

# **Official Transcript of Proceedings**

## **NUCLEAR REGULATORY COMMISSION**

Title:                   Advisory Committee on Reactor Safeguards  
Regulatory Policies and Practices

Docket Number:     (n/a)

Location:             Rockville, Maryland

Date:                  Tuesday, February 7, 2017

Work Order No.:     NRC-2886

Pages 1-245

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

[www.nealrgross.com](http://www.nealrgross.com)

UNITED STATES OF AMERICA  
 NUCLEAR REGULATORY COMMISSION

+ + + + +

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

REGULATORY POLICIES AND PRACTICES SUBCOMMITTEE

+ + + + +

TUESDAY

FEBRUARY 7, 2017

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., Harold B. Ray, Chairman, presiding.

COMMITTEE MEMBERS:

HAROLD B. RAY, Chairman

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

MARGARET CHU, Member

MICHAEL L. CORRADINI, Member

WALTER L. KIRCHNER, Member

**NEAL R. GROSS**

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

JOSE A. MARCH-LEUBA, Member

DANA A. POWERS, Member

JOY REMPE, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

MATTHEW W. SUNSERI, Member

ACRS CONSULTANT:

STEPHEN SCHULTZ

DESIGNATED FEDERAL OFFICIAL:

MICHAEL SNODDERLY

ALSO PRESENT:

GREG BOWMAN, NRR

TERRY BROCK, RES

TINA GHOSH, RES

ANTONIO GOMEZ, NRR

MEENA KHANNA, NRR

LOUISE LUND, NRR

PAMELA NOTO, NRR

AARON SANDERS, NRR

FRED SCHOFFER, NRR

JAMES SLIDER, NEI, Public Participant

ANDREA D. VEIL, Executive Director, ACRS

\*Present via telephone

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

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

Opening remarks and objectives - Harold Ray,	
ACRS.....	5
Opening statement - Louise Lund, NRR.....	11
Overview of plan to update regulatory	
and cost-benefit analysis guidance	
including Commission and EDO	
direction - Pamela Noto, NRR.....	17
Proposed Changes to NUREG-1530, "Reassessment	
of NRC's Dollar Per Person-Rem Conversion	
Factor Policy" - Tina Ghosh, RES.....	59
Proposed Changes to Revision 4 of NUREG/	
BR-0058, "Regulatory Analysis Guidelines	
of the U.S. NRC"	
Pamela Noto, NRR.....	107
Antonio Gomez, NRR.....	110
Aaron Sanders.....	137
Public Comment.....	185
Adjourn.....	188

**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

8:30 a.m.

CHAIRMAN RAY: This meeting will now come to order. This is a meeting of the Advisory Committee and Reactor Safeguard Subcommittee on Regulatory Policies and Practices.

I'm Harold Ray, Chairman of the Subcommittee. Members in attendance today are Ron Ballinger, Matt Sunseri, Margaret Chu, Dick Skillman, Dana Powers, Michael Corradini, John Stetkar, Walt Kirchner, Jose March-Leuba, Charlie Brown, Joy Rempe, and we expect to be joined shortly by ACRS Chairman, Dennis Bley.

We have with us also our consultant today, Dr. Stephen Schultz, formerly a member of the Committee. Mike Snodderly, the ACRS staff is a designated federal official for this meeting.

The purpose of today's meeting, and I'll elaborate on this at the end of my remarks here, is to discuss proposed changes to NRC guidance for cost-benefit analysis in accordance with Phase 1 of the staff's plan as described in SECY-14-0002, entitled plan for updating the U.S. Nuclear Regulatory Commission's cost-benefit guidance.

**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           We will hear presentations from the NRC  
2           staff.     We've received no written comments or  
3           requests for time to make oral statements from  
4           members of the public regarding today's meeting.  
5           The meeting is open to the public.

6           Subcommittee will gather information,  
7           analyze relevant issues and facts, and formulate  
8           proposed positions and actions as appropriate for  
9           deliberation by the full Committee.     And I'll  
10          emphasize that in a minute further.

11          The rules for participation in today's  
12          meeting have been announced as part of the notice of  
13          this meeting previously published in the Federal  
14          Register.

15          A transcript of the meeting is being  
16          kept and will be made available as stated in the  
17          Federal Registered notice.     Therefore, it's  
18          requested that all speakers first identify  
19          themselves and speak with sufficient clarity and  
20          volume so that they can be readily heard.

21          I understand there may be individuals on  
22          the bridge line today, and the bridge line will be  
23          on mute so that those individuals may listen in.

24          At the appropriate time later in the  
25          meeting we'll have an opportunity for public comment

**NEAL R. GROSS**

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

1 from the bridge line and from members of the public  
2 in attendance.

3 At this point in time, because, as I  
4 said, I wanted to elaborate a bit on the purpose of  
5 the meeting, I'll ask the staff to just display  
6 their Slide 2 because that's the easiest thing for  
7 me to use in speaking to this. That's Act 1. There  
8 we go, purpose.

9 We received the slides of Friday, so we  
10 didn't have much of a chance to, last Friday, to  
11 have any interaction with the staff over them. But  
12 I think it's important that I make the following  
13 comments.

14 The first bullet indicates that we'll  
15 receive an overview of the plan, and that overview  
16 provides important context for the two bullets that  
17 then follow on this slide. But that's what it is is  
18 context.

19 The second bullet states that a purpose  
20 is to, "obtain ACRS Subcommittee endorsement of  
21 NUREG-1530, Rev. 1".

22 And it's important for me to clarify the  
23 ACRS Subcommittee cannot take actions, including  
24 providing comments. Only the full Committee  
25 following deliberation can do this.

**NEAL R. GROSS**

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



1           Comments during the meeting are those of  
2           individual members only. With this clarification, I  
3           want to underscore two members that this NUREG  
4           revision is one of two matters that's on the table  
5           at present, and the staff will discuss these in  
6           their presentation of course.

7           The last bullet states that a purpose is  
8           to, "discuss proposed changes to NUREG-0058,  
9           Revision 4".

10          And again, we may discuss matters as  
11          individual members, but this is not ACRS Committee  
12          feedback as indicated. Rather, it may be feedback  
13          from individual members attending the Subcommittee  
14          meeting, and nothing more than that.

15          The status report for the meeting that  
16          was sent to members a couple of weeks ago closes  
17          with the, with the statement that a letter is sought  
18          on 0058.

19          It says, what it said was, staff has  
20          indicated that it would like a letter on whether or  
21          not draft proposed Revision 5 to 0058 should be  
22          released for public comment.

23          We'll hear more from the staff and then  
24          we can ask questions about this during the course of  
25          the meeting so we can conclude about whether to,

**NEAL R. GROSS**

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

1 what to anticipate in the future.

2 I understand from Mike that this will be  
3 on the full Committee agenda in March. So that's  
4 for your reference.

5 MEMBER STETKAR: Harold, how can, how  
6 can we do that when the vast majority of the  
7 appendices are blank? We are not reviewing the  
8 complete document.

9 CHAIRMAN RAY: Here?

10 MEMBER STETKAR: Because we don't review  
11 anything here. Nor can the Committee review  
12 anything in March because we will not receive the  
13 full document 30 days before our full Committee  
14 meeting.

15 CHAIRMAN RAY: That's a very fair  
16 question, and one that I'll table for discussion.

17 MEMBER STETKAR: Okay.

18 CHAIRMAN RAY: Because I don't have an  
19 answer to you. The, let's see here, so anyway, as I  
20 say, and the status report sent out to members  
21 indicated that this would be on, in March. That is  
22 0058.

23 And the staff will, it's a little  
24 confusing, and particularly, for example, the way  
25 this Slide 2 characterizes the two documents.

**NEAL R. GROSS**

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

1           What the relationship is between them,  
2           and more importantly, which one is the one that we  
3           should be focusing our attention mostly on.

4           I think that will be clearer during the  
5           course of the presentation, but I just want to note  
6           it now, and I'm not trying to supersede what the  
7           staff will present.

8           There's 46 slides and 18 backup. That's  
9           a little less than four minutes per slide if we  
10          allow for a break and for public comments. So we'll  
11          be pressing along here.

12          On the other hand, I'll note, and it  
13          will become clearer later in the presentation, this  
14          is a very broad and big subject. It's been going on  
15          for a long time.

16          There's a list of meetings that appears,  
17          in a little bit I'll have some further comment to  
18          make on those meetings that have been held  
19          previously.

20          And I think that the important thing,  
21          well, one other thing I'll mention is this  
22          discussion will not include, and it specifically  
23          does not include even though it's, the output of  
24          what we'll be talking about is certainly relevant to  
25          it, it does not include the backfit process, which

**NEAL R. GROSS**

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

1 is a deliberately separate process addressed by  
2 NUREG-1409.

3 There may be questions about how that is  
4 related to what we will be talking about, and they  
5 can be directed to the staff as appropriate.

6 I believe that's all I needed to do to  
7 begin today. As you heard, we have one question on  
8 the table already from a member, but let me turn it  
9 over to Louise Lund of the Office of Nuclear  
10 Regulation, NRR, for comments that she may wish to  
11 make.

12 MS. LUND: Okay, thank you. Good  
13 morning. My name is Louise Lund and I'm the  
14 Director of the Division of Policy and Rulemaking in  
15 the Office of Nuclear Reactor Regulation.

16 And I want to take this opportunity to  
17 thank the Subcommittee for allowing us the  
18 opportunity to discuss with you the cost-benefit  
19 guidance update. And I just wanted to say  
20 that, you know, there's a strong interest in, you  
21 know, these documents on both internal and external  
22 to the agency, as you can well imagine.

23 As you know, we have been working on  
24 this update for several years. In January 2014, in  
25 response to the staff requirements memorandum, SECY-

**NEAL R. GROSS**

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

1 12-0110, the staff issued a SECY paper describing  
2 the staff's plan for updating the cost-benefit  
3 guidance. Since that time, we have met

4 several times with this Committee to address various  
5 cost-benefit staff initiatives included in the plan  
6 that could affect cost-benefit guidance.

7 For example, the gap analysis and the  
8 qualitative factors. This briefing is going to be  
9 in three parts.

10 First, we will provide an overview of  
11 the plan for updating the cost-benefit guidance and  
12 note where changes have been made.

13 Secondly, we'll focus on the proposed  
14 changes to NUREG-1530, the reassessment of NRC's  
15 dollar per person-rem.

16 Lastly, we will focus on the proposed  
17 changes to NUREG/BR-0058, Rev. 4, regulatory  
18 analysis guidelines of the NRC.

19 We look forward to addressing any  
20 questions and/or comments that you might have on  
21 both the NUREG 1530, Rev. 1, and draft NUREG/BR-  
22 0058, Rev. 5.

23 I'd like to note that the final NUREG-  
24 1530, Rev. 1 is currently with a Commission for  
25 review and approval prior to issuance to the public.

**NEAL R. GROSS**

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

1           The draft NUREG/BR-0058, Rev. 5 is  
2 currently with the NRR front office for review and  
3 will be forwarded to the Commission for review by  
4 February 22, 2017 prior to issuance for public  
5 comment.

6           Several members from NRR, as well as  
7 Research NMSS and NRO are here this morning to  
8 support this presentation, and I'll start with the  
9 person on my right, who is Greg Bowman, who is for  
10 the next series of months, going to be the acting  
11 deputy for the Division of Policy and Rulemaking to  
12 the end of this fiscal year.

13           And behind me is Meena Khanna, who is  
14 the branch chief for the Rulemaking branch in our  
15 division who provides oversight of this particular  
16 activity.

17           And at the table here is Pam Noto, the  
18 Regulatory Analysis Team project manager for my  
19 staff who will lead the discussion of the plan for  
20 updating the cost-benefit guidance.

21           Tina Ghosh is right, is on the right  
22 side of her there, from Research, will lead the  
23 discussion on the proposed changes to NUREG-1530.

24           And Tina is supported by the technical  
25 expert for this topic, Terry Brock from the Office

**NEAL R. GROSS**

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

1 of Research's System Analysis Division.

2 Aaron Sanders and Antonio Gomez, the  
3 cost analyst from my staff, along with Pam, will  
4 lead the discussion on the proposed changes to  
5 NUREG/BR-0058, Rev. 4.

6 They will be supported by Fred Schofer,  
7 who is the Regulatory Analysis Team lead, and he's  
8 sitting up here at the table.

9 And additionally, we have members of the  
10 working group and key NRR management in attendance  
11 to assist in addressing any questions the Committee  
12 might have.

13 We look forward to an informative  
14 interaction with the ACRS today. I want to thank  
15 the ACRS for its review and support to the staff  
16 with regard to the cost-benefit guidance updates.  
17 And now, I will turn the presentation over to Pam  
18 Noto of my staff. Thank you.

19 CHAIRMAN RAY: Louise, if I may  
20 interrupt, just again, you mentioned a couple of  
21 things that, of course I always want to emphasize  
22 that this is merely a Subcommittee meeting, and  
23 therefore, we don't speak for the ACRS.

24 But you mentioned the status of 1530  
25 presently. Of course the Committee may decide to do

**NEAL R. GROSS**

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

1 or not do things on its own, but I did want to get  
2 from you whether or not there was any desire,  
3 expectation, or reason, for us to take any action  
4 with regard to 1530 itself?

5 MS. LUND: Do you want to, do you want  
6 to capture that, Meena?

7 MS. KHANNA: Good morning. My name is  
8 Meena Khanna. I just want to mention, we really  
9 appreciate ACRS looking at the report. We are not  
10 looking for a formal review.

11 Any comments, questions that you may  
12 have, there was an SRM that was issued whereby the  
13 Commission did ask us to take into consideration any  
14 public comments.

15 We've done some meetings and they also  
16 explicitly had asked us with both documents to also  
17 reach out to ACRS.

18 So that's what we'd like to do is just  
19 engage in dialogue and obtain any information,  
20 insights, and comments from you, but we are not  
21 looking for formal endorsement.

22 MS. LUND: So I think that, that was our  
23 interpretation of what the Commission had requested.  
24 But on the same token, if, you know, this particular  
25 venue and these particular meetings satisfy that

**NEAL R. GROSS**

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



1 from the point of view of the ACRS without a letter,  
2 we're also open to that as well.

3 MEMBER STETKAR: For the record, I have  
4 to say this really strongly. The ACRS speaks only  
5 through written letters that are provided after  
6 deliberation by the full Committee.

7 Anything that is said today in this  
8 meeting is by no means NRC, ACRS comments, ACRS  
9 endorsement, or ACRS criticism. Period.

10 So please stop using the word ACRS in  
11 the context of this meeting. It is a Subcommittee  
12 meeting, and the comments that you will hear are  
13 individual members' comments.

14 CHAIRMAN RAY: Do not --

15 MEMBER STETKAR: It doesn't make any  
16 difference.

17 CHAIRMAN RAY: Not everybody is here.

18 MEMBER STETKAR: This is not ACRS  
19 deliberation.

20 MS. LUND: Okay.

21 MEMBER STETKAR: So please stop using  
22 that phrase.

23 MS. LUND: Okay.

24 MEMBER STETKAR: It is, it is not  
25 appropriate. Is that clear enough?

**NEAL R. GROSS**

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

1 MS. LUND: That is clear, and --

2 MEMBER STETKAR: Thank you.

3 MS. LUND: -- thank you for that  
4 clarification.

5 MEMBER STETKAR: Well, the staff, I'm  
6 sorry, the staff has been dealing with the ACRS for  
7 I don't know how many years. You'd think eventually  
8 you'd kind of get how we're organized.

9 CHAIRMAN RAY: Well, I tried to make  
10 that same point, but not as --

11 MEMBER STETKAR: Yes. Well, apparently  
12 it doesn't get through unless you're really, really  
13 straightforward.

14 CHAIRMAN RAY: Explicit. All right. In  
15 any event, I'm going to interpret what I heard to be  
16 that there's no benefit sought by the ACRS, and  
17 that's not, as John has made really clear, that's  
18 not what's gathered here now. This is a  
19 Subcommittee.

20 But you're not looking for something  
21 from the ACRS having to do with 1530 in order to  
22 enable you to get the document out of its current  
23 status. And that's my takeaway from --

24 MS. LUND: That's correct.

25 CHAIRMAN RAY: All right. I just want

**NEAL R. GROSS**

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

1 to make sure if you needed something, I was aware of  
2 it. That's all. All right.

3 And again, you may hear similar comments  
4 to those you've just heard. If later on, the result  
5 of this meeting is characterized as having been  
6 input from the ACRS, that may trigger a letter that  
7 will say somewhat like what John just said. Okay.

8 Now, with that, sorry for the  
9 interruption. I turn it over to you folks.

10 MS. NOTO: Okay. Thank you, Louise, and  
11 thank you Committee. As Louise mentioned, the  
12 purpose of our briefing today is to provide you an  
13 overview of our plan for updating the cost-benefit  
14 guidance, and to discuss the proposed changes to  
15 NUREG-1530, the reassessment of NRC's dollar per  
16 person-rem conversion factor policy, and NUREG/BR-  
17 0058, Revision 4, the regulatory analysis guidelines  
18 of the NRC.

19 And I think we've discussed what the  
20 remaining purpose of this meeting is, so I won't  
21 touch on that. You can keep that slide for now.

22 I'd also like to highlight again what  
23 Louise mentioned, that the vote paper on NUREG-1530,  
24 Revision 1, is currently with the Commission for  
25 review and approval to be released to the public.

**NEAL R. GROSS**

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

1                   And that the draft NUREG-BR-0058,  
2                   Revision 5, will be forwarded to the Commission on  
3                   the 22nd of this month, and will be made available  
4                   for public comment in March of 2017.

5                   MEMBER STETKAR: Pamela, is there some  
6                   reason why, since you're going to forward it to the  
7                   Commission on the 22nd of this month, which is two  
8                   weeks from now, the ACRS Subcommittee did not have  
9                   all of Appendix B or any of Appendices F through L  
10                  of said document?

11                  MS. NOTO: I'm not sure about, what you  
12                  mean by all of Appendix B, but --

13                  MEMBER STETKAR: There's a section of  
14                  Appendix B that is missing. If you read through it,  
15                  it's, a sentence stops mid-page, and the  
16                  continuation on the next page, you can read,  
17                  obviously is something else. If you want the  
18                  reference, it is indeed, let me look up my notes  
19                  here.

20                  MS. NOTO: Okay, well, let me just say -  
21                  -

22                  MEMBER STETKAR: But that's, it's, that  
23                  particular thing is less important than the fact  
24                  that Appendices F through L are completely blank --

25                  MS. NOTO: Right.

**NEAL R. GROSS**

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

1 MEMBER STETKAR: -- we saw.

2 MS. NOTO: And so I will discuss what  
3 the plan is for updating, but this, the plan is a  
4 two-phased approach, and we are currently in Phase  
5 1, and Phase 2 will address those appendices. So we  
6 just have outlines for those at this point.

7 MEMBER STETKAR: So how does the  
8 Commission approve a NUREG that is, that is largely  
9 blank in the technical details and the appendices.

10 MS. NOTO: We have --

11 MEMBER STETKAR: Do they take it on good  
12 faith that you're going to do something good?

13 MS. NOTO: It is an information paper  
14 that is currently with the Commission. This is in  
15 draft form just getting ready to go out for public  
16 comment.

17 MS. KHANNA: And if I may add --

18 MEMBER STETKAR: The --

19 MS. KHANNA: Sorry, go ahead.

20 MR. SCHOFER: The intent is that the  
21 document and each of the appendices will be  
22 controlled separately so that we can revise them  
23 individually. And as part of Phase 1, we're  
24 planning on issuing the document plus Appendices A  
25 through --

**NEAL R. GROSS**

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

1 MS. NOTO: E.

2 MR. SCHOFER: -- E. And the other  
3 appendices are planned and will be issued  
4 separately.

5 MS. KHANNA: And just for full  
6 disclosure, we have communicated this to the  
7 Commission. They understand, so we tried to take a  
8 stab at the appendices to be able to put the lessons  
9 learned with respect to our reg analyses reviews.

10 The second phase that Pam will be  
11 speaking to, those are more like the policy matters.  
12 They're going to take a little bit more time for the  
13 staff to get through them, so we wanted to address  
14 what we could at this time.

15 And again, we have communicated to the  
16 Commission. They are very well aware of the Phase 2  
17 approach that we're taking.

18 MEMBER STETKAR: By the way, for the,  
19 for the record, I looked up my notes. That's  
20 Appendix B, Enclosure B, boy, 4 is the thing that,  
21 at least in our version, was incomplete.

22 MS. NOTO: It's one of the enclosures.

23 MR. SCHOFER: Of the enclosures at the  
24 back? Is that --

25 MEMBER STETKAR: Yes. Yes.

**NEAL R. GROSS**

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

1 MR. SCHOFFER: Okay.

2 MEMBER STETKAR: Well, but, it's part of  
3 the appendix, so --

4 MR. SCHOFFER: No. I --

5 MEMBER STETKAR: -- I thought I'd try to  
6 read it.

7 MS. NOTO: Okay. Okay. So I'll begin  
8 by giving you some background information as a  
9 reminder of how we've gotten here today, and then  
10 I'll give a brief overview of the plan before  
11 turning it over to Tina for the discussion of NUREG-  
12 1530.

13 So the Fukushima accident initiated  
14 questions regarding how the NRC considers potential  
15 economic consequences of a nuclear accident within  
16 our regulatory framework.

17 In response to these questions, in  
18 August 2012, the staff submitted SECY-12-0110, a  
19 consideration of economic consequences, and the  
20 NRC's regulatory framework.

21 And this addressed the policy question  
22 of, to what extent, if any, should NRC's framework  
23 modify consideration of economic consequences of the  
24 unintended release of licensed nuclear materials to  
25 the environment?

**NEAL R. GROSS**

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

1           So in this paper, the staff recommended  
2           enhancing the currency and consistency of the  
3           existing regulatory framework through updates to  
4           cost-benefit analysis guidance documents.

5           And this included updating NUREG-1530,  
6           which was last published in 1995. The Commission  
7           approved the recommendation, and they gave direction  
8           to identify potential changes to current  
9           methodologies and tools to perform cost-benefit  
10          analyses in support of regulatory backfit and NEPA  
11          analyses.

12          Additionally, the Commission also  
13          directed the staff to provide a regulatory gap  
14          analysis prior to developing any new guidance.

15          In response to this Commission  
16          direction, the staff wrote SECY-14-0002, the plan  
17          for updating NRC's cost-benefit guidance, which  
18          essentially, as the title states, provided the  
19          status and steps for updating the guidance.

20          And it identified potential changes to  
21          current methodologies and tools related to  
22          performing cost-benefit analyses.

23          The plan aims to establish consistent,  
24          effective, and efficient regulatory guidance across  
25          the agency, as well as take into account

**NEAL R. GROSS**

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



1 coordination with other Commission-directed tasks.

2 And this SECY paper recommended  
3 accomplishing this by the two-phased approach that I  
4 mentioned, to revise the content and structure of  
5 the cost-benefit guidance documents.

6 So we are currently working on Phase 1  
7 of the update, and I will go into more detail about  
8 the phases in a few more slides.

9 MEMBER POWERS: Is, you indicate here  
10 that you were motivated by the Daiichi accident.  
11 Has any of the old methods or the proposed new  
12 methods been exercised by an application to the  
13 Daiichi accident?

14 MR. SCHOFER: Yes, the, this is Fred  
15 Schofer. Yes. As you recall, I mean, what brought  
16 the, a number of different analyses in front of the  
17 ACRS, including, you know, containment vents.

18 We were using, you know, the  
19 methodologies that we're describing today. In fact,  
20 many of those remain unchanged.

