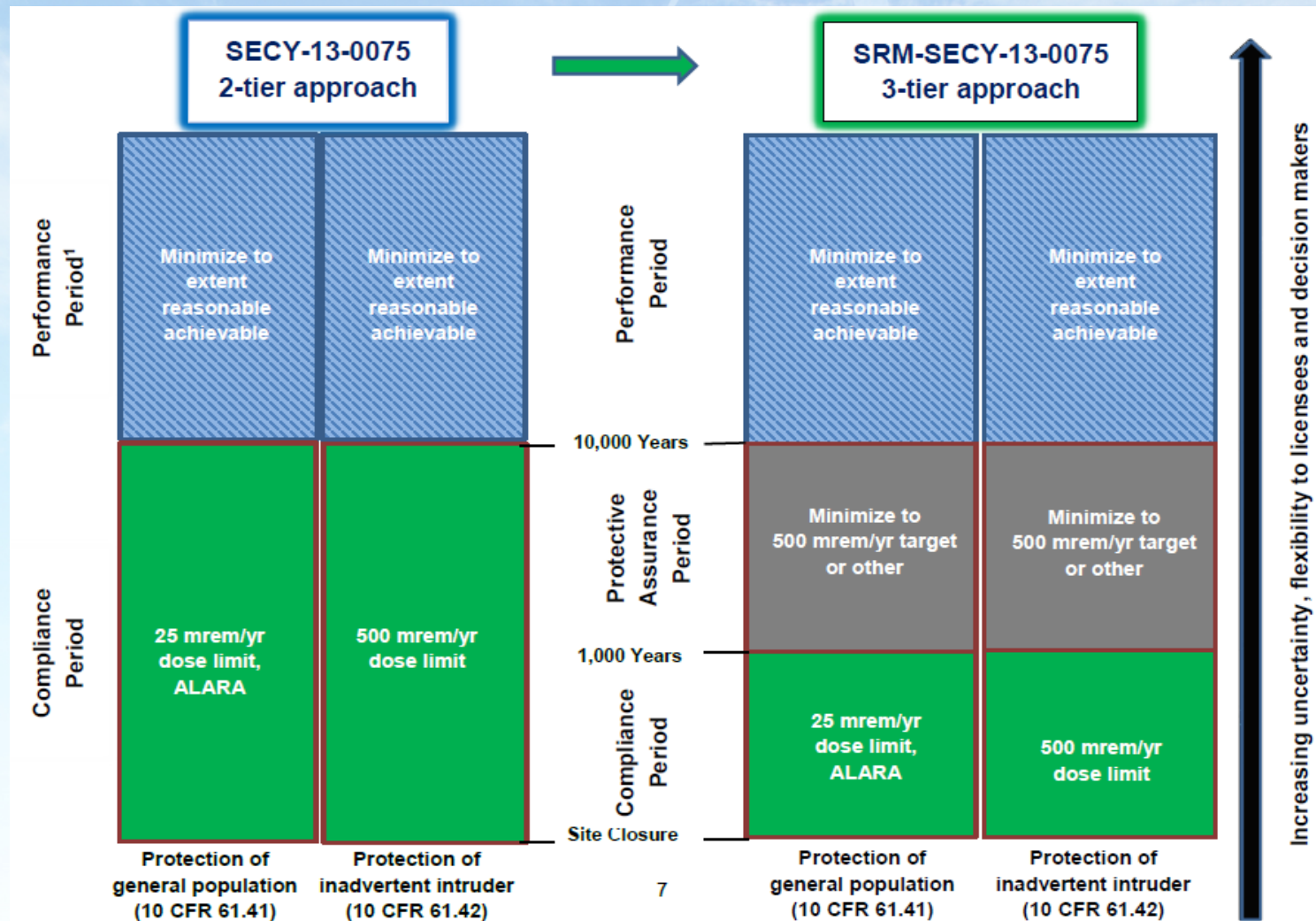
# QUESTIONS?

?????



**BACKUP SLIDE**

# Timeframe changes



<sup>1</sup> Only applicable if concentrations on a facility-averaged basis are above Class A

# Draft Final Rule Language – Definitions (61.2)

- *Compliance period*
  - Site closure to 1,000 years if no significant quantities of long-lived radionuclides.
  - Site closure to 10,000 years otherwise
- Performance period
  - timeframe established to evaluate the performance of the disposal site after the compliance period

# Draft Final Rule Language – Definitions (61.2)

- *Defense-in-depth*
  - Use of multiple independent and, where possible, redundant layers of defense such that no single layer, no matter how robust, is exclusively relied upon
  - Includes, but is not limited to, the use of siting, waste forms and radionuclide content, engineered features, and natural geologic features of the disposal site to enhance the resiliency of the land disposal facility

# Draft Final Rule Language – Definitions (61.2)

- *Inadvertent intruder assessment* is an analysis that:
  - Assumes inadvertent intruder occupies site and engages in normal activities and other reasonably foreseeable pursuits that are realistic and consistent with expected activities in and around the disposal site at the time of the assessment
  - Examines capabilities of intruder barriers to inhibit contact with the waste or limit exposure to radiation from the disposal unit
  - Estimates inadvertent intruder's potential annual dose considering uncertainties.

# Draft Final Rule Language – Definitions (61.2)

- *Long-lived radionuclide* means radionuclides:
  - Where more than 10 percent of the initial activity of the radionuclide remains after 1,000 years
  - Where the peak activity from progeny occurs after 1,000 years; or
  - Where more than 10 percent of the peak activity of the radionuclide (including progeny) within 1,000 years remains after 1,000 years

# Draft Final Rule Language – Definitions (61.2)

- *Performance assessment*
  - analysis to demonstrate compliance with the performance objectives
  - identifies the features, events, and processes that could affect the disposal site performance
  - estimates the potential dose as a result of releases caused by all significant features, events, and processes including the uncertainties

# Draft Final Rule Language – Definitions (61.2)

- *Safety case*
  - Collection of information that demonstrates the assessment of the safety of a land disposal facility
  - Includes technical analyses, defense-in-depth, and supporting evidence and reasoning
  - Also includes description of the safety relevant aspects of the disposal site, the design of the facility, and the managerial control measures and regulatory controls.

- 61.58 Alternative requirements for waste classification and characteristics.
  - Specifies waste acceptance criteria
  - Requires waste certification
  - Requires annual review of content and implementation of the waste acceptance criteria, waste characterization methods, and certification program