21 A lot, and in fact, you know, at that  
22 point in time, we were in the process of updating  
23 1530, reassessment, and because we were in that  
24 phase, we used a higher value of the dollar per  
25 person-rem conversion factor as a sensitivity

**NEAL R. GROSS**

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

1       because --

2                   MEMBER POWERS:   And that's --

3                   MR. SCHOFER:   -- we expected that number  
4       to go up.

5                   MEMBER   POWERS:       But   what   I   was  
6       specifically looking for was application to the  
7       environs of Daiichi itself.   Yes, I understand.  It  
8       would be enormously challenging, just for untold  
9       reasons.

10                   But here you've got a very interesting  
11       one in the sense that a vast percentage of the  
12       economic impact of the event came from the event and  
13       not from the reactor.

14                   And you have to do a separation somehow  
15       in there.   And it struck me, it would be very  
16       interesting to see how one goes about doing that  
17       separation.

18                   The road was destroyed, I couldn't  
19       evacuate people.  Now, do I attribute the fact that  
20       they all died of radioactive poisoning to the  
21       radioactivity or to the natural event of destroying  
22       the road?

23                   I mean, I don't know how you do that,  
24       but it would be very interesting to see,  
25       specifically, what would you, if Daiichi were in

**NEAL R. GROSS**

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

1 fact located in Illinois, what would you come up  
2 with, and what not.

3 I don't know the answer to that. It  
4 might be so challenging it's a feat. I mean, it's  
5 just not useful to you, but it would certainly be an  
6 interesting.

7 MR. SCHOFER: This is Fred Schofer  
8 again. Just a comment on that. When we were doing  
9 the regulatory gap analysis, we did look at the  
10 results from Fukushima with regard to, you know,  
11 there are the cost elements that were, you know,  
12 contributing to the recovery from that event to  
13 ensure the robustness and that we were of, our  
14 analyses, as well as whether there are any factors  
15 that we didn't consider.

16 With regard to the initiators, you know,  
17 there's been quite a bit of work as part of  
18 Fukushima. MidiBidi was discussed with the ACRS.

19 MEMBER STETKAR: Fred, don't use  
20 acronyms.

21 MR. SCHOFER: Oh, sorry. Let's see.

22 MEMBER STETKAR: You're thinking of  
23 beyond design basis events. Go on.

24 MR. SCHOFER: Thank you. And so, I  
25 mean, there was quite a bit of work with regard to,

**NEAL R. GROSS**

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

1       you know, looking at that event and how it could,  
2       may apply to the U.S. nuclear fleet.

3               With regard to, I guess the underlying  
4       question in terms of, you know, what were the  
5       consequences of Fukushima with regard to, you know,  
6       the earthquake, the tsunami, and the radiological  
7       release, I mean certainly, at least the information  
8       that I've seen, and I'll talk about, you know, this  
9       is my own opinions, it seems that the seismic event,  
10      you know, was pretty much, wasn't really the major  
11      problem there.

12             I mean, it was not until the tsunami  
13      occurred that really adversely effected that entire  
14      site and caused the resulting consequences.

15             But not only that, I mean, the effects  
16      of that tsunami and how it impacted the environment  
17      and the population in that precinct here, was, you  
18      know, devastating.

19             So although, you know, you can follow,  
20      you know, the radiological plumes. You can look at  
21      where some of the liquid releases went, the, it  
22      seems that the majority of that event was tsunami-  
23      related.

24             And you know, we haven't done a detailed  
25      evaluation of how to parse, you know, the effects of

**NEAL R. GROSS**

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

1       that.    But we have, you know, taken the lessons  
2       learned from that event to apply to these.

3               MEMBER POWERS:   You bring up the point  
4       of what it, you had a nice turn of phrase for the  
5       acronym, MidiBidi, or something like that.

6               And it has gotten so much emphasis,  
7       we're kind of in the position of having to do the  
8       parsing, aren't we?

9               And it just struck me, it would be  
10      interesting to see if you applied and tried it, I  
11      could, perfectly well understood if you said, we  
12      gave a shot at it and it's just too difficult  
13      because, one, it's an ocean away, and it's a  
14      completely different environment. But it would sure  
15      be interesting to see if you tried these techniques.

16              MR. SCHOFFER:   Okay. Thank you for that.

17              MEMBER STETKAR:   By the way, Pamela,  
18      just to correct the record, indeed Enclosure 4 to  
19      Appendix B is missing.

20              But the thing I was actually referring  
21      to was Section A.4.4 and Appendix A, which is, which  
22      has got the really missing material, as you turn  
23      from page to page. So I just wanted to make sure  
24      that you --

25              MEMBER POWERS:   You have no idea how

**NEAL R. GROSS**

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

1 often I tried to get my computer to reboot to try to  
2 figure out what it's, why it was not giving me  
3 anything on it.

4 MR. SCHULTZ: Attachment 4 is complete,  
5 but there's not any material there. It's coming in  
6 the future.

7 MEMBER STETKAR: Enclosure 4 to B is,  
8 yes, just says it's coming in the future, but the  
9 Section A.4.4 is the one that obviously has missing  
10 material out of the center of it.

11 MS. KHANNA: So we'll take that as an  
12 action, and make sure --

13 MEMBER STETKAR: And that's --

14 MS. KHANNA: -- we get that information.

15 MEMBER STETKAR: It's, that section's  
16 supposed to discuss how you, how you perform the  
17 bounding analysis. So I was kind of interested in  
18 that.

19 MS. NOTO: All right. Thank you. And  
20 the last bullet on the slide is SECY 14-0143, the  
21 regulatory gap analysis of NRC's cost-benefit  
22 guidance and practices, which was written in  
23 response to the SRM SECY-12-0110 direction to  
24 provide a regulatory gap analysis prior to  
25 developing any new cost-benefit guidance.

**NEAL R. GROSS**

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

1                   And so the gap analysis focused on  
2                   identifying differences across NRC business lines  
3                   such as material users, fuel cycle facilities, and  
4                   reactors.

5                   It also focused on identifying  
6                   differences across analyses such as regulatory  
7                   backfitting and NEPA, the National Environmental  
8                   Policy Act, in relation to methodologies and tools  
9                   used for cost-benefit determines.

10                  It also identified where additional  
11                  guidance was needed. The gap analysis results will  
12                  be used as appropriate in both phases of the updates  
13                  to the cost-benefit guidance.

14                  And currently an explanation of the  
15                  differences identified in the gap analysis are  
16                  provided in Phase 1 of the update.

17                  MEMBER CORRADINI: So before you go on,  
18                  I'm back at the, it's on, I'm back at the SRM that  
19                  you were given.

20                  And the, I think the operative sentence  
21                  is, the Commission's approved the staff's  
22                  recommended Option 2 to enhance, blah, blah, blah.

23                  Through updates, the guidance documents  
24                  performing cost-benefit analysis and sort of  
25                  regulatory backfitting and environmental analysis.

**NEAL R. GROSS**

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

1                   So can you please parse for me, what  
2                   this is, what we're going to hear today affect all  
3                   three of these, or just regulatory analysis, and  
4                   what's the interplay between them? Because I am a  
5                   bit confused.

6                   MR. SCHOFER: I'll take that.

7                   MS. NOTO: Yes sir.

8                   MR. SCHOFER: Fred Schofer. The  
9                   regulatory analysis document, NUREG/BR-0058,  
10                  establishes the methodology that's used agency-wide  
11                  to perform cost-benefit analysis.

12                  MEMBER CORRADINI: Regardless of --

13                  MR. SCHOFER: So, environmental  
14                  analyses, backfit analyses, regulatory analyses, all  
15                  use the same methodology.

16                  MEMBER CORRADINI: Okay. Okay. And  
17                  then, what's being fed into it is the, I forget what  
18                  you call it, 1530's judgement on terms of a  
19                  breakpoint.

20                  MR. SCHOFER: Well, NUREG-1530 provides  
21                  a method to monetize --

22                  MEMBER CORRADINI: Right.

23                  MR. SCHOFER: -- radiological dose so  
24                  that we can quantify and do a cost-benefit analysis.

25                  MEMBER CORRADINI: So then, Phase 1 of

**NEAL R. GROSS**

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



1 this is the technical portion, or Phase 2 is the  
2 technical portion?

3 As I, since we don't have the  
4 appendices, I interpreted Appendices F through  
5 whatever as more technical than Appendices A through  
6 E.

7 MR. SCHOFER: Correct.

8 MEMBER CORRADINI: Okay.

9 MR. SCHOFER: The Phase 1 is primarily  
10 administrative and dealing with a number of issues  
11 that have come up since 2012.

12 MEMBER CORRADINI: Okay, fine. Thank  
13 you.

14 MS. NOTO: I'll get into all of that in  
15 a little bit more detail too, so --

16 MR. SCHOFER: All right?

17 MS. NOTO: You can go to the next slide.  
18 Just a little bit more background information.  
19 Additionally, we have SECY-14-0087, the qualitative  
20 consideration of factors and the development of  
21 regulatory analyses and backfit analyses.

22 And this was written in response to the  
23 SRM SECY-12-015, consideration of additional  
24 requirements for containment venting systems for  
25 boiling water reactors with mark-1 and mark-2

**NEAL R. GROSS**

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

1 containments, which had directed the staff to seek  
2 guidance for, regarding the use of qualitative  
3 factors.

4 So SECY-14-0087 proposed updating the  
5 cost-benefit guidance to include a set of methods  
6 that could be used for the qualitative consideration  
7 of factors.

8 The Commission approved the plans, and  
9 they also directed the update to focus on capturing  
10 best practice, best practices and to provide a  
11 toolkit to the analysts.

12 So we've begun to tackle this in Phase 1  
13 of the update to NUREG/BR-0058. And this can be  
14 found in Appendix A, the qualitative factors  
15 assessment tools.

16 And Aaron will be giving, will be  
17 talking about that appendix a little bit later on  
18 this morning.

19 And then we also have the GAO and OIG  
20 audit reports, the Government Accountability Office,  
21 and Office of Inspector General audits.

22 The GAO audit report recommended that  
23 the NRC align its cost estimating procedures with  
24 relevant cost estimating best practices that are  
25 identified in the GAO cost guide.

**NEAL R. GROSS**

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

1           And this has also been addressed in  
2           Phase 1, and it can be found in Appendix B, the cost  
3           estimating and best practices of the update. Aaron  
4           will also be discussing that a little later on this  
5           morning.

6           And then the OIG audit report provided  
7           four recommendations primarily about knowledge  
8           management and training, and this effort of updating  
9           the cost-benefit guidance supports the knowledge  
10          management and knowledge transfer to cost analysts  
11          across the agency.

12          So that's a quick summary of the  
13          background. So I'll move onto the overview of the  
14          plan for updating the cost-benefit guidance. Next  
15          slide.

16          So in the next few slides, I'm going to  
17          go over the key points that were in SECY-14-0002,  
18          the plan for updating NRC's cost-benefit guidance.

19          And this paper provides a roadmap  
20          showing that there are many activities going on  
21          within the agency, not necessarily under the  
22          umbrella of the cost-benefit initiative that can  
23          inform our plans and update our guidance.

24          So on the next slide, Slide 6, I'll  
25          begin by talking about the current cost-benefit

**NEAL R. GROSS**

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

1 initiatives, or those that were current at the time  
2 of the paper. So here's a list of five  
3 activities that we envision will influence our  
4 guidance or are directly related to our guidance.

5 And the first four items on this slide  
6 are explicitly addressed in the updated guidance,  
7 and then the last bullet, the cumulative effects of  
8 regulation, is a process improvement that we've  
9 adopted.

10 So the first is an update to the  
11 replacement energy costs, which will be an appendix  
12 to NUREG/BR-0058, Revision 5, during Phase 2 of the  
13 update.

14 And this will address costs for  
15 replacement energy on a short term and long term  
16 basis.

17 The second item here is the update to  
18 the dollar per person-rem conversion factor policy,  
19 NUREG-1530, which provides guidance for monetizing  
20 the health detriment resulting from radiation  
21 exposure. And I won't steal Tina's thunder, so I'll  
22 allow her to talk about that shortly.

23 And then the next three items on the  
24 list are initiatives that are related to the cost-  
25 benefit update, even though they're under their own

**NEAL R. GROSS**

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

1 activities.

2 And I did briefly touch on the  
3 regulatory gap analysis as well as qualitative  
4 factors during the background slides.

5 And as I said, Aaron will go into a  
6 little bit more about qualitative factors later on  
7 this morning.

8 And then the last item on this list is  
9 the cumulative effects of regulation, which, again,  
10 is not specifically under the cost-benefit  
11 initiative.

12 It's under the cumulative effects of  
13 regulation initiative, but it has a direct link to  
14 how we update our guidance.

15 And with this, the Commission directed  
16 the staff to engage industry to perform case studies  
17 to better understand the accuracy of NRC's cost and  
18 schedule estimates used in regulatory analysis,  
19 which may inform our cost-benefit guidance updates  
20 in general.

21 So the NRC worked with NEI on a few case  
22 studies, and NEI provided a final report with  
23 recommendations such as clearly defining scope,  
24 closure criteria and characteristics.

25 The scope, reg analysis, and guidance of

**NEAL R. GROSS**

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

1 the regulation should receive early public input,  
2 and that regulatory analyses should include  
3 information on basic assumptions and sources that  
4 drive high-level estimates, and provide a range of  
5 estimates based on various sensitivities instead of  
6 a single point estimate.

7 And all of these NEI recommendations  
8 have been incorporated into staff processes. And  
9 the staff is also currently implementing a number of  
10 additional tasks in response to this direction.  
11 Next slide. Okay. So during the last --

12 MEMBER KIRCHNER: Before you go on --

13 MS. NOTO: I'm sorry?

14 MEMBER KIRCHNER: Could you just give a,  
15 I don't think you were going to talk about  
16 replacement energy guidance today, are you?

17 MS. NOTO: No. We haven't really  
18 developed --

19 MEMBER KIRCHNER: Could you just give a  
20 capsule summary of what you're doing there or what  
21 guidelines you've developed?

22 MR. SCHOFER: Sure. Fred Schofer.  
23 Replacement energy comes into play if the NRC  
24 identifies a regulatory action that requires a, you  
25 know, a modification to a plant.

**NEAL R. GROSS**

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

1           And as a part of that modification, it  
2           requires possibly an extended plant outage, short  
3           term plant outage.

4           So when we're evaluating the cost-  
5           benefit of that particular action, we're including  
6           the cost of that replacement power against what  
7           benefit we hope to achieve.

8           In addition, for longer term, you know,  
9           when we perform accident analyses where, as a result  
10          of an accident, it's, you know, a plant could be  
11          taken out of Commission totally, then we're looking  
12          at, you know, to prevent that accident or to  
13          mitigate that accident from occurring, we're looking  
14          at the averted cost of the accident happening, and  
15          therefore the averted cost of having to buy that  
16          replacement power.

17                 MEMBER STETKAR: Fred, I was going to  
18                 ask this later, but it -- Walt gave me a good intro.

19                 What is the total cost to the Japanese  
20                 economy of the whole country of Japan from the  
21                 accident at Fukushima?

22                 You, because your averted cost for  
23                 replacement power, as I read the guidance, looks at,  
24                 from an accident, the unit, singular, that was  
25                 damaged, and perhaps the need to shut down another

**NEAL R. GROSS**

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

1 unit at the same site for some period of time --

2 MR. SCHOFER: Correct.

3 MEMBER STETKAR: -- for repairs. It  
4 does not look at shutting down the entire U.S.  
5 nuclear industry.

6 MR. SCHOFER: That is correct.

7 MEMBER STETKAR: And the averted cost of  
8 doing that. It does not look at replacement power  
9 cost for the entire U.S. nuclear industry. Why?

10 MR. SCHOFER: The reason is, you know,  
11 that would be a speculative decision with regard to  
12 the impact of shutting down all power plants, which  
13 may not be affected by, directly by the event that  
14 occurred.

15 The plant onsite could very well have,  
16 you know, have issues with regard to operation if an  
17 accident unit is on that same site.

18 And you know, historically, you know,  
19 with, for instance, Three Mile Island, you know,  
20 that unit was not allowed to run for a number of  
21 years before it was able to come back online.

22 So I mean, we may do a sensitivities  
23 associated with units being taken offline for a  
24 period of time, but our guidance is such that we're  
25 looking at the direct impact of the event or

**NEAL R. GROSS**

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



1 scenario that we're considering.

2 Would one expect that the U.S. would  
3 have done the same, you know, edict that Japan did,  
4 and therefore, you know, shut down all nuclear power  
5 plants, import, you know, foreign oil such that, to  
6 replace that energy?

7 I mean, that was a major, major cost for  
8 the Japanese. But they believe that the same event  
9 could potentially effect a whole series of plants  
10 because a lot of those plants were, a lot on the  
11 coast line.

12 MEMBER POWERS: Well, I mean, it seems  
13 to me that that's a political decision --

14 MR. SCHOFER: It's a political decision.

15 MEMBER POWERS: -- not subject to  
16 engineering analysis. I mean, it's a societal  
17 decision that there is no engineering analysis you  
18 could possibly do to say what the probability of it  
19 is. It's as --

20 MR. SCHOFER: And I agree with you,  
21 Dana, that it is a speculative decision on our part  
22 whether that would occur.

23 MEMBER POWERS: They, I mean, they, you  
24 did an interesting comparison between the Japanese  
25 event and the Chernobyl event where one had a fairly

**NEAL R. GROSS**

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

1 dramatic impact on our plants. The other had no  
2 impact whatsoever.

3 And it's, you just don't know. It's how  
4 it gets portrayed in the politician's mind. And  
5 speculative is a generous term for the uncertainties  
6 associated with that one.

7 MR. SCHULTZ: Fred, although it is  
8 societal, this part of the discussion, is it, is  
9 what you have determined is contained, is going to  
10 be contained in the document, is it well described?

11 It seems to me what you've just  
12 described would be a useful section in the document,  
13 in the preview to the document to make comparisons  
14 between Fukushima and Japan and Chernobyl and U.S.  
15 experience. To lay that out and then to  
16 indicate what approach is being taken in each of the  
17 many, many, many different features associated with  
18 the cost-benefit evaluation to make it apparent,  
19 make it clear what is being done.

20 And it's a very ambitious undertaking,  
21 even if you constrain it in a number of different  
22 ways. But it's very important that those  
23 constraints, as they're determined by the analyst,  
24 be described fully.

25 And doing it in comparison to other

**NEAL R. GROSS**

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

1 understandings associated with the Fukushima event  
2 or other information, would be very helpful and  
3 important and necessary.

4 Because we're trying to do this to help  
5 inform the decision maker. It's not at all clear to  
6 me that, what comes out, and given to the decision  
7 maker without some context, very specific context,  
8 is going to be at all helpful.

9 MR. SCHOFFER: And that --

10 MR. SCHULTZ: You get a number, you get  
11 an uncertainty, but boy, if all of that is not well  
12 described, it's going to be hard for the decision  
13 maker to use the information to really make the  
14 decision.

15 MR. SCHOFFER: And that is our intent.  
16 When analysis is performed, as part of, you know,  
17 you know, once you identify what the problem is,  
18 then we'll go into more detail about this a little  
19 bit later.

20 And so there's a number of steps that  
21 you go through. You know, what is the problem? You  
22 know, what are the possible alternatives?

23 And then as part of describing the  
24 financial model that we've put together, I mean, we  
25 have to identify the bounds.

**NEAL R. GROSS**

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

1           You know, what's in, what's out, as well  
2           as what's important to that analysis. Because you  
3           don't want to make assumptions that fundamentally  
4           assume the answer.

5           So we need to, you know, clearly  
6           describe, you know, what is included in the  
7           analysis, and why the bounds of the analysis are  
8           what they are, and to provide that insight to  
9           decision makers so that they understand, you know,  
10          what our analysis really is performing or achieving.

11          So I agree with you. I mean, it is  
12          important to put everything in context and to, you  
13          know, clearly explain the assumptions and the  
14          limitations of the analysis.

15          CHAIRMAN RAY: This dialogue's  
16          important, but we do need to keep moving on as well,  
17          so let's do that.

18          MS. NOTO: All right. So during the  
19          last slide, we talked about these five sort of  
20          different items, and here we have this overall two-  
21          phased approach which aims to resolve two separate  
22          but important issues. Structural and administrative  
23          issues, as well as policy issues.

24          So there are three main NUREGs that  
25          provide guidance for cost-benefit analysts.

**NEAL R. GROSS**

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

1 NUREG/BR-0058, Revision 4, the regulatory analysis  
2 guidelines. NUREG-1409, backfitting  
3 guidelines, and NUREG/BR-0184, the regulatory  
4 analysis technical evaluation handbook.

5 Where NUREG/BR-0058 provides high-level  
6 guidance for regulatory analyses, and it refers  
7 users to NUREG/BR-0184, the technical handbook for  
8 of course the more technical information. NUREG/BR-  
9 0058 also contains information on backfitting, as  
10 well as NUREG-1409.

11 So the first phase, which we're calling  
12 the administrative phase, it will resolve structural  
13 issues, terminology conformity, and other  
14 administrative issues within the guidance documents.

15 And per SECY-140002, the plan for  
16 updating the cost-benefit analysis. The plan was  
17 initially to restructure all three of the main cost-  
18 benefit guidance documents where NUREG-1409  
19 backfitting, and NUREG/BR-0184, the technical  
20 evaluation handbook would be incorporated into  
21 NUREG/BR-0058 as Revision 5 of the document.

22 Now, due to a recent tasking to the  
23 CRGR, the Committee to Review Generic Requirements  
24 from the Office of the Executive Director for  
25 Operations, NUREG-1409 backfitting will, it will be

**NEAL R. GROSS**

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

1 kept as a separate document, and only cost  
2 information related to backfitting will now be  
3 incorporated into NUREG/BR-0058. NUREG-1409 will be  
4 updated is a separate but parallel effort.

5 So now, the plan is to just incorporate  
6 NUREG/BR-0184, the technical evaluation handbook  
7 into NUREG/BR-0058.

8 And during this phase, we are basically  
9 cleaning up the guidance. We're consolidating and  
10 updating the information, and we're making it  
11 applicable across business lines.

12 MEMBER CORRADINI: So just to make sure  
13 I understand, so BR-0058 will have the data that the  
14 other one that's not listed, 0149, will use. BR-  
15 0058 and 0184 are going to be combined.

16 MS. NOTO: Correct.

17 MEMBER CORRADINI: And what is the  
18 technical handbook in difference to the backfit  
19 analysis?

20 It's a different analysis for regulatory  
21 analysis if it asks a questions? I'm still  
22 struggling as to how these all fit together. I'm  
23 sorry.

24 MS. NOTO: Okay. 1409 is backfitting.

25 MEMBER CORRADINI: So it's a

**NEAL R. GROSS**

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

1 calculational procedure for backfitting, strictly?

2 MS. NOTO: Is that all of this?

3 MR. SCHOFFER: Yes. 1409 provides the  
4 details with regard to backfitting, going through  
5 the exceptions, the exclusions, and then the  
6 calculation of backfitting if you're attempting to  
7 demonstrate that there's a substantial safety, and  
8 that's why --

9 MEMBER CORRADINI: Okay. And so 0184 is  
10 --

11 MR. SCHOFFER: 0184 is a technical  
12 handbook that provides a lot of data --

13 MEMBER CORRADINI: Okay, fine.

14 MR. SCHOFFER: -- with regard to, you  
15 know, max runs and --

16 MEMBER CORRADINI: Okay.

17 MR. SCHOFFER: So it's a data handbook  
18 for all intents and purposes.

19 MEMBER CORRADINI: Right. Okay. Thank  
20 you.

21 MS. NOTO: Okay. Yes. So, okay. So  
22 now the technical handbook is going to be  
23 incorporated into 0058. And we're consolidating and  
24 updating the information and making it applicable  
25 across business lines.

**NEAL R. GROSS**

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

1           And then this centralized information is  
2 going to make up the main body of the document. And  
3 this document will be a consistent approach that  
4 will be used agency-wide.

5           And then we're going to have these  
6 series of appendices that will include current  
7 activities, will address Commission direction, as  
8 well as the GAO and OIG audit reports.

9           And by making them appendices, this  
10 should allow for easier updates in the future  
11 because they will be able to be revised  
12 independently of the main body of the document.

13           So for example, if we have an attribute  
14 that needs to be updated, we can work on just  
15 updating that attribute instead of the entire  
16 document.

17           So ultimately, the new document  
18 structure should increase efficiency and ease the  
19 burden of updating cost-benefit guidance.

20           MEMBER KIRCHNER: So this cost-benefit  
21 guidance then would apply to low-level waste  
22 facilities, potentially a repository? You'll use  
23 the same methodology across the board?

24           MS. NOTO: Yes.

25           MEMBER KIRCHNER: Thank you.

**NEAL R. GROSS**

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



1 MS. NOTO: And then we'll also have  
2 Phase 2, which will begin after Phase 1, and we're  
3 calling Phase 2 the maintenance phase.

4 And during this phase, we'll further  
5 refine cost estimate values, and we'll begin to  
6 address or resolve any emergent policy issues that  
7 were identified by the gap analysis.

8 And this phase is going to be more of an  
9 ongoing effort.

10 MR. SCHULTZ: In terms of updates of the  
11 appendices, I think that's a good idea to be able to  
12 do the updates periodically, but is there some  
13 framework associated with that?

14 I know you can expect the industry to  
15 come back and perhaps provide a comment that without  
16 some structure to that process, how do we know what  
17 to do when we're going our planning going forward?

18 Is there some structure that you're  
19 proposing in terms of periodic updates for those  
20 appendices?

21 MS. NOTO: We haven't established a  
22 formula for periodic review, but it is, I think it's  
23 part of Phase 2 of the update is to establish --

24 MR. SCHULTZ: Perhaps not a formula, but  
25 just some sort of ---

**NEAL R. GROSS**

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

1 MS. NOTO: Time frame.

2 MR. SCHULTZ: -- opportunity time frame  
3 to provide updates. It's more frequent than 20  
4 years, for example. Okay? Thank you.

5 MEMBER REMPE: So I have a comment that  
6 pertains to one of the public comments that you got  
7 about retrospective reviews.

8 And with this constant updating process  
9 that you're proposing here, and the significant  
10 increase in the value of the statistical life and  
11 all of that.

12 I'm just kind of wondering it, when you  
13 have here for retrospective reviews, EO-13563  
14 instructs agencies to periodically review existing  
15 significant regulations to determine whether any  
16 such regulations should be modified, et cetera.

17 And it seems like there's been a lot of  
18 things that we did not do with respect to Fukushima  
19 because we couldn't justify it based on cost-  
20 benefit. And I just am wondering what  
21 the, I know you're trying to separate this into  
22 phases, but I think that it would be good to  
23 understand what the impact, and have some answers.

24 I mean, do you think there won't be any  
25 changes in some of the past decisions because of

**NEAL R. GROSS**

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

1       this increase that you're proposing here in the  
2       regulatory analysis guidance?

3               MS. NOTO:    So you're speaking directly  
4       to NUREG-15 --

5               MEMBER REMPE:   30.

6               MS. NOTO:    -- 30.

7               MEMBER REMPE:   And I know you're trying  
8       to keep that separate for the impact, but still,  
9       what's the impact of what you're proposing here in a  
10      constant update process?

11              I mean, are you, and we thought about,  
12      well, we've made some decision that were pretty  
13      close because of the, we couldn't justify it because  
14      of cost-benefit, and do you have a feel for what the  
15      impact of this change is going to be if you did a  
16      periodic update on some of your past decisions and  
17      regulations?

18              MR. SCHOFER:   We anticipated that as  
19      we've been, you know, updating or doing the work to  
20      update 1530, and that's one of the reasons that  
21      we've been using higher, you know, conversion  
22      factors for a dollar per person round.

23              As we've been going through the  
24      Fukushima work, initially we started, you know, in  
25      the 2012 time frame of \$4,000. We thought that

**NEAL R. GROSS**

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

1 wouldn't, was going to be high enough.

2 More recently, we've been using \$5,200,  
3 and which is the dollar value that we're issuing the  
4 1530 Rev. 1 on.

5 But we don't anticipate that the  
6 decision that we've made recently would be  
7 adversely, or would be, need to be revised as a  
8 result of this update.

9 MEMBER REMPE: Okay.

10 MR. SCHOFFER: The decision, the cost-  
11 benefit hasn't been that close. I mean, you're  
12 talking about, you know --

13 MEMBER REMPE: So to paraphrase, you  
14 thought it had --

15 MR. SCHOFFER: A percentage versus  
16 magnitudes.

17 MEMBER REMPE: Okay. So to paraphrase,  
18 you've gone ahead and used the higher values in  
19 recent decisions.

20 MR. SCHOFFER: In every recent decision.

21 MEMBER REMPE: Okay. What about, has  
22 there been anything in the past? I mean, we've all  
23 been around listening to the Fukushima discussions,  
24 but is there anything that you know of in the past  
25 that was right on the edge that you think may, it,

**NEAL R. GROSS**

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

1 prior decisions?

2 MR. SCHOFER: There isn't.

3 MEMBER REMPE: Okay.

4 MR. SCHOFER: There isn't. And also  
5 with a number of the changes resulting from  
6 Fukushima, especially with the implementation of  
7 FLEX.

8 If we would go back and re-evaluate  
9 those, I guess events or scenarios now, it would be  
10 probably be even further apart.

11 MEMBER REMPE: Okay. Thanks.

12 MEMBER SKILLMAN: Fred and Pam, let me  
13 ask this. As you view the appendices and the other  
14 documents that are being changed, what action do you  
15 take to ensure that those changes are coordinated so  
16 when you are nearing the end of this journey, all of  
17 the pieces that you've touched are aligned.

18 MR. SCHOFER: I'm trying to --

19 MEMBER SKILLMAN: Making a change --

20 MR. SCHOFER: -- process your question.

21 MEMBER SKILLMAN: -- here, making a  
22 change there, making a change here, making a change  
23 there. What is the, what is the, I don't want to  
24 say the policy, but what is the action that you take  
25 to make sure that all of these changes are

**NEAL R. GROSS**

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

1 coordinated so that the change you make in this  
2 document and the change you make in that document  
3 and the change that you make in this policy are all  
4 heading in the same decision are heading in the same  
5 direction.

6 And you don't have a couple of orphans  
7 that actually create a diversion or a different  
8 direction that opposes where you're trying to get  
9 to.

10 MR. SCHOFFER: With regard to cost-  
11 benefit analysis by centralizing the guidance into a  
12 single set of documents, that would preclude some of  
13 that.

14 In addition, within the NRC and  
15 establishing these changes, we have a wide spectrum  
16 of participation from all the offices so that it's  
17 coordinated with regard to that perspective.

18 And the other thing is, you know, the  
19 NRC has centralized, you know, cost-benefit analysis  
20 into a reg analysis team such that all of the  
21 analyses are performed by a single group for the  
22 agency for the most part.

23 And so that ensures consistency, and in  
24 addition, going forward, the agency is looking to  
25 centralize rule making across the agency into a

**NEAL R. GROSS**

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

1 center of expertise.

2 And that will further ensure  
3 consistency. So you know, I don't have anything  
4 more I guess I want to say about that.

5 MEMBER SKILLMAN: Thank you. Thank you.

6 MR. SCHULTZ: The first example would  
7 be, is what you've just described. And that is,  
8 there's a, there's now the two groups that are  
9 working, one on backfitting and one on this effort.

10 And so to assure that there's complete  
11 and accurate coordination between the results of  
12 those two documents, that in itself is the first  
13 example of the challenge.

14 MR. SCHOFER: Well, actually that's not  
15 as big a challenge as you might think. The  
16 backfitting group is looking at the exceptions and  
17 the exclusions to backfitting, and how to apply  
18 that.

19 For instance, you know, some of the  
20 exceptions have to do with compliance backfits, with  
21 adequate protection, and redefinition of adequate  
22 protection. Those are --

23 MR. SCHULTZ: I understand what you're  
24 saying, but just --

25 MR. SCHOFER: But all of the experience

**NEAL R. GROSS**

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

1 shows that duplication, there's some overlap in the  
2 two areas.

3 They're not completely distinct. So  
4 assurance that the documents are accurately  
5 reflecting the information in each is important.

6 MR. SCHOFER: And if I can continue, so  
7 you have the definition on the exclusions. But in  
8 addition, we do cost-benefit analysis to support  
9 those.

10 And so all the cost-benefit analyses  
11 would remain and governed by this set of documents  
12 that we're talking about today. And they'll be the  
13 cross link.

14 You're not going to describe anything  
15 associated with doing that calculation. It will be  
16 a cross reference to ours.

17 Likewise, when we talk about backfitting  
18 policy exclusions, exemption, et cetera, we  
19 reference 1409. So there is a pretty clear line  
20 between the two efforts.

21 MR. SCHULTZ: Yes. That part is good  
22 news. It, the cross review is important. Just from  
23 experience.

24 MS. KHANNA: So this is Meena Khanna.  
25 If I may add, we -- management has made a decision

**NEAL R. GROSS**

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



1 to ensure that the working group -- so we've got the  
2 Cost-Benefit Guidance Working Group. We've also got  
3 a working group that has been established for the  
4 1409 effort. We've got members of both groups in  
5 both working groups to make sure that there is an  
6 interface that is being done between both efforts  
7 that are being done within this working group as  
8 well as in the 1409 Working Group, so I don't know  
9 if that helps, but Fred is definitely part of the  
10 working group on the update for 1409 in addition to  
11 a rulemaking PM.

12 CHAIRMAN RAY: We are just an hour into  
13 the meeting now, and we're at least a half-hour  
14 behind schedule, so we can decide we're not going to  
15 do all of the meeting, or we can try and accomplish  
16 the meeting.

17 MR. SCHOFFER: I think we can truncate  
18 some of the background if that is acceptable.

19 CHAIRMAN RAY: Well, I am not wanting to  
20 radically change anything that you're saying. I am  
21 just advising everybody -- it is part of what I have  
22 to do -- that we perhaps should have had a longer  
23 meeting scheduled to begin with, but that is  
24 history. Mike, you wanted to say something?

25 MEMBER CORRADINI: I just want to

**NEAL R. GROSS**

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

1 understand what this figure is telling me. Is the  
2 figure telling me that all the little boxes are  
3 pieces of the big box, or they are separate  
4 documents that feed in it?

5 MS. NOTO: So yes, so the -- the big box  
6 is the main body of the document.

7 MEMBER CORRADINI: Yes?

8 MS. NOTO: And -- and then the little  
9 boxes are the appendices --

10 MEMBER CORRADINI: Okay, but --

11 MS. NOTO: -- you are --

12 MEMBER CORRADINI: -- not all --

13 MS. NOTO: -- correct.

14 MEMBER CORRADINI: But there's not a  
15 one-to-one correspondence. I figured you were going  
16 to tell me that, except not all the appendices are  
17 the boxes, so --

18 MS. NOTO: Not all the appendices have  
19 been developed yet.

20 MEMBER CORRADINI: Okay. So --

21 MS. GHOSH: So these are just --

22 MEMBER CORRADINI: -- there's still  
23 going to be industry labor costs, NRC labor costs,  
24 occupational health, offsite property that is not in  
25 the appendices listed from A -- Appendix F through

**NEAL R. GROSS**

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

1 L? I am looking at the --

2 MS. GHOSH: Yes, it's not --

3 MEMBER CORRADINI: -- cheat sheet --

4 MS. GHOSH: -- right, you --

5 MEMBER CORRADINI: -- to the

6 Commissioners --

7 MEMBER KIRCHNER: -- can't match up the

8 titles --

9 MEMBER CORRADINI: -- which explains --

10 MS. NOTO: -- to these boxes.

11 MEMBER CORRADINI: -- all this.

12 MS. NOTO: Okay. Yes --

13 MS. GHOSH: Yes --

14 MS. NOTO: -- we just haven't

15 appropriately titled things. These just represent

16 technical areas that will become appendices as

17 appropriate.

18 MEMBER CORRADINI: So -- so somewhere in

19 the little boxes are all included in F through L? I

20 want to understand this.

21 MS. NOTO: Yes, A through all of the

22 appendices.

23 MEMBER CORRADINI: A through L, but as I

24 understood as I read A through E, a lot of this is

25 qualitative. What I heard they were administrative,

**NEAL R. GROSS**

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

1 and a lot of the technical details are in the  
2 unwritten or to-be-written or almost-written F  
3 through L, and I am just trying to do a mapping of  
4 what you show me there and what is listed there, and  
5 so there will be completeness?

6 MS. NOTO: Correct.

7 MEMBER CORRADINI: Okay.

8 MS. NOTO: So Phase 1 is the  
9 administrative, but we have also tried to tackle  
10 some Commission direction as far as qualitative  
11 factors as well as the GAO and OIG audit report  
12 findings such as Appendix B, so we have begun to  
13 tackle those in Phase 1 of the update.

14 MEMBER CORRADINI: Okay. Fine. Thank  
15 you.

16 MS. NOTO: Okay. So I think that is  
17 good for that slide then.

18 And then lastly for me, this slide just  
19 demonstrates how long this effort has been going on  
20 and how many interactions we have had with the  
21 public up to this point, so in total, six public  
22 meetings and workshops, five ACRS meetings, and  
23 we've had a Commission meeting. Three of the public  
24 meetings, two of the ACRS meeting, and the  
25 Commission meeting were on economic consequences.

**NEAL R. GROSS**

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

1 Two public meetings were --

2 MEMBER STETKAR: Pam, were those ACRS  
3 meetings, or were those ACRS subcommittee meetings?

4 MS. NOTO: They were ACRS --

5 MEMBER STETKAR: Full --

6 MS. NOTO: -- Full Committee meetings.

7 CHAIRMAN RAY: The Full Committee -- let  
8 me intervene here, because I was going to comment on  
9 this.

10 MEMBER STETKAR: Okay, sorry.

11 CHAIRMAN RAY: It is all right. The  
12 December was a Full Committee. The September was  
13 actually in October, and it was a subcommittee  
14 meeting in anticipation of the December Full  
15 Committee meeting. I am talking about 2014 now. If  
16 you go back to June and before, there's a mixture.  
17 I haven't research 2012 yet, but the upshot of it is  
18 even given that, John, the topics were very narrow  
19 by comparison with what we are talking about now,  
20 okay?

21 So I -- it would be a  
22 mischaracterization to imagine that at least the  
23 ACRS meetings, subcommittee and Full Committee,  
24 dealt with the scope of what we're talking about  
25 today because that is not the case. So having said

**NEAL R. GROSS**

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

1       that for the record, and again, I am feeling the  
2       pressure, the job of trying to get through this in  
3       the time we have allocated to it, I will ask you to  
4       please proceed.

5               MEMBER REMPE: Well, I would like to --

6               CHAIRMAN RAY: All right.

7               MEMBER REMPE:       -- ask one thing.  
8       Whatever you sent to the Commission, did it say  
9       something like this so you've mischaracterized your  
10      interactions with ACRS in what you sent to the  
11      Commission? Because I heard at the beginning of  
12      this meeting that -- that if we just interact with  
13      the ACRS during a subcommittee meeting, that  
14      probably meets the intent of the SRM, and I would  
15      hate for the Commissioners to see something like  
16      this and think oh, they did interact with the ACRS.

17              MS. NOTO: No. This was just -- this  
18      was just for this meeting, a snapshot that we've  
19      talked about qualitative factors, we've talked about  
20      the gap analysis, and all of these different pieces  
21      of this bigger plan we have addressed in ACRS  
22      meetings or subcommittee meetings.

23              CHAIRMAN RAY: Thank you.

24              MS. NOTO: And now I'll turn it over to  
25      Tina for the discussion of NUREG-1530.

**NEAL R. GROSS**

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

1 MS. GHOSH: Okay. So 1530 is the  
2 dollar-per person conversion factor NUREG, and this  
3 is just an outline of what I will cover: the  
4 definition, background, how do you calculate it, the  
5 proposed changes from the 1995 version, the  
6 regulatory applications where we use this factor, a  
7 very quick summary of public comments, and then the  
8 next steps. Okay, next slide?

9 So the definition of the dollar per  
10 person-rem, this is quoted directly from the Federal  
11 Register where it was defined. The factor  
12 translates to radiological dose -- translates  
13 radiological dose to a monetary value and, as such,  
14 allows for direct comparison between potential  
15 health and safety benefits and costs of a proposed  
16 regulatory initiative, so the whole point is you are  
17 trying to monetize the health, you know, detriment,  
18 the health impact of radiation dose. That is the  
19 whole point of the conversion factor. Next slide.

20 And so the background: the need for  
21 having a dollar per person-rem conversion factor  
22 first came up in 1974, and this was in the context  
23 of design criteria for limiting routine effluent  
24 releases from power plants. It is 10 CFR Part 50  
25 Appendix I, and basically, the Commission recognized

**NEAL R. GROSS**

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

1 that there was a need to monetize the -- the health  
2 detriment from these potential design changes.

3 So through that process, eventually in  
4 1975 the Commission issued the rule with a \$1000  
5 dollar per person-rem factor identified. This is  
6 actually the only place in NRC regulations where the  
7 dollar per person-rem is estimated directly in the -  
8 - in the regulations, in the rule.

9 MEMBER STETKAR: Tina, can I interrupt  
10 just --

11 MS. GHOSH: Yes.

12 MEMBER STETKAR: -- because I need to  
13 get to some technical things, but because of the  
14 preceding discussion about integration of regulatory  
15 guidance and regulations, I noted in 1530 it  
16 explicitly says that that \$1000 per person-rem value  
17 is still used in Appendix I and will continue to be  
18 used despite the reevaluation in 1530, and  
19 furthermore, in Regulatory Guide 8.37, \$1000 per  
20 person-rem is used, and it will continue to be used  
21 despite the changes in 1530. So how are we  
22 integrating all of this stuff?

23 MS. GHOSH: So as I mentioned, that is -  
24 - it is the one place in our 10 CFR 50 rules where  
25 the conversion factor is directly identified in the

**NEAL R. GROSS**

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



1 rule --

2 MEMBER STETKAR: Well --

3 MS. GHOSH: -- so you would --

4 MEMBER STETKAR: -- aren't we --

5 MS. GHOSH: -- need a --

6 MEMBER STETKAR: -- going to change the

7 rule, then, if it is wrong?

8 MS. GHOSH: You would need a rule change

9 to update it.

10 MEMBER STETKAR: Aren't we going to

11 change the rule if it is wrong?

12 MS. GHOSH: So I think there is some

13 justification provided in NUREG-1530 about why

14 perhaps it is not being pursued. This is for

15 routine effluent releases from power plants. There

16 are limits on how, you know, high it can go in the

17 first place, so it is basically ALARA. You are

18 looking for ALARA to improve, you know, routine

19 releases from very, very, you know, very, very small

20 amounts to maybe potentially even smaller amounts,

21 so I can't answer if that rule change is going to be

22 pursued. I don't know --

23 MEMBER STETKAR: I --

24 MS. GHOSH: -- of any --

25 MEMBER STETKAR: -- I made --

**NEAL R. GROSS**

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

1 MS. GHOSH: -- plans.

2 MEMBER STETKAR: -- my point. Let's go  
3 on.

4 MS. GHOSH: Okay. But -- but that is  
5 why we point it out. It is the one place that it's  
6 in the rule, so it -- you know, every -- all the  
7 other applications will refer back to 1530.

8 MEMBER STETKAR: And -- and in 8.37,  
9 people who adopt at material handling facilities who  
10 use Regulatory Guide 8.37 in their licensing are  
11 also constrained apparently to the \$1000 per person-  
12 rem, so just let's go on. These are nice pictures,  
13 but if you're not going to implement changes, you're  
14 not going to implement changes.

15 MS. GHOSH: I know. I think -- and  
16 coming back to the point earlier, I believe as part  
17 of our consolidating our guidance, we are making an  
18 effort to make sure all the other guidance documents  
19 that use this conversion factor just point directly  
20 back to 1530, so every time 1530 is updated the  
21 guidance document does not have to be updated too.  
22 That is part -- that was part of the whole point of  
23 the administrative restructuring, so we are trying  
24 to be mindful of that.

25 So over time -- so the --

**NEAL R. GROSS**

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

1                   MEMBER KIRCHNER: I hate to interrupt,  
2 but --

3                   MS. GHOSH: Yes.

4                   MEMBER KIRCHNER: -- I didn't have time  
5 to research this, so can you give us a quick summary  
6 how they came up with these numbers --

7                   MS. GHOSH: Yes, so --

8                   MEMBER KIRCHNER: -- for -- and this is  
9 for low-level routine release, right?

10                  MS. GHOSH: Right. So I think -- so  
11 back in 1974, when the Commission said we need a way  
12 to monetize this, the staff did some research to see  
13 what other agencies and applications were using, and  
14 they came up with a range of like anywhere from \$10  
15 to something that may be just above \$1000, and Fred  
16 can jump in. And basically, the staff, you know, at  
17 the time, they decided to go with \$1000 as a good,  
18 you know, estimate for that.

19                  MEMBER POWERS: Yes, but this is  
20 basically a willingness-to-pay study, and there was  
21 a wide variation, and it was decided to go with a  
22 round number of \$1000.

23                  MEMBER KIRCHNER: And again, to  
24 underscore, this was for routine release spread over  
25 large site areas, right?

**NEAL R. GROSS**

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

1 MS. GHOSH: Yes, yes. It was looking  
2 for -- it was design objectives for, you know,  
3 looking for ALARA opportunities for routine effluent  
4 emissions from power plants, yes. But --

5 MEMBER POWERS: An edifying document is  
6 one prepared by Brookhaven, I believe, for the  
7 revision to \$2000 per man-rem where they looked at  
8 what other regulatory agencies were using to avoid a  
9 human death, and it is very edifying because when  
10 they speak of a range, they are speaking of an  
11 enormous range. For instance, the -- if memory  
12 serves at all, and I am old enough that I have my  
13 doubts on that -- the Transportation Department  
14 would impose rules to avoid a death at like  
15 \$150,000, where FDA valued a life on like \$245  
16 million. That is the kind of range they were  
17 confronted with.

18 And to call the decision to adopt \$2000  
19 per man-rem an engineering judgment is  
20 extraordinarily generous to the engineer. But it  
21 just gives you an idea, when they speak of a range,  
22 they are talking about a range. There is not  
23 consistency within the government, and looking for  
24 that consistency on -- from other regulatory  
25 agencies is kind of a futile activity.

**NEAL R. GROSS**

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

1 MS. GHOSH: Yes. In the subsequent  
2 slides, I will go over what the update is based on.  
3 That was for the NUREG -- original NUREG-1530, which  
4 eventually, this \$1000 was revisited. It was  
5 subsequently used in other regulatory applications,  
6 but it was recognized that it should be revisited,  
7 and in 1995, NUREG-1530 was published, and that  
8 established the \$2000 per person-rem value, and it  
9 also at that point separated the offsite economic  
10 consequences from this factor, so originally, the  
11 \$1000 was meant to represent all offsite  
12 consequences from doses, but they -- but in 1995, we  
13 separated out estimating the economic consequences,  
14 the offset economic consequences.

15 MR. SCHULTZ: Just a point.

16 MS. GHOSH: Yes.

17 MR. SCHULTZ: The value of \$1000 per  
18 person-rem, I didn't want to leave the impression  
19 that that was selected as some arbitrary value,  
20 we'll just pick it and go. There was a lot of  
21 thought and consideration that went into picking  
22 \$1000 per person-rem --

23 MS. GHOSH: Yes.

24 MR. SCHULTZ: -- at that point.

25 MS. GHOSH: Right.

**NEAL R. GROSS**

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

1 MR. SCHULTZ: Not so much different than  
2 what we're doing today in picking a different value  
3 --

4 MS. GHOSH: Right.

5 MR. SCHULTZ: -- so I think that is  
6 important. The other --

7 MS. GHOSH: Yes.

8 MR. SCHULTZ: -- the other part about  
9 what you have just said in terms of separating  
10 offsite consequences from onsite consequences, '74,  
11 we didn't -- the offsite consequences that were  
12 evaluated was the local releases from the plant.  
13 That is what was under consideration. So the  
14 separation you pointed in 1995 was important because  
15 PRA had come into being, and WASH-1400, and so on  
16 and so forth. We had information that we were now  
17 dealing with, with regard to offsite consequences,  
18 so that is the history behind some of that --

19 MS. GHOSH: Right.

20 MR. SCHULTZ: -- decision-making --

21 MS. GHOSH: Right.

22 MR. SCHULTZ: -- and pronouncement.

23 MS. GHOSH: Yes, thank you, thank you  
24 for that.

25 So then in 2009, it had been some time

**NEAL R. GROSS**

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

1 since we published 1530, and the staff began  
2 research to update the dollar per person-rem value  
3 once again, and once staff sent SECY-12-0110 to the  
4 Commission, we indicated that we would update the  
5 guidance documents related to cost-benefit analyses,  
6 including NUREG-1530, and the Commission approved  
7 this recommendation in 2013. And Fred already  
8 mentioned, since we had this work in progress at the  
9 time we were evaluating some of the post-Fukushima  
10 regulatory actions, we did go ahead and use larger  
11 dollar per person-rem conversion factors in our reg  
12 analyses.

13 Okay. So how is the dollar per person-  
14 rem actually calculated? The NRC multiplies a  
15 current value of a statistical life by a cancer risk  
16 coefficient, and we'll talk a little bit about what  
17 does value of statistical life mean in a couple of  
18 slides. In NUREG-1530 from 1995, we used a VSL,  
19 that is value of statistical life, of \$3 million,  
20 and a cancer risk coefficient of  $7 \times 10^{-4}$  per  
21 person-rem, and that was based on the International  
22 Commission on Radiological Protection, or ICRP, 60  
23 report, which was published in 1991, and multiplying  
24 those two factors together, rounded to the nearest  
25 thousand, gave us \$2000 per person-rem.

**NEAL R. GROSS**

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

1                   Currently, the NUREG-1530 does not  
2 provide a method for adjusting this value into real  
3 dollars, so this was in --

4                   MEMBER CORRADINI: Can I ask a question?  
5 Since this is not an area that I am knowledgeable  
6 about, the  $7 \times 10^{-4}$  --

7                   MS. GHOSH: Yes.

8                   MEMBER CORRADINI: -- is an estimate  
9 with a range.

10                  MS. GHOSH: Yes.

11                  MEMBER CORRADINI: What was the range?  
12 Is it the same approximate range that you quote I  
13 think later in one of your slides, that it's like  
14 plus or minus a factor of two?

15                  MS. GHOSH: Yes, so --

16                  MEMBER CORRADINI: Because this is --  
17 you know, this is a --

18                  MS. GHOSH: Yes, epidemiological, right  
19 --

20                  MEMBER CORRADINI: Thank you very much -  
21 - estimate.

22                  MS. GHOSH: Right. So we'll show you  
23 later the range of the EPA coefficient, which is  
24 what we're going to now, and I don't remember the  
25 range. That might have been reported back --

**NEAL R. GROSS**

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



1 MEMBER CORRADINI: Okay. Fine.

2 MS. GHOSH: -- in 1991.

3 MEMBER CORRADINI: That is fine. But it  
4 is -- but is it fair to characterize it that this is  
5 where the major uncertainty is?

6 MS. GHOSH: You know --

7 MEMBER CORRADINI: I am struggling --

8 MS. GHOSH: -- yes --

9 MEMBER CORRADINI: -- I am struggling in  
10 your appendix on uncertainty --

11 MS. GHOSH: Yes.

12 MEMBER CORRADINI: -- which is  
13 interesting. This one strikes me as where it all  
14 sits.

15 MS. GHOSH: I think, yes, there's only  
16 two factors in this equation, and I think there is -  
17 - there is quite a bit of uncertainty in both of  
18 those factors.

19 MEMBER CORRADINI: Okay.

20 MS. GHOSH: I think Dr. Powers just  
21 mentioned that when you actually look back at the  
22 willingness-to-pay studies and what the value of a  
23 statistical life implied, it varies very widely.

24 MEMBER CORRADINI: Okay.

25 MS. GHOSH: So there is a lot of

**NEAL R. GROSS**

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

1       uncertainty there. And you are absolutely right,  
2       there is also uncertainty in the cancer coefficient,  
3       so there is uncertainty in both of those terms.

4               MEMBER BALLINGER: The VSL, I went and  
5       did some research on that, varies currently from  
6       \$7.9 million for the Food and Drug Administration to  
7       \$9.4 million for the Transportation Department.  
8       Oddly enough, the VSL for a Russian citizen is  
9       \$71,500.

10              (Laughter.)

11             MR. SCHULTZ: Tina, your last bullet  
12       does not provide a method for adjusting the value  
13       into real dollars. Do you mean that there is no  
14       opportunity to inflate the value --

15             MS. GHOSH: Exactly.

16             MR. SCHULTZ: -- because the cost of  
17       dollars -- cost of money --

18             MS. GHOSH: That is exactly --

19             MR. SCHULTZ: -- and so forth?

20             MS. GHOSH: -- right. So --

21             MR. SCHULTZ: Okay.

22             MS. GHOSH: -- it doesn't take into  
23       account inflation and other economic factors such as  
24       real income --

25             MR. SCHULTZ: It is selected --

**NEAL R. GROSS**

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

1 MS. GHOSH: -- growth.

2 MR. SCHULTZ: -- at the time without  
3 guidance for how it might be --

4 MS. GHOSH: Exactly.

5 MR. SCHULTZ: -- augmented. Thank you.

6 MS. GHOSH: That is right, that is  
7 right. Next slide.

8 MEMBER KIRCHNER: Has there been further  
9 work by the International Commission on this cancer  
10 risk factor, because this --

11 MS. GHOSH: There has.

12 MEMBER KIRCHNER: -- strikes me as a  
13 high number.

14 MS. GHOSH: Yes, there has. Their  
15 updated number is something like 5.7 for estimated -  
16 -

17 MEMBER KIRCHNER: See, this says, you  
18 know, on face value, it says 1 in 1000 people would  
19 probably get cancer from going to the doctor's and  
20 the dentist because people get a rem in medical  
21 procedures these days pretty quickly.

22 MS. GHOSH: Yes.

23 MEMBER KIRCHNER: And if we thought we  
24 created 1 in 1000 cancers by using these medical  
25 procedures, I don't think we would do it, so I just

**NEAL R. GROSS**

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

1 observe that I think that more recent work by the  
2 International Commission would suggest a lower  
3 number.

4 MS. GHOSH: Yes, and so we'll discuss  
5 the cancer coefficient on a separate slide.

6 So this is just a quick list of the  
7 proposed changes to NUREG-1530, and we will discuss  
8 each of these subsequently. Basically, in our  
9 proposed update, we are proposing to update from  
10 \$2000 to \$5200 dollars per person-rem for the best  
11 estimate, and there is guidance to vary that number  
12 up and down by 50 percent to -- for sensitivity  
13 studies.

14 And in this revision, we are also  
15 proposing to report the dollar per person-rem to two  
16 significant figures, and we propose a method for  
17 maintaining the dollar per person-rem conversion  
18 factor and provide guidance to staff on when to use  
19 -- or really to remove the dose and dose rate  
20 effectiveness factor, or DDREF, and we'll talk about  
21 that --

22 MEMBER CORRADINI: So --

23 MS. GHOSH: -- in a subsequent slide.

24 MEMBER CORRADINI: If you're going to  
25 discuss it later, then --

**NEAL R. GROSS**

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

1 MS. GHOSH: Yes.

2 MEMBER CORRADINI: -- I will stop, but  
3 the DDREF --

4 MS. GHOSH: Yes.

5 MEMBER CORRADINI: -- is included in the  
6 \$5200, or --

7 MS. GHOSH: Yes, it is.

8 MEMBER CORRADINI: So it is -- it is --  
9 this is lower because of it?

10 MS. GHOSH: Yes, that is right, because  
11 it is assumed that for the applications that we're  
12 looking at, we're basically looking at aggregating  
13 small doses to, you know, sizable numbers of people.  
14 We are not anticipating using this factor --

15 MEMBER CORRADINI: So it is already  
16 included in the \$5200, correct?

17 MS. GHOSH: It is already included in  
18 the \$5200, which is why we're saying we would have  
19 to look for situations where it wouldn't be  
20 appropriate to assume low dose or dose rates, but I  
21 will get to that.

22 Okay. So the value of a statistical  
23 life, so it's a concept that is widely used in the  
24 federal government here and in fact in some other  
25 countries too in order to monetize the health

**NEAL R. GROSS**

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

1 benefits of a safety regulation, and we like to  
2 emphasize that it is not meant to be a value that is  
3 placed on an actual human life, but a value that  
4 society would be willing to pay for reducing health  
5 risk.

6 So for example, if you reduced an annual  
7 risk of death by one in a million for each of two  
8 million people, that is equivalent to two  
9 statistical lives. So it is basically a way to  
10 monetize risk reduction.

11 NRC uses the willingness to pay method  
12 for calculating VSL, which is also consistent with  
13 other federal agencies, and we have largely used the  
14 research that was done by other federal agencies in  
15 calculating the VSL for our purposes. So right now,  
16 we are applying a best estimate --

17 MR. SCHULTZ: Excuse me --

18 MS. GHOSH: Yes?

19 MR. SCHULTZ: -- does that mean you went  
20 back and looked at everything they did and  
21 determined that it was all done just right, or does  
22 it mean that you took the values that came out of  
23 their studies and, as it appears, averaged them?

24 MS. GHOSH: Yes, so we certainly did the  
25 latter, and also some of the former. You know, this

**NEAL R. GROSS**

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

1 effort had been going on for years. There were some  
2 workshops that were undertaken across the federal  
3 family to discuss issues of VSL. We had a  
4 contractor do research. Basically, these other  
5 agencies were doing even more research than we were,  
6 so we relied on their work to decide what to do  
7 ourselves.

8 MR. SCHULTZ: That is good. That is  
9 complete enough. Thank you.

10 MS. GHOSH: And in this case, we looked  
11 at two agencies that are close to what we do in  
12 terms of trying to quantify safety benefits from  
13 proposed regulations. The DOT had a VSL of \$9.3  
14 million in 2014 dollars, and the Environmental  
15 Protection Agency had a VSL of \$8.7 million in 2014,  
16 and \$9 million is an average of those two agencies'  
17 best estimates, so that is how we came up with the  
18 \$9 million in 2014 dollars.

19 Okay.

20 MEMBER STETKAR: Okay, wait.

21 MS. GHOSH: Yes?

22 MEMBER STETKAR: I am finally going to  
23 start talking about things that I can talk about.  
24 To kind of preface several of my questions and  
25 comments, I very much want to understand how the

**NEAL R. GROSS**

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

1 staff is documenting sources of uncertainty,  
2 accounting for those uncertainties, and propagating  
3 those uncertainties through the entire analysis  
4 process, not only 1530, but out into your BR-0058.  
5 I think that is very, very important.

6 We're in the 21st century. The Agency  
7 has guidance from very high that we should  
8 explicitly account for uncertainties in everything  
9 that we do. We should present those uncertainties  
10 to decision-makers so that they understand things  
11 like there may be a 5 percent probability of  
12 exceeding some notion, or a 30 percent probability  
13 or something, so I am very interested in this topic.

14 So on this slide, I know where you came  
15 up with \$9.3 million. I looked at the upper and  
16 lower bounds. You selected a high estimate of \$13.3  
17 million that you took from OMB, and you selected a  
18 low estimate of \$4.5 million, and I have no idea  
19 where that came from, so where did the \$4.5 million  
20 come from as the lowest?

21 MS. GHOSH: Yes, okay, so I hope it  
22 wasn't too hard to follow. In the NUREG-1530  
23 document itself, we reported the high and low  
24 estimates that were based on other agencies such as  
25 OMB, DOT, EPA I believe.

**NEAL R. GROSS**

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



1 MEMBER STETKAR: Yes.

2 MS. GHOSH: We took all of that into  
3 consideration as well as the uncertainty in the  
4 cancer risk coefficient, which I --

5 MEMBER STETKAR: No, no, no --

6 MS. GHOSH: -- will talk about in the  
7 next --

8 MEMBER STETKAR: -- I don't want to get  
9 -- that is a different question. I asked --

10 MS. GHOSH: Sorry.

11 MEMBER STETKAR: -- how did you come up  
12 with \$4.5 million --

13 MEMBER KIRCHNER: Yes.

14 MEMBER STETKAR: -- for the low estimate  
15 for the value of statistical life?

16 MS. GHOSH: So we decided that instead  
17 of using a specific VSL estimate from another agency  
18 in terms of a high and a low from another estimate -  
19 -

20 MEMBER STETKAR: I am sorry. You used  
21 high from OMB, so don't -- that -- you used \$13.3  
22 for your high, and that is explicitly the high from  
23 OMB. Their low is \$1.3.

24 MS. GHOSH: What we're --

25 MEMBER STETKAR: So what did you -- why

**NEAL R. GROSS**

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

1 -- what is the -- just answer the specific question:  
2 how did you come up with \$4.5 million for your low  
3 estimate for the value of statistical life? Because  
4 I know where you got the best estimate and I know  
5 where you got the high estimate. I can't figure out  
6 where you got the --

7 MS. GHOSH: Yes --

8 MEMBER STETKAR: -- estimate.

9 MS. GHOSH: -- I am trying to answer.

10 MEMBER STETKAR: Okay.

11 MS. GHOSH: The sensitivity analysis  
12 that we are recommending is to apply a 50 percent  
13 increase and 50 percent decrease on our best  
14 estimate anchor values.

15 MEMBER STETKAR: That is values -- so  
16 you assumed a normal distribution plus or minus 50  
17 percent?

18 MS. GHOSH: I don't think we assumed any  
19 distribution --

20 MEMBER STETKAR: No --

21 MS. GHOSH: -- this is for --

22 MEMBER STETKAR: -- you have to do this,  
23 Tina. If you are going to specify uncertainty, you  
24 have to tell me why you selected the high value.  
25 You have to tell me why you selected the low value.

**NEAL R. GROSS**

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

1 And you have to provide me some distribution between  
2 those.

3 MS. GHOSH: Actually, in this case, so  
4 far, we are only recommending sensitivity studies,  
5 not --

6 MEMBER STETKAR: Well, that is contrary  
7 to Commission guidance on specification and  
8 treatment of uncertainty, isn't it?

9 MR. SCHOFER: There are a couple areas  
10 where, in cost-benefit analysis, we only perform  
11 sensitivity studies, and that has to do with the  
12 discount rate and the dollar per person-rem  
13 conversion factor. We do uncertainty analysis for  
14 those particular scenarios, but we don't do  
15 distributions on or uncertainty on the value of --  
16 of that conversion factor.

17 MEMBER STETKAR: Harold, I think the  
18 ACRS should write a letter on 1530 because it is  
19 technically unjustified. That is my opinion. If  
20 you're going to do uncertainty analysis, do  
21 uncertainty analysis.

22 So okay. I am going to eventually get  
23 to something here. I selected your \$4.5 million  
24 because you report it as your lower bound. I have  
25 no idea what the confidence interval between your

**NEAL R. GROSS**

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

1 upper and lower bound is. It is a normal  
2 distribution because it is plus or minus the same --  
3 the same value, so I don't know whether that's a 90  
4 percent confidence interval or an 80 percent or a 95  
5 percent confidence interval, but I selected a normal  
6 distribution --

7 MEMBER CORRADINI: John --

8 MEMBER STETKAR: -- for that.

9 MEMBER CORRADINI: -- you're going  
10 somewhere with this, but --

11 MEMBER STETKAR: I am.

12 MEMBER CORRADINI: -- can I ask you a  
13 question? Why couldn't it be uniform since they  
14 don't know?

15 MEMBER STETKAR: It could be uniform,  
16 but I don't know what those upper and lower bounds  
17 mean. Are they the hundredth -- the zeroth and the  
18 hundredth?

19 MEMBER CORRADINI: Well, they could have  
20 gotten 14 wise individuals in a room, and they  
21 fought over it --

22 MEMBER KIRCHNER: It doesn't make any  
23 difference if it turned out that this isn't based on  
24 any data or anything. These are political decisions  
25 by agencies.

**NEAL R. GROSS**

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

1                   MEMBER STETKAR:    They are values that  
2                   the Nuclear --

3                   MEMBER KIRCHNER:  I am surprised you are  
4                   not forced to go with the OMB number because in the  
5                   world I was in, the OMB number was what you did all  
6                   these calculations, but I will leave that aside.  It  
7                   turns out that that higher number --

8                   CHAIRMAN RAY:       Yes,  let's  --  the  
9                   discussion among members we can have later.

10                  MEMBER KIRCHNER:  Sorry.

11                  CHAIRMAN RAY:    But let's let John ask  
12                  his questions because we've got limited time --

13                  MEMBER STETKAR:    So go to the next  
14                  slide.

15                  CHAIRMAN RAY:    -- staff.

16                  MEMBER STETKAR:  I have made my point on  
17                  this one.

18                  MS. GHOSH:    Okay.    So the cancer risk  
19                  coefficient, and I think we already mentioned this,  
20                  that the NUREG-1530 from 1995 used the ICRP 60  
21                  cancer risk coefficient, which was  $7 \times 10^{-4}$  per  
22                  person-rem, which included morbidity and heredity  
23                  effects.  It wasn't just the cancer mortality, but  
24                  all cancer incidents and heredity effects.  And the  
25                  2007 update in ICRP 103 presents an updated cancer

**NEAL R. GROSS**

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

1 risk coefficient representing the same thing, so not  
2 just mortality, but everything, of  $5.7 \times 10^{-4}$  per  
3 person-rem.

4 In 2011, the EPA published a cancer  
5 mortality risk coefficient of  $5 \times 10^{-4}$  per person-  
6 rem, and this is for mortality only, so it is cancer  
7 mortality only, and they reported a 90 percent  
8 confidence interval of  $2.8 \times 10^{-4}$  to  $1 \times 10^{-3}$ .

9 MEMBER STETKAR: And that is good  
10 because that is a log normal uncertainty  
11 distribution.

12 MS. GHOSH: Yes. They are --

13 MEMBER STETKAR: It is.

14 MS. GHOSH: And they --

15 MEMBER STETKAR: That's just a --

16 MS. GHOSH: -- they would have reported  
17 --

18 MEMBER STETKAR: -- statement of fact.

19 MS. GHOSH: I think they have actually  
20 reported a shape of a distribution, so there is more  
21 information there than we have --

22 MEMBER STETKAR: Okay. I -- I didn't go  
23 back and look at it, but I will tell you that you  
24 can fit a log normal distribution to those three --

25 MS. GHOSH: Yes.

**NEAL R. GROSS**

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

1 MEMBER STETKAR: -- parameters.

2 MEMBER POWERS: Yes, and that inherently  
3 is an assumption that leaves out entire classes --

4 MEMBER STETKAR: That is -- that is --

5 MEMBER POWERS: -- of distributions.

6 MEMBER STETKAR: -- that is -- just let  
7 me -- just let me do the math here.

8 (Laughter.)

9 MEMBER STETKAR: I mean, get away from  
10 the philosophy, let me do the math as --

11 MEMBER POWERS: Well, I think it is a  
12 narrow point of view.

13 MEMBER STETKAR: It is -- if you're  
14 going to specify something, you ought to do the  
15 math.

16 MS. GHOSH: So if we go to the next  
17 slide, the staff had actually, in our draft that we  
18 put out for public comment, had proposed using the  
19 ICRP cancer coefficient, but we got public comments  
20 about that. There was some confusion that was  
21 created by that. There was a preference for the  
22 EPA's cancer mortality coefficient, so when we went  
23 back and reevaluated things, we decided to go ahead  
24 and adopt the EPA's cancer mortality-only risk  
25 coefficient for a number of reasons.

**NEAL R. GROSS**

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

1           You know, it is based on the cancer risk  
2           specific to the U.S. population, where the ICRP's  
3           includes the global population, of which the U.S. is  
4           a part, but includes everybody else too, and also,  
5           the EPA's mortality-only risk -- mortality-only risk  
6           part coefficient aligns better with the VSL, because  
7           in the VSL, we are only quantifying, you know, the  
8           loss of statistical life, and so that should be  
9           matched up with a fatality risk, so we felt it was a  
10          better match, so we went ahead and went with the  
11          EPA's cancer mortality risk coefficient. Okay, next  
12          slide.

13                 So then the dollar per person-rem value,  
14          actually we talked about this before. It is -- it  
15          is a simple formula. We're basically multiplying  
16          the estimates for the value of a statistical life  
17          times the cancer mortality risk coefficient in order  
18          to get the dollar per person-rem conversion factor,  
19          so with our updated best estimates, that is \$9  
20          million times  $5.8 \times 10^{-4}$  per person-rem. That is  
21          how we get \$5200 per person-rem for the best  
22          estimate.

23                 And as we just discussed, for the  
24          purposes of sensitivity analyses, we are in the --  
25          the proposed update, we said to vary this factor by

**NEAL R. GROSS**

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



1 plus or minus 50 percent in the dollar per person-  
2 rem conversion factor itself, so this can handle  
3 either plus or minus 50 percent in the VSL by  
4 itself, or a plus or minus 50 percent in the cancer  
5 mortality risk coefficient by itself, so it's akin  
6 to doing -- if you did a one-off sensitivity  
7 analysis for either of those factors, you know, what  
8 would you get?

9 And just to show you what that would  
10 translate to, looking at those two factors one at a  
11 time, we have the two columns that shows you the --  
12 the low and high sensitivity numbers for VSL as well  
13 as the low and high sensitivity numbers that that  
14 translates to for the cancer mortality risk  
15 coefficient.

16 MEMBER CORRADINI: Yes. Mine is quick.  
17 I'm sure yours is much more mathematical.

18 So back to Walt's point: if I have done  
19 this right, that means every 1725 person-rem of  
20 medical treatment, I am going to have a death. Have  
21 we announced that to the general public? Because I  
22 can compute how many times I get zapped by the  
23 dentist on a yearly basis, right? So I am just  
24 struggling for how this all computes from a  
25 comparison standpoint. So I think Walt's point is

**NEAL R. GROSS**

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

1 accurate, or at least ought to be restated. It just  
2 strikes me as a -- a large number which then  
3 therefore has more implications than just this  
4 analysis, doesn't it?

5 MEMBER POWERS: And in fairness to the  
6 poor dentists, you get zapped in the least sensitive  
7 part of your body.

8 MEMBER CORRADINI: Thank you.

9 (Laughter.)

10 MEMBER POWERS: And this is a whole body  
11 dose.

12 MEMBER MARCH-LEUBA: Okay. I have a  
13 more -- and I am sorry, Harold -- a more profound or  
14 deep question about this. You are calculating the  
15 probability of death times a value, and completely  
16 ignoring the cost to society which is curing the  
17 cancer, which is not insignificant. So as you  
18 really use the probability and the number of person-  
19 rem probability, it's because the cure of cancer,  
20 people -- if I get a prostate cancer today, I won't  
21 die, whereas in 1960, I would die. So you use the  
22 probability of me dying by increasing the cost to  
23 society in your insurance premium, which grows  
24 exponentially, 10, 15, 20 percent a year.

25 MS. GHOSH: Yes, so actually, thank you

**NEAL R. GROSS**

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

1 for reminding me. I forgot to mention earlier,  
2 because we decided to go with the mortality-only  
3 part of the cancer mortality risk coefficient, well,  
4 we also basically have a to-do that in our updated  
5 NUREG/BR-0058, we now need to create how to quantify  
6 the nonfatal cancer. How do you monetize getting  
7 nonfatal cancer?

8 MEMBER MARCH-LEUBA: It is becoming the  
9 largest-growing part of society --

10 MS. GHOSH: Yes.

11 MEMBER MARCH-LEUBA: -- cost.

12 MS. GHOSH: Yes, so stay tuned --

13 MEMBER MARCH-LEUBA: It is not --

14 MS. GHOSH: -- for that.

15 MEMBER MARCH-LEUBA: -- insignificant.

16 MS. GHOSH: Yes, so please stay tuned  
17 for that. We are developing a morbidity appendix  
18 which will provide guidance on how to monetize the  
19 nonfatal cancer risk --

20 MEMBER MARCH-LEUBA: And --

21 MS. GHOSH: -- and hereditary effects to  
22 the extent that those are still --

23 MEMBER MARCH-LEUBA: Yes, and all these  
24 VSLs and numbers, they keep popping around, they are  
25 just current, of the year. I mean, there is what

**NEAL R. GROSS**

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

1 society is willing to pay --

2 MS. GHOSH: Yes.

3 MEMBER MARCH-LEUBA: -- whereas the cost  
4 of going to the hospital --

5 MS. GHOSH: Yes.

6 MEMBER MARCH-LEUBA: -- which I am sure  
7 for every cancer rate is in the millions --

8 MS. GHOSH: Yes.

9 MEMBER MARCH-LEUBA: -- even if you  
10 don't die, that is not insignificant.

11 MEMBER POWERS: Yes, but that is -- this  
12 is what you're willing to pay to avoid going to the  
13 --

14 MEMBER MARCH-LEUBA: Correct.

15 MEMBER POWERS: Yes. I mean, it is a  
16 different number.

17 MEMBER MARCH-LEUBA: But we're not  
18 considering the cost in the cost-benefit?

19 MEMBER POWERS: That is not the -- not  
20 the cost that they are considering here.

21 MEMBER MARCH-LEUBA: That's why I am  
22 just asking, should they consider it?

23 MEMBER POWERS: For nonfatal cancer?  
24 Not part of our analysis.

25 MEMBER MARCH-LEUBA: That is real cost.

**NEAL R. GROSS**

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

1 This is imaginary.

2 MEMBER POWERS: Well, the --

3 MEMBER MARCH-LEUBA: And I will shut up.

4 MEMBER POWERS: You've got to go talk to  
5 the Commission about this one, and it is a -- how to  
6 evaluate societal risk is what ultimately the  
7 Commission has to do, and there the problem is too  
8 big if you consider everything, so they take a  
9 subset and say this is indicative and do a relative  
10 comparison. Fair enough. That is what I pay them  
11 the big bucks to do because it is too big for me to  
12 handle.

13 And much of it is subject to not an  
14 engineering analysis, like what do I do about  
15 psychological effects? I mean, I have no idea what  
16 to do about that. Some people get them and some  
17 people don't, you know? I mean, it is --

18 MEMBER MARCH-LEUBA: Yes, I just wanted  
19 to put on the record that some -- you could argue  
20 with the math that there are terms missing.

21 MEMBER POWERS: No, I think there is no  
22 term missing.

23 MEMBER MARCH-LEUBA: You could argue  
24 with it.

25 MEMBER POWERS: You can argue, but the

**NEAL R. GROSS**

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

1 equation as specified is as specified. There is no  
2 term missing from what they set out to do here as  
3 far as I can tell.

4 MEMBER MARCH-LEUBA: That's why I  
5 started saying that this is deeper than -- I mean,  
6 this math equation is --

7 MEMBER POWERS: I can always make a hard  
8 problem more difficult. That I can assure you.

9 (Laughter.)

10 MS. GHOSH: I guess that is why the  
11 title of the -- the report is "Conversion Factor  
12 Policy." Ultimately, the Commission, you know,  
13 decides on, you know, what is --

14 MEMBER POWERS: And that is --

15 MS. GHOSH: -- acceptable going --

16 MEMBER POWERS: I mean --

17 MS. GHOSH: -- forward.

18 MEMBER POWERS: -- no analysis I know  
19 gets closer and has to thread this problem that we  
20 inherently have, but there are aspects to safety  
21 that are not subject to engineering analysis, and so  
22 we employ people in high positions to make those  
23 judgments for us because there is no engineering  
24 analysis that can solve some of these problems.

25 MR. SCHULTZ: Tina, we have on this

**NEAL R. GROSS**

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

1 slide sensitivity analyses bolded and underlined,  
2 and I think that is really important because until  
3 Fred said it, that we do not do uncertainty analyses  
4 associated with these features, the VSL and the --

5 MR. SCHULTZ: Discount -- no, well, the  
6 discount rate, but the -- the dollar per -- the  
7 death per person-rem, the -- I didn't know that. I  
8 just assumed we were doing that, and I am not sure  
9 who in the industry or the Commission knows we're  
10 not going to do uncertainty evaluations. This will  
11 not be part of it. We only are going to present to  
12 the decision-maker a sensitivity analysis where we  
13 specify what we have chosen to choose for the bounds  
14 related to this because, as John has said, if you do  
15 the math here, you do not combine these two features  
16 and multiply them together and develop a -- a  
17 bounding range of 50 percent. It doesn't happen.  
18 You have to do that combination, and tails are going  
19 to be out much further.

20 MEMBER STETKAR: Let me tell you where  
21 the fails are so that --

22 MR. SCHULTZ: Yes, but -- So we have to  
23 make that crystal clear in this document that we are  
24 not going to be using it for a part of our  
25 uncertainty evaluation and the reason I am saying we

**NEAL R. GROSS**

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

1 have to emphasize that is I don't think that  
2 everyone understands that we're not going to do a  
3 full uncertainty evaluation of, for example, those  
4 evaluations that we do in the cost benefit studies,  
5 which include offsite releases from an accident.

6 We don't do it right. We're not going  
7 to do it right. We're going to present values that  
8 are based upon assumptions and we're going to  
9 present that to the decision maker and let them make  
10 a decision. That has to be crystal clear.

11 MS. GHOSH: If I could just add, this  
12 doesn't preclude the uncertainty analysis which  
13 would give you a full distribution on what dose you  
14 are getting in the first place.

15 You know, that this is the multiplier  
16 after, you know, what you have done as input to this  
17 basically quantifying, you know, the dose spread  
18 that you might get from the projected.

19 MEMBER STETKAR: I need to --

20 MR. SCHULTZ: That's another issue we  
21 have to explore in 0058.

22 MS. GHOSH: Yes, that will be in  
23 Appendix H when it is developed.

24 MR. SCHULTZ: Right.

25 MEMBER CORRADINI: Before John comes

**NEAL R. GROSS**

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



1 after you I was looking at the commission, the thing  
2 which is called, you gave us, Proposed Revision to  
3 1530 to the Commissioner, I assume it's like a  
4 synopsis of 1530 and I think Steve's point is well  
5 taken, as on Page 3 of this it only talks about  
6 sensitivity analysis, it does not contrast it to an  
7 uncertainty and I think that's got to be clear if  
8 they are going to vote, if they are in the middle of  
9 voting on it.

10 MS. GHOSH: Oh, okay.

11 MEMBER CORRADINI: Okay.

12 MEMBER STETKAR: Let me for the public  
13 record, because this is a public meeting and I hope  
14 Commissioners can look at the transcript of a public  
15 meeting, if I take the staff's distribution for the  
16 value of the statistical life with a lower value of  
17 \$4.5 million, an upper value of \$13.3 million, and a  
18 best estimate of \$9 million, and I fit a normal  
19 distribution to that, because I am not told  
20 otherwise, I'll use that as the 90 percent  
21 confidence interval of that normal distribution, and  
22 I take the EPA's cancer mortality risk coefficient  
23 distribution, which is specified as a 90 percent  
24 confidence interval, and a low normal distribution,  
25 and I multiply them together, this is just simple

**NEAL R. GROSS**

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

1 math, I get a resulting distribution that has a mean  
2 value of \$5200 per person rem, which is good because  
3 the means ought to multiply.

4 The 5th percentile of that distribution  
5 is \$1900 per person rem and the 95th percentile is  
6 \$10,200 per person rem. So that, according to  
7 propagation of uncertainty, is my 90 percent  
8 confidence interval on the dollar per person rem  
9 value.

10 Somewhere between \$1900 and \$10,200 is  
11 the 90 percent confidence interval given the  
12 distributions that the staff has selected. It's not  
13 between \$2600 and \$7800, but it is a distribution  
14 that can be calculated and reported from the  
15 information in this NUREG and I don't know why that  
16 distribution is neither calculated nor reported.

17 CHAIRMAN RAY: Please proceed.

18 MS. GHOSH: Okay. On the next slide we  
19 have a graph where we show what the effect is of  
20 using two significant figures instead of one  
21 significant figure.

22 So the blue curve is if you look at from  
23 1995 to today, or 2014, what would be the best  
24 estimate of the dollar per person rem conversion  
25 factor if we used one significant figure versus two.

**NEAL R. GROSS**

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

1           You can see that you wait a lot longer  
2           until you have a sudden step change, whereas with  
3           two significant figures it's more of a gradual  
4           change and it is closer to the best estimate value  
5           at any given point.

6           So basically we are recommending that we  
7           go to two significant figures and it's actually  
8           consistent with the significant figures that are  
9           reported for the two input parameters that we used  
10          to the equation, so we feel that that is  
11          appropriate.

12          Next slide. We are also proposing in  
13          this revision to 1530 a methodology for keeping the  
14          factor current. So as we mentioned before when 1530  
15          was originally published in 1995 it didn't have a  
16          way to update the factor to keep it current, so in  
17          this revision we are proposing this formula for  
18          keeping the dollar per person rem factor current.

19          We basically take the base year where  
20          the dollar per person rem factor was quantified and  
21          multiply it by the inflation times the real income  
22          growth raised to income elasticity of power and  
23          that's how we get the dollar per person rem for the  
24          current year.

25          We also say that we would inform the

**NEAL R. GROSS**

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

1 Commission if the EPA adopts a new cancer mortality  
2 risk coefficient and, you know, if the Commission  
3 gives us direction that we can go ahead and update  
4 ours we would do that for the formula and that we  
5 would also reevaluate our baseline values for VSL  
6 and cancer mortality risk coefficient periodically  
7 and provide a recommendation to the Commission if  
8 the conversion factor is expected to change by more  
9 than \$1000 per person rem.

10 So basically we have a way to keep it  
11 current for any given year and we also have this  
12 \$1000 trigger point for going back to the Commission  
13 to kind of reevaluate our baseline if needed.

14 And this practice is consistent with  
15 other federal agency initiatives in terms of  
16 establishing a formal process for both re-baselining  
17 and keeping the factor current. Next slide.

18 MEMBER SKILLMAN: Tina, would you go  
19 back two slides, please.

20 MS. GHOSH: Two slides, sure.

21 MEMBER SKILLMAN: I'm looking at the  
22 little -- The one before that, please.

23 MS. GHOSH: Okay.

24 MEMBER SKILLMAN: Was it the intent of  
25 this graphic that the dollar per rem always be the

**NEAL R. GROSS**

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

1 product or the VSL times the mortality risk  
2 coefficient?

3 MS. GHOSH: Yes, yes.

4 MEMBER SKILLMAN: Because the left-hand  
5 column doesn't jive. It's accurate for the first  
6 instance but it's not accurate for the next two. So  
7 if the intent was for that to align then this misses  
8 the mark.

9 MS. GHOSH: Oh, yes. Yes, no, my  
10 apologies. Yes, maybe this table is confusing. We  
11 just wanted to show that if you apply the plus or  
12 minus of 50 percent to the dollar per person rem  
13 conversion factor and you were looking at a  
14 sensitivity in one factor at a time what that  
15 implies for the assumed input.

16 So, for example, for the cancer  
17 mortality risk coefficient if we kept VSL constant  
18 and we assumed a \$2600 per person rem that implies  
19 that we are inputting a 2.9 times 10 to the minus 4  
20 cancer risk coefficient.

21 MEMBER SKILLMAN: Then I think you need  
22 to explain that if you're going to carry this  
23 graphic forward, do it in any other use, because if  
24 one is looking at your top line then one would  
25 expect that the dollar rem conversion would change

**NEAL R. GROSS**

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

1 in accordance with the product and it does not.

2 MS. GHOSH: Okay, yes. Right, right,  
3 okay, yes.

4 MEMBER SKILLMAN: Thank you.

5 MS. GHOSH: Thanks. Okay, so I think we  
6 were on Slide 22 for the dose and dose rate  
7 effectiveness factor, so we did talk about this  
8 briefly earlier.

9 Basically, intrinsic to the EPA cancer  
10 mortality risk coefficient that we use is the  
11 judgement that we are basically looking at low dose  
12 and low dose rate regimes.

13 We are looking at low doses and we are  
14 adding them up to a quantified statistical risk and  
15 the reason that we use a dose and dose rate  
16 effectiveness factor in the first place is that most  
17 of the epidemiological data we have is based on  
18 atomic bomb survivors, so that's in a very high dose  
19 high dose rate regime, and we need to extrapolate  
20 that down to the doses that we are actually looking  
21 at.

22 And the community, you know, believes  
23 that at low dose and dose rates certainly the  
24 effectiveness of an increment of dose is a lot  
25 different than you get at the high dose and high

**NEAL R. GROSS**

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

1 dose rate regimes.

2 MEMBER POWERS: Tina, in thinking about  
3 this do you bear in mind the recommendation from the  
4 Health Physics Society that we not quantify the  
5 effects of dose rates of less than, doses less than  
6 a rem?

7 I mean does that get any credence in  
8 this since it -- I mean it's a professional society  
9 of people that do this for a living and it carries  
10 some sort of cache, and I'm trying to understand  
11 what cache it carries with you in doing these kinds  
12 of analyses.

13 MS. GHOSH: Yes, so, you know, I believe  
14 that for our regulatory purposes the Commission  
15 policy is to use, you know, linear no threshold dose  
16 response model and that we don't use the threshold  
17 in terms of where we --

18 (Simultaneous speaking.)

19 MEMBER POWERS: They did not say  
20 anything contrary to that. They simply said don't  
21 try to quantify the consequences of doses less than  
22 one rem. They did not speak to the -- They didn't  
23 say there weren't consequences, they said just don't  
24 try to quantify the consequences. I'm just  
25 wondering how that factors in.

**NEAL R. GROSS**

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

1                   MR. SCHOFFER:   Fred Schofer.   As Tina  
2                   indicated our policy is a no threshold dose.  
3                   However, on particular analyses, I can think of  
4                   several, we do evaluate if a threshold is used what  
5                   impact that would have and examples of that is  
6                   exposed spent fuel transfer had that sensitivity --

7                   MEMBER POWERS:   Yes, I mean I -- There  
8                   has been and can be no evidence of a threshold  
9                   existing. This is a different, it speaks to how you  
10                  deal with these low and uncertain things.

11                  Now the Health Physics Society did not  
12                  speak to the issue of a threshold except to note  
13                  that some people believe it exists, but it's an  
14                  element of religion, it's not a product of looking  
15                  at the data, and they didn't speak to that.

16                  They said as a matter of how one goes  
17                  about dealing with these don't try to do things less  
18                  than one rem. Perfectly willing to admit that there  
19                  may be consequences for doses less than a rem, they  
20                  said don't try to quantify them.

21                  And I'm just wondering does it get any  
22                  mention or any obeisance in the discussions or is it  
23                  -- I mean ignoring it seems to be imprudent simply  
24                  because learned societies have some voice in this.

25                  I mean you could say, yes, we recognize

**NEAL R. GROSS**

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



1 it but by policy we're not going to do it, I mean  
2 that would be an acceptable answer. It's -- I think  
3 it's an interesting voice in all this.

4 MR. SCHOFER: And I believe we got  
5 public comments on that as well and we annotated  
6 that, or answered the question with the policy  
7 statement.

8 MEMBER CORRADINI: But I guess, Dana, to  
9 take it into account it would effectively be a  
10 cutoff.

11 MEMBER POWERS: It would be.

12 MEMBER CORRADINI: I mean I agree with  
13 you, I think they should take it into account, but  
14 effectively to take it into account wouldn't it turn  
15 out to be a cutoff?

16 MEMBER POWERS: No, it's -- Because it's  
17 not. It does not speak to the issue of threshold  
18 and the analyses put out by the National Cancer  
19 institute show that none of the epidemiological data  
20 can ever demonstrate through any kind of confidence  
21 that there exists a threshold.

22 It's simply a statistical problem that  
23 is insurmountable because the CADRE source size gets  
24 so big that you can draw a conclusion. Now some of  
25 the things that research DOE has been doing tries to

**NEAL R. GROSS**

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

1 get around that, but that hasn't come to any kind of  
2 fruition here.

3 I am really asking a question of what  
4 does the regulator do in the face of this kind of a  
5 problem where statistically you cannot deal with  
6 very, very small numbers here, but he has to, and  
7 how does he do it, and what they are doing, but I  
8 don't think it invokes a threshold.

9 Now some attempt has been made by  
10 hypothesizing the existence of the threshold and  
11 showing that decisions don't typically change very  
12 much when we hypothesize a decision, hypothesize a  
13 threshold.

14 And I think, in fact, even Hormitzis has  
15 been hypothesized in some of these analyses to show  
16 what effect that would have, and it really doesn't -  
17 - I mean I suppose they only do it in cases where it  
18 doesn't change the decision, but be that as it may.

19 CHAIRMAN RAY: Okay. After two hours we  
20 are now one hour behind and we haven't gotten to the  
21 thing that we are here for mostly, so, Tina, try and  
22 finish up and we'll --

23 MS. GHOSH: Yes. I think we are just  
24 about done. The main point, so with our update to  
25 1530 we are just recommending that the staff be

**NEAL R. GROSS**

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

1 mindful of cases where you might be in a higher dose  
2 dose rate regime, which is, you know, quite high.

3 It's only -- We're not even sure we have  
4 ever encountered such a case. It's more of a  
5 caution that if you get into those regimes to remove  
6 the 1.5 DDREF factor so that the dollar per person  
7 rem conversion factor would be multiplied, it would  
8 be higher by 1.5, so that was the only point of  
9 that.

10 We did go out for public comments on the  
11 draft of 1530. I already mentioned that we had 38  
12 individual comments from 11 different commenters,  
13 and I already mentioned one of the main comments we  
14 got.

15 There seemed to be a lot of confusion  
16 about our using the ICRP cancer risk coefficient  
17 versus the EPAs and we just decided to go with the  
18 EPA's cancer mortality only risk coefficient.

19 There was some comments about the  
20 significant figures and methods of keeping the  
21 factor current. If anybody is curious we did  
22 include the public comment resolution report, you  
23 know, in our package to the Commission. I think you  
24 all got it, so I think there is not much more to say  
25 on that.

**NEAL R. GROSS**

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

1                   And the last slide was just our next  
2                   steps. We recognize we are at the Subcommittee  
3                   today and right now the SECY package is with the  
4                   Commission for review and, you know, once we get the  
5                   Commission feedback on that eventually it would be  
6                   published.

7                   But I think that's it for 1530. Unless  
8                   there are any final questions I am going to turn it  
9                   back over to Pam.

10                  CHAIRMAN RAY: Well, actually --

11                  MS. GHOSH: Yes, sorry?

12                  CHAIRMAN RAY: -- we're not going to --  
13                  We're going to take a break that was now postponed.

14                  MS. GHOSH: Okay.

15                  CHAIRMAN RAY: But we're going to make  
16                  some other adjustments to it. Do you have a quick  
17                  question, Steve?

18                  MR. SCHULTZ: Yes, I had a -- I'll  
19                  phrase it as a question. In the document there is a  
20                  couple places where you describe, point to, that the  
21                  industry uses higher values related to the dollar  
22                  per person rem, not dollar, for the, yes, dollar per  
23                  person rem in the work that they do associated with  
24                  ALARA.

25                  And the way that is phrased I think is

**NEAL R. GROSS**

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

1 somewhat peculiar, that is, you know, occupational  
2 limits that the utility industry uses is certainly  
3 one thing, that if you evaluated that you would  
4 determine that there is a higher value that is being  
5 used and perhaps that is what's being described  
6 here.

7 I think it ought to be expressed that  
8 way rather than the way it's expressed in the  
9 document. It seems a little bit confusing because,  
10 you know, you come up with a statement that comes, I  
11 think, from different approaches, different  
12 regulations, different purposes, and it seems to  
13 suggest that the utility industry has got a  
14 different evaluation process that they use.

15 In fact, for ALARA, back in the day and  
16 back in today \$1000 per person rem is what, in fact,  
17 was used to make an ALARA determination as to  
18 whether to do something or not.

19 Certainly in the industry if something  
20 is easy to do and you reduce dose it gets done, but  
21 if something gets expensive and you have to evaluate  
22 it you would use \$1000, or in this case now the new  
23 value to do that evaluation.

24 It seems to suggest that there is  
25 something else that happens in the utility industry

**NEAL R. GROSS**

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

1 the way it's written that it's different and I don't  
2 think that's true.

3 MS. GHOSH: Yes. I think --

4 (Simultaneous speaking.)

5 CHAIRMAN RAY: Okay, we're going to have  
6 to take a comment break.

7 MR. BROCK: I am Terry Brock, I am in  
8 research and I work with some of the utilities on  
9 the dollar per person rem value.

10 What we are using ours is more a  
11 regulatory context and at the power plant often  
12 times it is ingrained into their management goals  
13 and so there is quite a various degrees of actual  
14 dollars spent per person rem.

15 I think there is one plant that's up in  
16 the \$20,000 per person rem, so it's really part of  
17 their culture and a lot of the times the success of  
18 an outage is based on how much can they lower their  
19 collective dose.

20 So the incentives there are a little bit  
21 different than what we are talking here when INPO  
22 comes in and does their analysis and they try to  
23 drive the dose down as low as possible.

24 CHAIRMAN RAY: Okay, listen, I think  
25 we've got to cut this off.

**NEAL R. GROSS**

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

1 (Simultaneous speaking.)

2 MR. SCHULTZ: The way that's expressed  
3 that's fine. Thank you for getting that on the  
4 record.

5 CHAIRMAN RAY: Okay. Now we're -- A  
6 number of the members here have conflicts at 12  
7 o'clock that they must go to, so before 12 o'clock  
8 we will go around the table for the members comments  
9 at that point in time.

10 Public comments, the meeting will not  
11 end at 12 o'clock is my prediction, we'll see, maybe  
12 the world will turn upside down in the second half  
13 here, but we will take public comments for those on  
14 the line or here in the room.

15 That may extend past 12 o'clock but  
16 because of scheduling considerations we will stop in  
17 time to get input from the members as we normally do  
18 at the end of a Subcommittee meeting before 12  
19 o'clock and then we'll take public comments if that  
20 turns out to be the case.

21 The other thing is we'll only schedule a  
22 break for ten minutes. We will -- Now it's nine  
23 minutes. We will absolutely begin at 20 minutes to 11 and do our best to get through the more  
24 important part of this agenda, which has yet to come. Thank you.

25 (Whereupon, the above-entitled matter went off the record at 10:33 a.m. and

**NEAL R. GROSS**

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

1 resumed at 10:40 a.m.)

2 CHAIRMAN RAY: The meeting will resume  
3 and we are ready for the next part of the agenda, so  
4 please proceed.

5 MS. NOTO: So I'll quickly introduce the  
6 topic before turning it over to the cost analysts.  
7 In this section of the presentation we'll focus on  
8 the proposed changes to NUREG/BR-0058, Revision 4,  
9 the NRC's Regulatory and Cost Benefit Analysis  
10 Guidance.

11 So this slide shows the proposed changes  
12 to the guidance for Phase 1. One of the proposed  
13 changes to the guidance as I mentioned earlier  
14 during the plan overview is to expand the guidance  
15 so that it's applicable across all business lines.

16 So this guidance is being expanded for  
17 material licensees regulatory analyses as well as  
18 NEPA analyses. The guidance now focuses on  
19 improving methods for quantitative analyses,  
20 including the treatment of uncertainty and  
21 developing realistic estimates of the cost of  
22 implementing proposed requirements.

23 It also provides methods for assessing  
24 factors that are difficult to quantify and  
25 incorporates cost estimating best practices. And

**NEAL R. GROSS**

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



1 I'll just note here quickly that the proposed  
2 changes in conducting regulatory analyses have  
3 already been implemented in the regulatory analyses  
4 that we are currently conducting.

5 So this slide is basically an overview  
6 of the table of contents of the new, or should I say  
7 enhanced, guidance document, and Tony and Aaron will  
8 be discussing each of these sections.

9 And I will just highlight real quickly  
10 here that reg analysis, backfitting and issue  
11 finality, and NEPA represent the main body of the  
12 document and most of this information in the main  
13 body of the document is not new information.

14 It's all just being centralized into a  
15 single location now and this document will be a  
16 consistent approach that will be used Agency wide.  
17 And then the rest of the topics listed here are  
18 appendices to the NUREG and then we have drafted  
19 some outlines for a few of the appendices that will  
20 be developed in the Phase 2 of the update.

21 So this shows some of the appendices,  
22 all of the appendices in Phase 1 and the appendices  
23 for Phase 2. As I mentioned on the previous slide  
24 those listed under Phase 2 we just have draft  
25 outlines for at this point and many of these will be

**NEAL R. GROSS**

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

1 new material, such as the severe accident  
2 consequence analysis, morbidity, and replacement  
3 power costs.

4 And then appendices such as historical  
5 data will basically house a lot of the old data from  
6 NUREG/BR-0184, the technical handbook, just  
7 information that needs to be retained. And, of  
8 course, this is not an exhaustive list.

9 CHAIRMAN RAY: Fourteen, what's the  
10 number?

11 MS. NOTO: 09, backfitting?

12 CHAIRMAN RAY: Yes, 1409. How is going  
13 to relate to this Phase 2 Appendix E called  
14 Backfitting Cost Benefit Analysis Procedures?

15 MR. SCHOFER: Fred Schofer. There will  
16 be a cross reference to 1409 that talks about the  
17 programmatic aspects of backfitting.

18 This will be the detailed instructions  
19 for the cost analyst to calculate the backfitting,  
20 you know, analyses, because one thing that's  
21 important is backfitting is a stylized cost benefit  
22 analysis, regulatory analysis is much more, it is  
23 much broader in terms of items considered.

24 With backfitting there is a much more  
25 focus on the radiological consequences versus the

**NEAL R. GROSS**

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

1 cost.

2 CHAIRMAN RAY: Well I understand, I  
3 don't want to spend any more time on it now, but I  
4 was just aware that 1409 is separate and will remain  
5 separate and I was curious since this is yet to go  
6 how you are going to maintain that separation and  
7 yet include the analysis procedures here.

8 MR. SCHOFER: Yes. The intent is as  
9 1409 gets revised this appendix will be written and  
10 will be coordinated in parallel with that effort.  
11 So the documents will flow together and then at the  
12 appropriate point in time 1409 will be issued and  
13 this appendix will be issued and be part of this  
14 document.

15 CHAIRMAN RAY: Thank you.

16 MS. NOTO: Okay. So the for the  
17 purposes of this presentation we will briefly touch  
18 on the topics listed under Phase 1 and I will just  
19 reiterate real quickly that this is enhanced  
20 guidance and the first three bullets under Phase 1  
21 are new material.

22 So qualitative factors assessment tools  
23 was developed from SECY-140087 direction, the cost  
24 estimating and best practices was developed from the  
25 GAOR Report results, and the treatment of

**NEAL R. GROSS**

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

1       uncertainty was developed from SECY-140087 direction  
2       as well as from ACRS recommendations.

3               And then the other two bullets are  
4       current cost benefit guidance information that is  
5       just being consolidated. So I will turn it over to  
6       Tony for the discussion of what's in the main body  
7       of the document.

8               MR. GOMEZ: Okay. Good morning. I am  
9       Tony Gomez and I will be covering the cost benefit  
10      guidelines, which is the body of NUREG/BR-0058  
11      guidance update.

12              What I will do is I will cover  
13      regulatory analysis, specifically what is an RA,  
14      when do you perform an RA, the steps in conducting  
15      an RA. I will also touch very briefly on the safety  
16      goal screening criteria, backfitting considerations,  
17      and NEPA.

18              Let's go ahead and get started. If you  
19      go ahead and look at these you'll see that it  
20      includes a sizeable cost benefit analysis. We are  
21      trying to provide an analytical, too, we provide the  
22      rationale for action.

23              We also follow, we have consistency with  
24      executive orders, that we comply with OMB and  
25      executive. Thanks. I would like to state that this

**NEAL R. GROSS**

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

1 is not a change in the RA process that the NRC  
2 follows.

3 RAs are performed whenever additional  
4 burden is placed on licensees. In fact, the NRC has  
5 been doing this for the past 40 years. RAs are  
6 performed with new regulations or when the NRC is  
7 considering amending existing regulations.

8 The RA process should begin when it  
9 becomes apparent that some type of regulatory action  
10 is needed to address and identify a problem. The RA  
11 process intended to be an integral part of the NRC's  
12 decision-making capability and systematically  
13 provides complete disclosure of the relevant  
14 information supporting a decision.

15 In other words, we want to be  
16 transparent. The no action or status quo is also an  
17 alternative. And this is important because this is  
18 from the baseline that costs and benefits are  
19 measured.

20 The conclusions and recommendations of  
21 an RA document are neither final nor binding. They  
22 are intended to enhance a soundness of decision  
23 making. The RA should provide the level of  
24 assessment that will demonstrate the cost savings  
25 that would be sufficient to justify the action.

**NEAL R. GROSS**

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

1           Let's go on to the next slide. When are  
2 regulatory analyses performed? Well let's say that  
3 all mechanisms proposed to be used by the NRC to  
4 establish or communicate generic requirements,  
5 guidance, requests for staff decisions that would  
6 affect a change in the use of resources by the NRC  
7 licensees will include an accompanying RA.

8           Examples of regulatory actions that meet  
9 this criteria are shown on the left column. We do  
10 not perform RAs for the items on the right column.  
11 The NRC performs RAs to support numerous NRC actions  
12 affecting reactor and material licenses.

13           As I mentioned before we follow  
14 Executive Order 12866 and this covers that an annual  
15 effect on the economy of \$100 million or more per  
16 year or it would create a series of consistency or  
17 otherwise interfere with an action taken or planned  
18 by another agency, materially alter the budget  
19 impact of entitlements, grants, user fees, loan  
20 programs, or the rights and obligations of  
21 recipients, or raise novel legal or policy issues  
22 arising out of legal mandates, the President's  
23 priorities, or principles set forth in this  
24 Executive Order.

25           No statute, NRC regulation, or Executive

**NEAL R. GROSS**

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

1 Order requires the NRC to do an RA. We have  
2 probably been performing this duty since the  
3 bicentennial year of this country, 1976.

4 Next. Steps for conducting a regulatory  
5 analysis. Let's briefly go ahead and cover how we  
6 go about doing it. You see a nice little eye chart  
7 there, let's start with A.

8 You have to know where you are going if  
9 you want to get to your destination. What you want  
10 to know is what is the problem that you are trying  
11 to answer.

12 You need to communicate how big, wide,  
13 or gnarly the problem is. For example, is the  
14 problem a series of equipment failures during an  
15 operation or a major incident fields and inherent  
16 design weakness.

17 Could it be a fundamental nature of the  
18 problem of inadequate design, inadequate inspection  
19 or maintenance? Could it be operator failure?  
20 Failure to incorporate adequate human factors?

21 Let's go to B. You should look at  
22 several alternatives to know how you are going to  
23 develop your approach to arrive at your solution.  
24 What you are trying to avoid is to have a limited  
25 number of tools.

**NEAL R. GROSS**

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

1           If your toolkit only includes a hammer  
2           you tend to look at all problems as a nail and you  
3           don't want to do that. You want to develop a set of  
4           alternative approaches early in the analysis to  
5           maintain objectivity and prevent premature  
6           conclusions from being drawn.

7           Let's move to C. I'm trying to be as  
8           quick as possible, based on other things. On C at  
9           this time we would move to a safety goal analysis.  
10          What you are after here is to perform the analysis  
11          to see the safety goal screening criteria are met.

12          I will show this a little later on in  
13          the presentation but note that if the screening  
14          criteria are not met you accept the process, and you  
15          see the little thing coming up, with the process  
16          with no regulatory action taken.

17          Let's move to D. If the screening  
18          criteria are met and you have gone and selected your  
19          approach now is the time to begin to evaluate the  
20          cost and benefits.

21          A takeaway here is you are trying to  
22          find out if the benefits outweigh the costs of the  
23          approach you are evaluating.

24          Let's move to E. Remember, your  
25          analysis and results are to provide management with

**NEAL R. GROSS**

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



1 decision-making tools. For example, if you have  
2 evaluated the alternative besides a status quo, you  
3 need to do this for every alternative evaluated.

4 You want to discuss the sources and  
5 magnitudes of the uncertainties and attribute  
6 estimates and the methods used to quantify  
7 sensitivity or uncertainty in the estimates.

8 The effects of the proposed action on  
9 other NRC programs should also be assessed. These  
10 could include eliminating or creating the need for  
11 other programs using limited NRC resources resulting  
12 in a postponement or rescheduling of the programs.

13 One of the programs that I worked with  
14 was MidiBidi and we have already figured out what  
15 that was. On that one we evaluated three, the  
16 status quo, which is the way we were doing things,  
17 but based on that we went ahead and compared our  
18 costs to, and we had two other alternatives, one  
19 that included evaluating SAMGs, Significant Accident  
20 and Mitigation Guidelines, and another one without.

21 We eventually selected and recommended  
22 for approval the option without the SAMGs. So,  
23 again, in that document we went ahead and evaluated  
24 all the alternatives you saw, where we got the  
25 figures, how they played out, and we presented

**NEAL R. GROSS**

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

1 those.

2 MEMBER CHU: Can I ask a real quick  
3 question?

4 MR. GOMEZ: Yes.

5 MEMBER CHU: This is a proposed Revision  
6 5, okay, now any changes from Revision 4 to Revision  
7 5 in terms of those steps?

8 MR. GOMEZ: They were -- no, they were  
9 very --

10 MEMBER CHU: The same?

11 MR. GOMEZ: No, no, it's essentially the  
12 same.

13 MEMBER CHU: Okay, thank you.

14 MR. GOMEZ: Okay. As I had mentioned  
15 before and I will also mention several other times,  
16 this is not a, at least for our purposes here this  
17 is not a change in the way, and we're not changing  
18 the RA process.

19 We are continuing to do what we have  
20 done. We are just trying to present that so that  
21 you folks are aware of that, too.

22 Let's look at F. Here we are trying to  
23 communicate your rationale as to why you are  
24 selecting the recommended alternative, and so  
25 essentially you are explaining the net benefit

**NEAL R. GROSS**

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

1 calculation for each alternative.

2 And in considering the net benefit care  
3 should be taken in interpreting the significance of  
4 the estimate. This is important because if the net  
5 benefit is only weakly positive or weakly negative,  
6 remember you are dealing with uncertainty here that  
7 could change the recommendation.

8 For G, for this one, for implementation  
9 you should present the schedule of the proposed  
10 action. It has to be realistic because you need to  
11 know what needs to be done, that is the analysis  
12 approval, procedures testing, procedure development,  
13 training and reporting.

14 The word "realistic" as in realistic  
15 schedule is important here, so you need to complete  
16 the required actions and note that there might be  
17 alternative schedules if appropriate.

18 Let's move on to the next, okay.  
19 Attributes considered in a regulatory and cost  
20 benefit analysis. Let's look at some of the  
21 attributes when doing a CBA.

22 For every CBA to be performed these  
23 attributes that could be impacted by the proposed  
24 action have to be identified. Remember we are  
25 trying to be thorough.

**NEAL R. GROSS**

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

1           You will need to see that these  
2 attributes apply broadly to society, industry, the  
3 NRC, licensees, other federal agencies, and the  
4 public. We evaluate attributes to attempt to  
5 quantify examples that we can use in the CBA.

6           Note the breadth of the items that we  
7 are looking at here. We are trying to catch the  
8 significant items so that our analysis is thorough.  
9 Not only is it important to seek what the NRC staff  
10 considers, but note that these attributes are broad  
11 spectrum items, that as societal consequence aspect  
12 they also have other components and you also need to  
13 look at inclusion that is consistent with OMB  
14 guidance which is also used by other federal  
15 agencies.

16           For example, let's go ahead and look at  
17 some of these. This attribute measures expected  
18 changes in radiation exposures for the public due to  
19 changes in accident frequencies or accident  
20 consequences associated with the proposed action.  
21 In most cases the effect on the proposed action  
22 would be on public exposures.

23           Let's move to another example, public  
24 health routine. This attribute accounts for changes  
25 in radiation exposures for the public during normal

**NEAL R. GROSS**

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

1 facility operations, that is non-accident  
2 situations.

3 When used this attribute would employ an  
4 actual estimate because accident probabilities are  
5 not involved in this.

6 Let's go on to the next one,  
7 occupational health accident. This attribute  
8 accounts for health effects both immediate and long-  
9 term associated with site workers, that would be  
10 both plant personnel and external workers that would  
11 be brought in to assist in the plant in response to  
12 an accident as a result of changes in accident  
13 frequency or accident mitigation.

14 MEMBER STETKAR: Antonio, can I stop you  
15 right there --

16 MR. GOMEZ: Yes, yes.

17 MEMBER STETKAR: -- because there is no  
18 other place I can ask this question so I'll ask it  
19 now.

20 MR. GOMEZ: Oh, okay, sure.

21 MEMBER STETKAR: In the guidance for  
22 quantifying occupational health effects due to an  
23 accident there is the infamous dollar per person rem  
24 conversion factor. There are equations for  
25 immediate doses and long-term doses and the same

**NEAL R. GROSS**

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

1 dollar per person rem conversion factor is used for  
2 both.

3 Why for immediate doses to workers  
4 onsite following an accident isn't the higher  
5 conversion factor from NUREG-1530 used, because my  
6 suspicion is that at least a number of those workers  
7 are going to get the higher dose rates over shorter  
8 periods of time that NUREG-1530 explicitly addresses  
9 that factor of one-and-a-half?

10 So why do you use the long-term averaged  
11 conversion factor for those immediate doses to  
12 onsite workers after an accident?

13 MR. SCHOFER: Fred Schofer. You are  
14 correct. If it turns out that the dose received is  
15 above 20 rem or a high dose rate field we would use  
16 the higher conversion factor, yes.

17 MEMBER STETKAR: There is no guidance in  
18 this report. If I was going to use this report  
19 there is nothing in this report that tells me to do  
20 that.

21 MR. GOMEZ: You're saying it's not clear  
22 and we shouldn't use it and we should --

23 MEMBER STETKAR: There is simple  
24 equations that says for immediate doses Z-I-O equals  
25 R-Y-I-O, and for long-term doses Z-L-T-O equals R-Y-

**NEAL R. GROSS**

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

1 L-T-O and dollar R is the same dollar per person rem  
2 conversion factor.

3 There is nothing in the guidance that  
4 says for those people I would expect to get much  
5 higher doses, use a different R value.

6 MR. SCHOFER: Yes, and more likely that  
7 equation was a carryover from the past.

8 MEMBER STETKAR: Okay.

9 MR. SCHOFER: Likewise, we didn't have  
10 the DDREF that we are talking about in the revision  
11 to 1530 in the past so we probably need to  
12 reevaluate that equation.

13 MEMBER STETKAR: Thank you. Sorry, that  
14 was the only place I could find that one in.

15 MR. GOMEZ: No, that's fine, that's  
16 fine. All right, let's move on to economic  
17 consequences, offsite property.

18 This attribute measures the expected  
19 total monetary effects on offsite property resulting  
20 from the proposed action. Changes to economic  
21 consequences can take various forms, that is both  
22 direct, for example, land, food, and water, and  
23 indirect, tourism.

24 This attribute is typically the product  
25 of a change in accident frequency and of property

**NEAL R. GROSS**

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

1 consequences resulting in the occurrence of an  
2 accident, for example, cost of interdiction measures  
3 such as decontamination, cleanup, and evacuation.

4 Moving to offsite property, this  
5 attribute measures all consequences of an accident  
6 that arise when a facility's boundaries an area  
7 controlled by the licensee.

8 The expected monetary effects of offsite  
9 property include replacement power for power  
10 reactors, decontamination, and refurbishment costs.  
11 This attribute is typically the product of the  
12 change in accident frequency and the onsite property  
13 consequences in the event of an accident.

14 For industry implementation, this  
15 impacts the accounts project net economic benefit on  
16 the effected licensees to install or replace  
17 mandated changes.

18 Costs will include procedural and  
19 administration activities, equipment, labor,  
20 materials, and shutdown costs, including the cost of  
21 replacement power in the case of power reactors.

22 For industry operation this attribute  
23 measures the projected net economic effect due to  
24 routine and recurring activities required of the  
25 proposed action on all affected licensees, if

**NEAL R. GROSS**

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



1 applicable, replacement power costs for the power  
2 reactors only, directly attributable to the proposed  
3 action will be included.

4 Now we're moving for the NRC. For NRC  
5 implementation this attribute measures the projected  
6 net economic benefit on the NRC to place a proposed  
7 action into operation.

8 I would like to state that costs already  
9 incurred, including all pre-decisional activities  
10 performed by the NRC are viewed as sunk costs and  
11 are not to be included, because you don't include  
12 sunk costs.

13 The NRC may seek compensation from  
14 affected licensees to provide needed services. Any  
15 fees provided by licensees are viewed as transfer  
16 payments.

17 For NRC operation this attribute  
18 measures the projected net economic effect on the  
19 NRC after proposed action is implemented.  
20 Additional inspection, evaluation, or enforcement  
21 activities would be examples of these costs.

22 Note that, as I have stated before, we  
23 are evaluating incremental costs for an RA. Okay,  
24 when we perform an RA we are comparing the as-is  
25 status quo condition to the alternatives.

**NEAL R. GROSS**

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

1 Incremental costs are the difference in the cost  
2 between the status quo and the alternatives.

3 Let's move on to the next slide,  
4 Estimation of Costs and Benefits. Costs and  
5 benefits are estimated in relation to the baseline  
6 case, which I have also said it's the no action or  
7 status quo alternative.

8 When establishing the regulatory  
9 baseline an assumption is made about existing NRC  
10 and agreement state requirements and other written  
11 license commitments are already being implemented  
12 and that the cost plus benefits associated with  
13 these requirements are not part of the enumerated  
14 estimates prepared for the RA.

15 These are some examples of the costs and  
16 benefits that are shown on this slide. Go on to the  
17 next slide, Safety Goals Screening Criteria. The  
18 safety goal evaluation is intended to determine  
19 whether the residual risk is already acceptably low  
20 that a regulatory requirement should not be imposed  
21 generically on nuclear power plants.

22 The intent is to eliminate some proposed  
23 requirements and for the consideration independently  
24 of whether they should be justified on RA on their  
25 net value basis.

**NEAL R. GROSS**

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

1           The evaluation of the core damage  
2 frequency, CDF reduction, provides a calibration on  
3 the significance of proposed regulatory action. If  
4 the initiative results in a small change in the CDF,  
5 that it's less than 1 times 10 to the minus 5 per  
6 reactor here the RA should more than likely proceed  
7 only of alternative justification for the proposed  
8 requirement can be formulated.

9           The NRC's philosophy for safety goal  
10 evaluations involve a concept of defense-in-depth  
11 and a balance between prevention and mitigation.  
12 The safety goal evaluation focuses on accident  
13 prevention, that is on issues intended to reduce  
14 core damage frequency.

15           However, to achieve a measure of balance  
16 between prevention and mitigation the safety goal  
17 screening criteria established for these evaluations  
18 include a mechanism to use when relatively poor  
19 containment performance results in the need for  
20 greater consideration of issues and associated  
21 accident sequences.

22           MEMBER STETKAR: Antonio, let me stop  
23 you there because I have several questions here.

24           MR. GOMEZ: Yes.

25           MEMBER STETKAR: In the interest of time

**NEAL R. GROSS**

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

1 I'll just try to hit a few highlights. First of all  
2 the implications are that we will never be able to  
3 justify any regulatory actions for new reactors  
4 because all of them publish total core damage  
5 frequencies and large early release frequency --  
6 total core damage frequencies well below 10 to the  
7 minus 5 per year so the increase will never meet  
8 these criteria and large early release frequencies  
9 that are well below 10 to the minus 6 or 7 or  
10 whatever.

11 MR. GOMEZ: That's correct.

12 MEMBER STETKAR: So we'll never be able  
13 to justify anything according to these very  
14 narrowly-defined criteria that are based on our  
15 evaluation of plants that were operating in the  
16 1980s as they were configured in the 1980s.

17 So it's always been curious to me why we  
18 institutionalize these precise numbers forever.  
19 That's a philosophical issue. A practical concern  
20 that I have is that the NUREG contains a few tables  
21 that have numbers in them, in particular Table 2-1,  
22 Table 5-1, and Table 5-2.

23 2-1 is snapshots of internal event at  
24 full power, core damage frequencies derived from  
25 PRAs that were submitted over a range of times.

**NEAL R. GROSS**

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

1 Tables 5-1 and 5-2, 5-1 is release frequencies from  
2 the five plants that were evaluated in NUREG-1150  
3 and then 5-2 is some sort of frequency-weighted, an  
4 amalgamation of those release frequencies, and I  
5 don't know why, why do we have those tables of  
6 numbers in this NUREG, because they scream for  
7 misuse.

8 I think that there should be guidance,  
9 this is my opinion. There should certainly be  
10 guidance for someone who is going to do an analysis,  
11 and, in fact, subcommittees of the ACRS and the full  
12 committee have seen analyses that have been done  
13 that are quite well thought out in terms of looking  
14 at a particular class of reactors, what their  
15 internal event core damage frequency might be using  
16 the best available current information.

17 Scaling or additions for internal fires,  
18 internal floods, which are not included in those  
19 tabulations, external events, seismic events,  
20 external flooding and so forth, there certainly  
21 should be guidance for places for people to look for  
22 in how to do those analyses, but tabulating those  
23 numbers just begs somebody to say I picked this  
24 number from this table and that's what I am going to  
25 use.

**NEAL R. GROSS**

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

1           And certainly the large early release  
2           frequencies and the frequency-weighted stuff in  
3           Table 5-2 are totally unjustified, so why do we need  
4           to carry that stuff forward rather than having  
5           guidance?

6           You have now appendices, why don't we  
7           have an appendix that says those of you who are  
8           going to do accident analyses here are some sources  
9           of information that you can go look for, not tables  
10          of numbers, but go look at these things, and here is  
11          kind of how to do that.

12          MR. SCHOFER: Yes, thank you for that  
13          question. And in actuality, Appendix H I believe it  
14          is --

15          MEMBER STETKAR: Yes.

16          MR. SCHOFER: -- severe accidents, the  
17          whole purpose is to do just that. However --

18          MEMBER STETKAR: That's good because I  
19          read the whole appendix and it was pretty short  
20          right now.

21          (Laughter.)

22          MR. SCHOFER: Kind of. I mean because  
23          it's all new and it's doing an update of all the  
24          analyses that we have done, you know.

25          MEMBER STETKAR: But, again, until we --

**NEAL R. GROSS**

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

1 You know, until that appendix gets generated my  
2 recommendation is be cautious about just tabulating  
3 numbers, that somebody can read row and column and I  
4 pick this number and therefore it applies to all  
5 BWRs with Mark-1 containments regardless of what the  
6 issue is.

7 And if you are going to do that why have  
8 these tables in the main body of the NUREG which  
9 will essentially be more difficult for people to  
10 miss, to use.

11 CHAIRMAN RAY: Let me be a contrarian  
12 here and say that I think we should spend enough  
13 time that everybody is satisfied with John's comment  
14 because we need to come to some conclusion about  
15 this.

16 Tony has been doing a terrific job of  
17 catching up but I think this is an area that I want  
18 to make sure all the members are satisfied they  
19 understand what John is pursuing and the response of  
20 the staff.

21 So if anybody has any, wants to follow-  
22 up go ahead.

23 MEMBER STETKAR: There were a couple of  
24 issues. One is the philosophical issue about this  
25 particular chart. The other one is regardless of

**NEAL R. GROSS**

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

1 this chart why are we putting tables of numbers in  
2 the body of the NUREG if in fact an appendix is  
3 going to provide practical guidance for someone  
4 doing an analysis or how to think about accidents,  
5 whether it's core damage frequency or release  
6 frequency or contributors.

7 CHAIRMAN RAY: Tina is at the  
8 microphone.

9 MS. GHOSH: Yes, this is Tina Ghosh  
10 again from NRC's Office of Research. Just so you  
11 know we already put quite a bit of thought into how  
12 to update those tables.

13 We recognize that they are terribly out  
14 of date and we struggled on the working group with a  
15 variety of questions to the point where we ran out  
16 of time and we couldn't get the updates in in this  
17 version because there are deep questions that we are  
18 struggling with, you know, with regard to what  
19 sources of information can we use to update those  
20 tables, you know, where is it appropriate.

21 So at a minimum I can tell you that  
22 right now in the planned Appendix H we plan to have  
23 a discussion of if you were to do what is called a  
24 standard analysis where as a first cut you would  
25 take some screening values for our inputs, we're

**NEAL R. GROSS**

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



1 going to have that updated and we are trying to  
2 develop that updated information and approach to  
3 include in Appendix H.

4 For now in the body of NUREG-0058 we  
5 kept those tables but we are still struggling with  
6 the questions of what exactly should be the context  
7 of those tables, because we recognize that  
8 especially with 5-1 and 5-2 those numbers are  
9 terribly outdated at this point but we ran out of  
10 time, so we didn't have a replacement.

11 MEMBER STETKAR: Okay, Tina, but, again,  
12 listen to what I am saying.

13 MS. GHOSH: Okay.

14 MEMBER STETKAR: I am saying take out  
15 tables and numbers, do not publish tables and  
16 numbers, provide guidance and source references so  
17 if I am going to do an analysis and it says here are  
18 some references, contemporary references, that might  
19 be updated as life progresses.

20 If I wanted, for example, to look at  
21 estimates of internal event core damage frequencies  
22 for a class of pressurized water reactors, here is a  
23 set of references to go look for.

24 If I wanted to look at people doing fire  
25 analyses, it may not make any difference whether

**NEAL R. GROSS**

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

1 it's a boiler or pressurized water reactor, it might  
2 make a difference, here are some references to look  
3 for there, and so forth, flooding analyses, seismic  
4 analyses, and so forth.

5 But don't put tables of numbers in there  
6 that you'll run into the problem of how do I update  
7 that number and what is the most contemporary number  
8 and how do I change that table and provide more  
9 guidance about look for this, look for that, here  
10 are places you can go look, and make sure you cover  
11 things like contributions from seismic, which might  
12 have conditional containment failure probabilities  
13 of like one, and things like that so that when you  
14 do the analysis the analyst will have a library of  
15 reference material rather than just kind of looking  
16 at a table, reading a row and a column and picking a  
17 number and say, well, I didn't have to think because  
18 they told me what number to use.

19 MR. SCHOFER: And that is our planned  
20 end state.

21 MEMBER STETKAR: Okay.

22 MR. SCHOFER: The reason that that table  
23 is still in there is to get to that end state I  
24 wanted some data available that one might be able to  
25 do a calculation to kind of figure out what the

**NEAL R. GROSS**

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

1 significance is before you start getting into a full  
2 analysis, so fundamentally it's intended for that  
3 purpose.

4 MEMBER STETKAR: My approach to life  
5 would be is if Appendix H is blank I would have  
6 taken the tables out of there and said go look at  
7 Appendix H.

8 MR. SCHOFER: I thought about that, yes.

9 MEMBER STETKAR: Appendix H contains the  
10 guidance for how you do this kind of thing.

11 MR. SCHULTZ: And that would be a good  
12 place to put this information and perhaps just  
13 summarize it rather than plant-by-plant name and  
14 information.

15 MEMBER STETKAR: Yes.

16 MR. SCHULTZ: It's just if you want to  
17 have a separate discussion in the appendix  
18 associated with values that can be used to get  
19 started in a sense, or to be used in a first cut  
20 analysis then that would be an appropriate -- It's  
21 still appropriate to put it in the appendix.

22 MR. SCHOFER: Yes.

23 MEMBER STETKAR: It's also consistent  
24 with the philosophy that you heard earlier that it  
25 is easier to update appendices than necessarily to

**NEAL R. GROSS**

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

1 reissue the entire NUREG itself as more information,  
2 people do more fire analyses, people do more seismic  
3 and flooding analyses, outside of Fukushima they  
4 will become sources of reference information that  
5 people can use.

6 CHAIRMAN RAY: Dennis, do you want to  
7 comment?

8 MEMBER BLEY: I did. This is a  
9 Subcommittee meeting. You are not getting advice  
10 from the committee and as much as I agree with what  
11 I have heard here you get rid of all that stuff and  
12 the next time you come in somebody will say, hey,  
13 you need some examples in here so we can figure out  
14 what to do with this stuff.

15 So however you put it together, I kind  
16 of agree, avoiding things that people can  
17 specifically snatch and think they are doing the  
18 right thing when they are doing the wrong thing, be  
19 a little careful of that.

20 CHAIRMAN RAY: Well as it stands now,  
21 and I don't know if we have covered this before you  
22 came Dennis, this is intended to be on the March,  
23 not the one before, but this one, the March Full  
24 Committee.

25 MEMBER BLEY: Right.

**NEAL R. GROSS**

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

1 CHAIRMAN RAY: We will have PNP later  
2 this week to talk about what the scope exactly will  
3 be of what's done at the Full Committee and then  
4 whatever happens after that is yet to be determined.

5 But this isn't the only input on 58 and  
6 maybe not on 1530, that's yet to be discussed. So  
7 please proceed.

8 MR. GOMEZ: Okay. All right, let's go  
9 ahead and move on to the next slide, Backfitting and  
10 Issue Finality. I'll be very brief on this one.

11 10 CFR 50.109 is what requires us to do  
12 backfits. We apply the same cost estimating  
13 techniques to backfits that we apply to RAs and  
14 NEPA. The message here is that if you have a  
15 backfitting issue or imposing generic requirements  
16 you have to have an RA.

17 Okay, let's move on to the next slide,  
18 NEPA. For NEPA, as I have said before, we will use  
19 the same cost benefit approach as regulatory  
20 analysis for backfits, and the reason you might be  
21 asking is why.

22 The reason is because the NRC uses only  
23 one document, and it's this one, NUREG/BR-0058.  
24 Note that NEPA is a procedural statute which  
25 requires a federal agency to consider the

**NEAL R. GROSS**

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

1 environmental consequences of a proposed action  
2 prior to making the decision to approve or  
3 disapprove the action.

4 NEPA requires federal agencies to take a  
5 hard look at environmental impacts of the proposed  
6 action as well as the impacts from any reasonable  
7 alternatives to that proposed action, but also  
8 recall that this hard look is tempered by the rule  
9 of reason.

10 NEPA requires agencies to address only  
11 impacts that are reasonably foreseeable, not those  
12 that are remote and speculative. As a procedural  
13 statute NEPA does not mandate any particular result  
14 nor can it be the basis for the NRC to require any  
15 of its licensees to take any measures that may avoid  
16 or mitigate radiological damage to offsite property.

17 While the NRC does have this authority  
18 it derives it from the Atomic Energy Act, not NEPA.  
19 For the second bullet, Environmental Justice, note  
20 that there are no environmental justice regulations.

21 What that is is it's an Executive Order,  
22 and that's EO-12898, issued in 1994 and supported by  
23 Commission policy, that's 69-FR-52040, which was  
24 published in 2004, and it's also backed up by office  
25 guidance in NRR and NMSS.

**NEAL R. GROSS**

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

1           For design certification under 51.55(a)  
2       it states "the environmental report plus the risk of  
3       costs and benefits of severe accident mitigation  
4       design alternatives and the basis for not  
5       incorporating severe accident mitigation design  
6       alternatives to be certified."     Are there any  
7       questions?

8           (No audible response.)

9           MR. GOMEZ:     Good.     I will now de-  
10       accelerate from Warp 9.   I will turn it over now to  
11       Aaron.

12           MR. SANDERS:   Hello, my name is Aaron  
13       Sanders.   I'm also a cross analyst here at the NRC  
14       in the rulemaking branch of NRR.   And I'll be  
15       discussing the slides which represent the five  
16       drafted appendices, not the outlined ones but the  
17       drafted ones A through E for this update.

18           So the first appendix I'm going to  
19       discuss is cost estimation is the topic of the first  
20       appendix.   And updating and revising our cost  
21       estimating procedures at the NRC, we incorporated  
22       best practices in large part from GAO, OIG, and NEI.

23           OIG and NEI's recommendations were  
24       discussed earlier by Pam.   I would go a little  
25       further into the four sub-bullets here from GAO that

**NEAL R. GROSS**

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

1 are shown on the slide.

2 Credible means essentially that we take  
3 into account limitations of the analysis due to  
4 uncertainty or biases around data and assumptions.  
5 Further, it means we need to determine the  
6 sensitivities of the outcomes to the input  
7 parameters. And finally, it recommends an  
8 independent cost estimate to see if other methods  
9 yield different results.

10 Well documented means that data are  
11 tracked back to the source documentation. There's a  
12 technical baseline description. All steps in  
13 developing the estimate are documented so a  
14 different cost analyst can recreate it with the same  
15 result, and the analysis also documents how the data  
16 was normalized and describes in full the methodology  
17 used for each work break-down structure element.

18 Accurate means that estimates are not  
19 overly conservative or optimistic, adjusted for  
20 inflation, and contain few mistakes, if any, if I  
21 can be so optimistic.

22 Estimates are revised when schedules  
23 change, and clearly to verify the accuracy of a  
24 model, it must be thoroughly understood by the  
25 reviewer which again highlights the importance of it

**NEAL R. GROSS**

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



1 being well documented.

2 And finally, cost estimates need to be  
3 comprehensive. Analysts must insure all costs are  
4 taken into account, all elements included and not  
5 double counted. All cost influencing ground rules  
6 and assumptions must be detailed, and the work  
7 breakdown structure must be fully defined and  
8 described.

9 And that's this slide. In order to  
10 improve our cost estimating, we've revised and  
11 expanded the items, this new reg we're currently  
12 discussing, to incorporate these best practices.

13 In this cost estimating appendix,  
14 several methods and procedures are described such as  
15 engineering buildup which is a type of activity base  
16 costing commonly understood and frequently used.

17 Activities are separated into detail  
18 tasks with labor hours, material costs, equipment  
19 costs, and subcontract costs. Analysts are also  
20 instructed to use parametric estimating techniques  
21 where you develop a statistical relationship between  
22 historical costs and program physical and  
23 performance characteristics.

24 This method is sometimes called a top-  
25 down approach. Types of physical characteristics

**NEAL R. GROSS**

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

1 used in parametric estimating are weight, power,  
2 lines of code, that sort of variable.

3 Other program and performance  
4 characteristics may include site deployment plans  
5 for IT installations, maintenance plans, test and  
6 evaluation schedules, technical performance measures  
7 and crew size.

8 It requires access to historical data  
9 which could be difficult to obtain. So you have to,  
10 for each factor in your cost estimating you need to  
11 determine what the best technique is.

12 If the data are available, they can be  
13 used to determine the cost drivers and to provide  
14 statistical results and can be adjusted to meet the  
15 requirements of the new program.

16 In addition, analysts can also use  
17 analogies to produce cost elements if one element is  
18 like another known element or a scale estimate for  
19 similar elements that are of different sizes.

20 Unlike parametric estimating, an analogy  
21 relies on data from perhaps a single program and  
22 covers a narrow range. And also in this appendix  
23 are practices for estimating life cycle costs, in  
24 other words, cost elements that have a cost over  
25 time in addition to potentially an initial

**NEAL R. GROSS**

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

1 investment.

2 Net present value calculations are  
3 described in this appendix along with discount rates  
4 for the analysts to use such as three percent which  
5 covers inflation and typical economic growth, and  
6 seven percent which also includes typical capital  
7 investment gains for businesses.

8 Along with these principles, the  
9 selection of the proper time horizon is discussed  
10 based on the expected duration of the activities and  
11 the work breakdown structure. For example, the ASME  
12 code cases have three year lifetimes.

13 We typically extent each one for one  
14 extension, so a total of six years would be a  
15 lifetime for that. Other regulations might use the  
16 average expected remaining reactor life, or each  
17 reactor on an individual basis depending on what  
18 factor you're assessing.

19 Understanding all these aspects of life  
20 cycle costs is critical to accurate cost estimating.  
21 The next slide?

22 And the appendix goes into the  
23 development process for cost estimate. These are  
24 relatively self-explanatory, so I'll try to go  
25 quickly. Planning is essentially when an estimate's

**NEAL R. GROSS**

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

1 needed, who's going to prepare it, what input  
2 sources you'll use, how you're going to determine  
3 the scope, and what estimating techniques you think  
4 you'll use.

5 And then you determine your inputs like  
6 the sources of cost estimate data and the  
7 development considerations. And you're ready to  
8 prepare the cost estimate starting with development  
9 of your work breakdown structure, collecting,  
10 validating and adjusting data, selecting methods and  
11 models for estimating, and estimating the actual  
12 cost, doing the actual work, and conducting  
13 uncertainty analyses and presenting the results.

14 When the cost estimate is prepared, we  
15 have an established review and concurrence process  
16 at the NRC. May personnel will be looking at your  
17 estimate, so it's typically an iterative process  
18 towards estimate, reconciliation.

19 During the process of review and  
20 reconciliation, an independent cost estimate may be  
21 performed. This is a good time for that to be  
22 conducted. You'll make conforming changes as a  
23 result of the feedback you receive, and all your  
24 assumptions need to continually be analyzed as you  
25 make changes to make sure you're still working in

**NEAL R. GROSS**

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

1 the right direction and you haven't become  
2 sidelined.

3 And finally, it's time to document the  
4 cost estimate package. This is essentially here at  
5 the NRC placing it into an RA, a regulatory  
6 analysis. Usually they're developed in parallel, but  
7 this is the time when I'll describe it.

8 It should be detailed enough to provide  
9 an accurate assessment of the quality, it should  
10 identify your data sources, justify all assumptions,  
11 and describe the methods for the work breakdown  
12 structure cost elements.

13 Milestones and deliverables need to be  
14 consistent and traceable, and estimating methods  
15 should be thoroughly documented for replication,  
16 verification, and updating.

17 So that's the process appendix.

18 MEMBER KIRCHNER: I have a question.

19 MR. SANDERS: Yes?

20 MEMBER KIRCHNER: When would you do an  
21 independent cost estimate? Is it based on  
22 complexity or total cost estimate from the first  
23 steps? Or is it just management judgement?

24 MR. SANDERS: That's a good question.

25 MEMBER KIRCHNER: Which is a good

**NEAL R. GROSS**

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

1 answer.

2 MR. SCHOFFER: It is management  
3 judgement. It is an identified good practice that's  
4 provide the GAO and their guidance. But in  
5 practice, we tend to have a lot of moving parts,  
6 especially when you're looking at new regulations.

7 There's, you know, quite a bit of  
8 changes that go all the way through in terms of,  
9 let's say proposed rule, or even in the rule basis  
10 stage. So to do independent cost estimates, you  
11 know, contracted out, are difficult because of that  
12 change.

13 However, as part of the review process,  
14 one might do an order of magnitude estimate to check  
15 the validity of the estimate that they're reviewing,  
16 and that also would fulfill that function. But a  
17 traditional independent cost estimate is done by a  
18 group that is separate from the estimating group.  
19 And right now we have all those resources in one  
20 spot.

21 MEMBER MARCH-LEUBA: So there is no  
22 input of review by industry?

23 MR. SCHOFFER: There is. In fact, when  
24 we talk about human effects of regulation earlier,  
25 part of the changes or recommendations that were

**NEAL R. GROSS**

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

1 made was to do cost estimating earlier in the  
2 process.

3 And so even before we get to a decision  
4 on rulemaking, we are doing formal regulatory  
5 analyses and providing that to for public comment.  
6 So at the regulatory bases stage, we put out that  
7 regulatory bases which is looking at the technical  
8 and legal aspects of the rule, of a potential change  
9 with a cost estimate in terms of what we foresee the  
10 cost benefits of that change might be.

11 We put that out for public comment  
12 before we finalize the reg bases which is when we  
13 make a determination as to whether rulemaking might  
14 be the appropriate solution.

15 MEMBER MARCH-LEUBA: So the industry or  
16 licensee becomes of part of the public comments?

17 MR. SCHOFER: Exactly.

18 MEMBER MARCH-LEUBA: You don't request  
19 it. You just say, I mean, I want to change the  
20 windows in my house and I go to Home Depot and  
21 they're \$2,000. The US it could cost \$20,000. You  
22 know, I mean, it's --

23 MR. SCHOFER: It includes the public,  
24 includes industry groups, industry as well as non-  
25 government organization.

**NEAL R. GROSS**

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

1                   MR. SCHULTZ:     Is that part of the  
2 process while documented in the description, in the  
3 appendices description? I didn't get that. What I  
4 got from it is that we're trying to describe best  
5 practices. And that's very well done, but how that  
6 gets implemented the way you've described it.

7                   MR. SCHOFER:     That's actually in a  
8 separate document.

9                   MR. SCHULTZ:     Okay.

10                  MR. SCHOFER:     That's in our office  
11 instructions for rulemaking. And that's where it  
12 establishes, you know, the steps that one would go  
13 through for a change in regulations. So part of  
14 that is describing the development of a rulemaking  
15 plan, a regulatory bases, proposed rule, final rule,  
16 et cetera.

17                  And an RA, or regulatory analysis,  
18 supports all those steps. So we use our guidance to  
19 develop those analyses supporting that rulemaking  
20 process.

21                  MR. SCHULTZ:     It seems it would be good  
22 to capture at least a summary of that in the  
23 document here because what this seems to be  
24 documenting is something I think that's different.  
25 It seems to suggest that in performing a cost

**NEAL R. GROSS**

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



1 benefit analysis, it's up to the agency to do a cost  
2 benefit, a cost evaluation of what is to be done.

3 And what you've described, having  
4 industry involved in the appropriate way, was missed  
5 in at least my reading of the document.

6 MR. SCHOFER: Yes, it's not in the  
7 document.

8 MR. SCHULTZ: Then I didn't miss it.

9 MEMBER CHU: Quick question.

10 MEMBER STETKAR: It's in Appendix M.

11 MEMBER CHU: Just curious. You know,  
12 your regulatory analysis on one branch after all  
13 these analyses you may say no action. Okay. Just  
14 out of curiosity, how often that happens, ten  
15 percent, five percent, twenty percent? Fifty  
16 percent?

17 MR. SCHOFER: That's a good question. I  
18 don't know if I have percentages on that. However,  
19 we do, you know, analyses and turn things off.

20 MEMBER CHU: So it does happen?

21 MR. SCHOFER: It does happen. I mean, I  
22 wouldn't say it happens 50 percent of the time  
23 because typically you wouldn't have that kind of, I  
24 mean, people within the agency are aware of, you  
25 know, regulatory analysis. It has to be cost

**NEAL R. GROSS**

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

1       beneficial, and they recognize the backfitting  
2       principle as well.

3               And so you know, the initial screen is  
4       can it be backfilled? I mean, can you justify that  
5       there is a substantial safety enhancement first.  
6       And if you can't justify that --

7               MEMBER CHU: Then it's gone, yes.

8               MR. SCHOFER: Yes, you're cut off. And  
9       then if you can justify that, then is that, can you  
10      achieve that level of safety improvement at an  
11      acceptable cost? And then it may, you know, stop at  
12      that point.

13              But in some cases it goes further. And  
14      we've had some examples where, you know, we've done  
15      full analyses and then not implemented a regulatory  
16      change. I mean, containment vents is a key example.  
17      Another one is expedited spent fuel, you know, is  
18      another one where some cases you want to do a fuller  
19      analysis so that it's documented for the future.

20              MR. SANDERS: I would add to that  
21      something I'll discuss on a later slide. Individual  
22      requirements is another case where a regulatory  
23      analysis may say all right, we'll look at these few  
24      individual requirements of this larger initiative  
25      are not going to be pursued. But yet these others

**NEAL R. GROSS**

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

1 will remain. So that's also a function that RA  
2 might find itself performing. But it's common if  
3 not more than --

4 (Simultaneous speaking.)

5 MR. SCHOFER: That's much more common  
6 where there may be items that, you know, staff  
7 recommends. And then when you evaluate them  
8 individually, they don't meet the requirements for  
9 substantial safety enhancement or cost beneficial.  
10 And therefore, those requirements go away even  
11 though that regulatory action may continue to go  
12 forward.

13 MR. SANDERS: All right, I'm done with  
14 this slide. So in the past, oh the next appendix  
15 that we'll discuss concerns uncertainty and  
16 sensitivity analyses. In the past, regulatory  
17 analyses at the NRC used point estimates and  
18 sensitivity analysis on a case by case basis.

19 There was infrequent use of uncertainty  
20 analysis, typically only when the actions were  
21 expected to have a significant economic impact, in  
22 other words over \$100 million per year in cost.

23 In the revised guidance, analysts are  
24 instructed to perform uncertainty and sensitivity  
25 analyses for each cost estimate as additional

**NEAL R. GROSS**

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

1 analysis tools for decision makers. And I will go  
2 into the specifics on the next --

3 CHAIRMAN RAY: You used the word current  
4 there on the slide but you said the word revised.

5 MR. SANDERS: We've been acting in  
6 accordance with the planned guidance for several  
7 years now in our regulatory analyses. And I'm happy  
8 to go into more detail as to I'm going to describe  
9 what is meant by sensitivity uncertainty in this.  
10 But also I'm happy to go into how we employ that in  
11 regulatory analysis. I was planning on doing that  
12 next.

13 MEMBER STETKAR: Where in your slides  
14 are you going to explain what you mean by  
15 sensitivity analyses?

16 MR. SANDERS: I am --

17 MEMBER STETKAR: I guess I missed that.

18 MR. SANDERS: Well, the next slide gives  
19 examples of --

20 MEMBER STETKAR: Qualitative.

21 MR. SANDERS: I'm sorry. We're on the,  
22 we skipped to, don't skip to -- actually, I'm just  
23 going to do it all here.

24 MEMBER STETKAR: Oh, okay.

25 (Simultaneous speaking.)

**NEAL R. GROSS**

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

1                   MEMBER STETKAR:   Because if there were  
2                   other slides, I was going to ask about them.   But  
3                   all --

4                   MR. SANDERS:    This will be the slide.  
5                   Do you want me to go first or you go first?

6                   (Off the record comments.)

7                   MR. SANDERS:   All right.   So sensitivity  
8                   analysis addresses how sensitive outcomes are to  
9                   variations and input.   Typically, they characterize  
10                  one input at a time, but multiple inputs can also be  
11                  assessed at the same time.

12                  And    through    sensitivity    analyses,  
13                  decision makers can understand which elements of the  
14                  proposed action have the most impact on the final  
15                  outcome and may alter their action accordingly to  
16                  increase benefits or lower costs.

17                  Uncertainty analysis such as the range  
18                  of outcomes and the relative probabilities of  
19                  different outcomes from many trial runs of different  
20                  model inputs.   They consider all activities and  
21                  their associated risks and would therefore be  
22                  considered part of a risk analysis or assessment.

23                  Monte Carlo analysis is a method that  
24                  we're using here at the NRC for both uncertainty and  
25                  sensitivity analyses.   What it does is it uses trial

**NEAL R. GROSS**

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

1 values from random sampling technique from model  
2 input variables where the values are uncertain.

3 After many trials, the frequency  
4 distribution is generated for the inputs and outputs  
5 which approximates the true probability of the  
6 system. Often when graphed, the X axis of the  
7 analysis will represent the range of cost estimate  
8 values and the Y axis represents the probability  
9 that the project will have costs less than or equal  
10 to that value on the Y axis.

11 In general, the detail -- the value on  
12 the X axis, sorry. In general, the detail and  
13 breadth of the uncertainty analysis should be  
14 commensurate with the overall policy significance  
15 complexity and level of controversy as well as the  
16 perceived importance of the uncertainties to the  
17 bottom line conclusion.

18 Sources of magnitudes of uncertainty and  
19 the quantification methods used should be discussed  
20 in all regulatory analyses. And I can go into  
21 detail about that. It's consistent with GAO cost  
22 guide and GAO recommendations mentioned before.

23 MEMBER KIRCHNER: I would like to ask a  
24 question now, put you on the spot.

25 MR. SANDERS: Yes.

**NEAL R. GROSS**

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

1                   MEMBER KIRCHNER:   How often after you  
2                   implement a regulatory action do you go back and  
3                   check the actual costs incurred versus what you  
4                   estimated going in?  Now it's easier to do when you  
5                   when you have a bricks and mortar project,  
6                   obviously.

7                   And the experience in industry, despite  
8                   all these nice techniques, is often surprising.  
9                   Anywhere from 1.2 to 1.5, best practice, good  
10                  estimate of the cost.  So do you ever go back and  
11                  look at your work and see how you came out versus  
12                  what you predicted?

13                  MR. SANDERS:   Well, if we try to do  
14                  that, and actually NEI has provided us with some  
15                  information in case studies to demonstrate that.  
16                  There are a couple of considerations that should be  
17                  taken into account when looking at those sorts of  
18                  results.

19                  First is that we're not able to assume  
20                  or estimate what the profit margin might be.  For  
21                  example, if we're dealing with vendor actions and  
22                  then they're going to place the cost upon the  
23                  licensee.

24                  And then in the other case, if you're  
25                  reporting back, you know, this is how much the

**NEAL R. GROSS**

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

1 project costs, we tracked the whole project on this  
2 code so we know this is how much your action  
3 affected us from the industry.

4 The important thing to note is that our  
5 regulatory analyses, our cost estimates are for the  
6 delta in costs, from the current regulatory  
7 environment to a change. So that project may  
8 already have actions that are already forced upon  
9 it, in essence sub-costs if you want to think about  
10 it in that term.

11 And then the additional costs would be  
12 the ones we would want to compare to the regulatory  
13 action which is a bit trickier to do. But Fred, I  
14 don't know if you want --

15 MR. SCHOFER: Fred Schofer. I'll just  
16 add to Aaron's points. One thing to keep in mind is  
17 that we're doing forecasts. I mean, we are very  
18 early in the cycle with regard to developing these  
19 estimates.

20 You know, in your case where you're  
21 talking about 1.2 to 1.5, typically the engineering  
22 has already been conceptualized as well as you then  
23 go into detailed engineering and then procurement  
24 and then so forth and so on. And then you're  
25 looking at the cost growth as a result of that

**NEAL R. GROSS**

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



1 initial project budget. We're more at the  
2 conceptual phase which is --

3 CHAIRMAN RAY: Okay, but you could put  
4 an allowance in there which is what the best  
5 practice should be to account for those  
6 uncertainties. I think this is probably not the  
7 best use of our time, so let's move on.

8 MEMBER STETKAR: Let's not move on.

9 CHAIRMAN RAY: Well, move on from that  
10 discussion.

11 MEMBER CORRADINI: I know John's got a  
12 detailed question. Can I ask a short question, if  
13 you allow me? So let's take a specific example,  
14 let's take spent fuel level indication, and what you  
15 estimated the cost to be versus what it turned out  
16 to be. Do you ever do a post mortem and see how far  
17 off you were?

18 MR. SCHOFFER: That's not a good example  
19 because we did not do a cost estimate on that. That  
20 was --

21 MEMBER CORRADINI: Because that was --  
22 okay, excuse me. I guess it was in the wrong pile.  
23 Okay, fine.

24 CHAIRMAN RAY: Look, debating cross,  
25 actual, and projected, I don't want to go there.

**NEAL R. GROSS**

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

1 MEMBER CORRADINI: But I just want --

2 CHAIRMAN RAY: We could spend the rest  
3 of the morning on it.

4 MEMBER CORRADINI: I understand. But I  
5 just want to make sure, it was on the column of  
6 regulatory analysis or perform for, and it was  
7 orders.

8 MR. SCHOFER: Yes.

9 MEMBER CORRADINI: But you didn't do  
10 one?

11 MR. SCHOFER: There was not one done for  
12 that.

13 MEMBER CORRADINI: Thank you.

14 CHAIRMAN RAY: John?

15 MEMBER STETKAR: I read through  
16 appendices B and C, and just again, this is  
17 individual comments. I thought taken as a whole the  
18 discussion of the need to address uncertainties  
19 throughout the document is done pretty well. I  
20 mean, it's emphasized in a few places. So in terms  
21 of drawing attention to that, I was pleasantly  
22 surprised.

23 In appendix B, there's a table B-2  
24 that's basic characteristic of credible cost  
25 estimates. And one step in that table is provision

**NEAL R. GROSS**

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

1 for uncertainties and risk. And again, that's good  
2 because it emphasizes that's an integral part of the  
3 process.

4 In the table it says identify the  
5 confidence level, for example 80 percent appropriate  
6 for the cost estimate. What do you mean by the  
7 confidence interval and why is 80 percent important?

8 When I think of confidence interval, I  
9 think of there's an 80 percent probability that I'm  
10 within that range or a 20 percent probability that  
11 I'm outside of that range. Is that what you mean,  
12 and why do we -- is there an intentional focus on an  
13 80 percent confidence interval rather than  
14 estimating the full range of uncertainty and  
15 displaying it?

16 MR. SANDERS: Well, that's a good point.  
17 Actually, in fact, I commonly have been putting into  
18 my regulatory analyses, and I think our team has  
19 been doing the same 90 percent confidence, 5 and 95.  
20 So perhaps you've caught something that we need to  
21 correct as our example.

22 The other thing is yes, we do consider  
23 the full range of uncertainty, in particular in  
24 these regulatory analyses is the description of the  
25 uncertainty analysis results and inputs, and we'll

**NEAL R. GROSS**

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

1 show common parameters of course like the main, the  
2 5 and 95 percent sometimes standard deviation.

3 But then we discuss, for example if you  
4 had the full range of uncertainty results were  
5 entirely within the benefits section, then that  
6 would be mentioned and pointed out on that graph.

7 Or if it broke across into the cost side  
8 for the output, it would be important to say, and I  
9 have stressed these in my analyses, that the  
10 uncertainty results show that 93 percent chance that  
11 you have a benefit and then a 7 percent chance that  
12 you have a cost, and further descriptions of course,  
13 I'm abbreviating.

14 MEMBER STETKAR: I think, take a look at  
15 that. It's I'm hung up on that and because other  
16 parts of the guidance, the text implies that you  
17 should do a full uncertainty analysis and display  
18 that.

19 Now one thing that I want, and this is  
20 detailed and I have to apologize for it. There's a  
21 figure C-3 in Appendix C. Appendix C is kind of a  
22 reference appendix. It's got good guidance and it's  
23 got different tools that you can use.

24 But C-3 is an example of a cumulative  
25 distribution function. And what bothers me about

**NEAL R. GROSS**

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

1 that example, and it's not explained, is there's a  
2 point on that cumulative function that is labeled  
3 the risk adjusted primary estimate equals 825 or 40  
4 percent probable.

5 Now in the guidance, you often talk  
6 about a point estimate value and the probability  
7 that that point estimate value applies. Most people  
8 think of point estimate values as they ought to be  
9 close, if not equal, to the mean value or the  
10 expected value of the uncertainty distribution.

11 And indeed there's, depending on the  
12 uncertainty distribution, there's some probability  
13 that you'll exceed that and some probability that  
14 you'll be less than that.

15 In my previous example for NUREG 1530,  
16 you notice that my mean value is indeed the mean  
17 value, \$5,200 per person. My uncertainty grounds  
18 were broader than the nominal values that were  
19 listed.

20 The thing that bothers me about this  
21 cumulative is that the risk adjusted primary  
22 estimate equals 825. Is that the point estimate  
23 because if it is, it certainly is not the mean value  
24 of this distribution.

25 MR. SANDERS: Right.

**NEAL R. GROSS**

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

1                   MEMBER STETKAR: It is well, well below  
2                   the mean value of that distribution. So now I'm  
3                   confused about what I'm -- am I supposed to do all  
4                   my calculations with point estimate values and then  
5                   go assess uncertainties as an afterthought and  
6                   develop these distributions because if I'm supposed  
7                   to do that, that's wrong.

8                   MR. SANDERS: Right.

9                   MEMBER STETKAR: If I'm supposed to use  
10                  the mean values from my uncertainty distributions as  
11                  my point estimates, I don't know what this point on  
12                  that curve means. So what is that point on that  
13                  curve?

14                 MR. SANDERS: Well first of all that's,  
15                 and I know the ref you're referring to. I had to  
16                 recreate it from the old guidance. And not to use  
17                 the old guidance had it in it as an excuse, but  
18                 perhaps that graph does need a little more of an  
19                 evaluation on our part because it might be unclear  
20                 as to what is implied. Certainly --

21                 MEMBER STETKAR: The reason I hung up on  
22                 it is that I struggled as a read through the  
23                 guidance about this notion. It mentions point  
24                 estimate and an evaluation of the probability of  
25                 that point estimate, or words to that effect.

**NEAL R. GROSS**

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

1           And okay, I get that in terms of  
2           probability distributions.       But if the point  
3           estimate is intended to be the mean value, that is  
4           indeed the expected value.   And if this graph is  
5           telegraphing the fact that I'm supposed to do a  
6           point estimate, the risk adjusted primary estimate  
7           and then sort of back the uncertainties, that's not  
8           good.

9           And the problem is I've seen a lot of  
10          people do that.   And then they try to justify why  
11          the mean value of the uncertainty analysis is a  
12          factor of four times different from my point  
13          estimate value.

14          MR.   SCHOFER:       Let me add some  
15          clarification to this.   This figure was not in prior  
16          guidance, NRC guidance.   This figure actually came  
17          from GAO and we were trying to, you know, provide  
18          some context to that.

19          But my recollection from how GAO was  
20          using it.   It was not, that is not a point estimate.  
21          I think what they're doing is this is an example of  
22          a project which has a risk register where they're  
23          trying to manage, you know, risks against the  
24          project and that was that point.   But it doesn't  
25          apply here.

**NEAL R. GROSS**

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

1                   MEMBER STETKAR:    Okay.    If you could,  
2                   this is just my individual comment because you do  
3                   provide those tools, you talk about uncertainty  
4                   distributions. If you're going to plot something as  
5                   an example, don't make it more confusing than it  
6                   should be.

7                   If you're going to put a point on there,  
8                   put a point on where the mean value is and call it a  
9                   mean value and not this other, because you've got  
10                  the median value, you've got the 70th percentile.  
11                  You know, you could put the 5th and 95th.

12                  The range of the plot is the 90 percent  
13                  confidence interval. But it's just really confusing  
14                  and people could, if I wanted to misuse it, I could  
15                  misuse it.

16                  MR. SCHOFER:    That's a good point, thank  
17                  you.

18                  MEMBER SKILLMAN:   I would like to ask  
19                  you a question before we time out here.    I'm  
20                  respectful of Chairman Ray's guidance.

21                  CHAIRMAN RAY:    Too late.

22                  (Laughter.)

23                  MEMBER SKILLMAN:   On chapter, on section  
24                  53212, monetary valuation of accident related health  
25                  effects. You identify mortality and morbidity. We

**NEAL R. GROSS**

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



1 cover that with a VSL.

2 That gets tied to the dollar rem  
3 conversion. But there's another one hiding at the  
4 base of that paragraph which is the psycho-social  
5 effects. But you end this whole section with this  
6 one sentence.

7 These impacts, psycho-social, are not  
8 readily monetized but should be considered within  
9 cost benefit analysis with the exception of the NEPA  
10 analysis. And I just raised that as a maybe the 500  
11 pound gorilla in the room.

12 That one is huge. And I just wonder how  
13 that gets contained or how you actually draw a  
14 perimeter around that and communicate. And here's  
15 how we're going to treat that.

16 MR. SCHOFER: Yes. You indicate we do  
17 have it identified as an attribute for  
18 consideration. Historically that has not been  
19 something that has been included in NRC's analyses.  
20 There has been some court, or at least some court  
21 cases on Three Mile Island vintage where, you know,  
22 there were associated with psycho-social effects and  
23 where, you know, and decisions were made where there  
24 was not going to be compensation for that.

25 However, in reviewing the Fukushima

**NEAL R. GROSS**

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

1 event, we do see that that is a major cost factor  
2 from, you know, that accident being a foreign by the  
3 Japanese. So we're including it in our guidance.  
4 We're still developing what methodology would be  
5 applied and what the bounds would be, and that is a  
6 future appendix.

7 MEMBER SKILLMAN: Thank you.

8 MEMBER BLEY: I have two quick ones.  
9 This kind of brings up to me how we ought to be  
10 looking at this report right now. It's I assume you  
11 want us to think of this as a work in progress.

12 MR. SCHOFER: Exactly.

13 MEMBER BLEY: And it's continuing. So  
14 as long as I have the right head about that. And  
15 then sort of not to beat a dead horse, but when you  
16 went through the list of reasons why if one is  
17 forced to or ought to do an uncertainty analysis, it  
18 was a good list. And the last one was controversial  
19 and maybe important, something like that.

20 And I have to go back to our discussion  
21 with Tina and Fred earlier. What's your basis for  
22 not doing uncertainty analysis on the value of  
23 statistical life stuff? I don't understand. You've  
24 told us that's what you're doing.

25 MR. SCHOFER: Yes.

**NEAL R. GROSS**

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

1                   MEMBER BLEY:    I don't understand the  
2 basis for how you decided that, especially in light  
3 of where this guidance is going and other guidance  
4 from the Commission has put us.

5                   MR. SCHOFER:   And my recollection on  
6 this is that, you know, dollar per person rem, I  
7 mean initially and for the past since 1995 has been  
8 based upon a constant value point estimate with no  
9 sensitivity, no uncertainty.

10                  In that guidance document, it told us  
11 too that it was in constant dollars. And therefore,  
12 we didn't even, you know, as part of that policy we  
13 couldn't inflate that value either. So I mean, it  
14 truly was \$2,000 then, \$2,000 now.

15                  With NUREG 1530, we've made a number of  
16 recommendations which was still waiting for the  
17 Commission to weigh in on. And it is to inflate  
18 that number, to have it in, you know, tied to a  
19 year, a base year as well as to formalize doing  
20 sensitivity analysis which is a departure from where  
21 we've been at.

22                  Now granted, you know, should we be  
23 doing more and do full uncertainty. The working  
24 group did talk about that but decided that at this  
25 juncture to go forward with the 50 percent lower and

**NEAL R. GROSS**

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

1 higher, and to do it as sensitivities.

2 MEMBER BLEY: In the overall context and  
3 then the context of the fact you're in the process  
4 of reevaluating all this, I don't get how that  
5 decision came out.

6 CHAIRMAN RAY: Okay, we're down to nine  
7 minutes till. Where are we? There will be members  
8 leaving. I want to get everyone's input before the  
9 noon hour. How much longer do you need?

10 MR. SANDERS: Five slides might take 15  
11 minutes more. Get that input, yes.

12 (Simultaneous speaking.)

13 CHAIRMAN RAY: Okay. Well, what is the  
14 piece that's left?

15 MR. SANDERS: Qualitative factors. So  
16 there might be some of important to you there. And  
17 special circumstances, and consensus standards which  
18 is not changing as the rulemakings and so on.

19 CHAIRMAN RAY: All right. Well --

20 MEMBER BLEY: You could just do those --

21 CHAIRMAN RAY: Well, I could but I  
22 thought all members should hear what the other  
23 members wish to say, and our consultant also. And  
24 we'll complete then the rest of the agenda after  
25 those who have to leave are gone. I hope as many

**NEAL R. GROSS**

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

1 can stay as possible.

2 And then we will take public comment  
3 before we adjourn. And I foresee that by I hope  
4 12:15 because we do have another, yet another  
5 meeting this afternoon, another subcommittee  
6 meeting.

7 So with that, let me interrupt the  
8 agenda and ask at this point, and recognizing we  
9 haven't completed the agenda, Steve Schultz, if  
10 there's anything you would like to say to the  
11 members about what we've heard so far.

12 And I should say while you ponder that,  
13 we as I've said and others have as well, we have yet  
14 to work through exactly how the full committee will  
15 wish to address 1530 as well as 0058. There is an  
16 agenda item at the full committee in March. It's  
17 set up as if it's going to handle just 0058.

18 Recognizing that 1530 is ready to go, be  
19 issued. And yet I'll note that a slide here on 1530  
20 did indicate that a next step would be an ACRS  
21 recommendation to the Commission. So I'm not sure  
22 exactly what we're going to do with either of those  
23 two other than to say there is a place in March for  
24 us to talk about some aspect of this, whether it's  
25 both 1530 and 0058 or just the latter.

**NEAL R. GROSS**

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

1                   Okay, Steve?

2                   MR. SCHULTZ: I would just emphasize a  
3 couple of points.

4                   CHAIRMAN RAY: Microphone.

5                   MR. SCHULTZ: Thank you. I emphasize a  
6 couple of points. And the first is a follow up to  
7 what Dennis just said. In terms of the evaluation  
8 of sensitivity and uncertainty, it's described in  
9 this document, 0058. We talked about it with regard  
10 to the other NUREG.

11                  And it's not really stated clearly with  
12 regard to dollar per person rem. There's more  
13 information really about how the cost of money is  
14 evaluated as a sensitivity.

15                  But that seems to be something that I  
16 think has been used in the past clearly, and  
17 everyone knows. The opportunity to evaluate  
18 properly the uncertainty associated with dollar per  
19 person rem and would be, I think, an appropriate  
20 addition given that everything is being looked at  
21 freshly.

22                  And so that ought to be considered in  
23 really both documents. And it's not well stated.  
24 If it's not going to be done, if it's only going to  
25 be a sensitivity, it is not well stated in either

**NEAL R. GROSS**

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

1 document that that is in fact the case, and that's  
2 to form some of the basis of what decisions were  
3 made with regard to the 50/50, 50 percent/50 percent  
4 associated with those factors that go into the  
5 dollar per person rem evaluation.

6 Secondly, with regard to the expectation  
7 of information that flows to decision makers is  
8 there's one statement that comes out in the NUREG  
9 that would suggest when evaluating, when the  
10 discussion goes into evaluating what is going to be  
11 done with previous regulation decisions, there's one  
12 statement that suggests well, a decision maker would  
13 really need to evaluate and see that the cost  
14 benefit of a change would really have to show a  
15 substantial impact before a decision would be made  
16 to go forward. I think a factor of five is  
17 mentioned, for example, because of uncertainty.

18 I'm not questioning that that might be  
19 the case. But again, for many people that's not how  
20 cost benefit evaluations have been interpreted.

21 And I say most people, I would certainly  
22 say the public would look at a cost benefit  
23 evaluation and say well, it certainly looks like  
24 we're right on the line, we ought to do it, not that  
25 given uncertainty we really ought to weigh this

**NEAL R. GROSS**

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

1 carefully and, you know, I think we really need to  
2 understand how we are going to present the results,  
3 especially with regard to the mean value and  
4 uncertainty of the overall evaluations and presented  
5 in such fashion that the decision maker knows what  
6 to do with that information, or at least has a  
7 better appreciation than what has been done in the  
8 past.

9 Again, with all of this reevaluation,  
10 we're focusing a lot on how the analysis and the  
11 data can be improved. But the connection between  
12 this information that we provide for the decision  
13 maker and how it can be used in decision making is  
14 also important.

15 CHAIRMAN RAY: Joy?

16 MEMBER REMPE: Well, I think we, if this  
17 goes forward as it's outlined in the presentation  
18 with going forward and having it issued and going to  
19 the Commission, I think we should have a letter.

20 (Off the record comments.)

21 CHAIRMAN RAY: Okay, you're --

22 MEMBER REMPE: If you go on to --

23 CHAIRMAN RAY: Let me clarify what you  
24 just said. Are you talking about a letter on 1530  
25 or --

**NEAL R. GROSS**

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



1 MEMBER REMPE: On 58. If you go on to  
2 slide 46 which we haven't seen, it says the draft  
3 guidance document status update's due to the  
4 Commission on February 22nd.

5 CHAIRMAN RAY: Yes, you're talking about  
6 58 then?

7 MEMBER REMPE: Right.

8 CHAIRMAN RAY: Okay.

9 MEMBER REMPE: And that's what I thought  
10 you wanted to have this meeting in March on is 58,  
11 right?

12 CHAIRMAN RAY: That's not what I wanted,  
13 it is what is currently --

14 MEMBER REMPE: Scheduled. If you have  
15 it --

16 CHAIRMAN RAY: -- planned to be. And  
17 the reason is that 1530 is pending release right now  
18 as we sit here.

19 MEMBER REMPE: Right.

20 CHAIRMAN RAY: And so trying to  
21 intercept that is a different activity than a letter  
22 in -- but what you're referring to I think will be  
23 part of the discussion at full Commission in March.

24 MEMBER REMPE: Right. And so if we have  
25 that, it in effect goes forward, there aren't

**NEAL R. GROSS**

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

1 substantial changes. I think enough topics were  
2 raised today on 58 that yes, we should have a letter  
3 on it.

4 If 1430 comes into the discussion at the  
5 full Commission meeting also, I think a lot of  
6 topics were raised and it should be, a letter should  
7 be issued too. But I'm not sure what's happening  
8 right now with respect to what we're talking about  
9 at the Commission meeting from the discussion today.

10 CHAIRMAN RAY: Right now the timing is  
11 such that it would be after the fact as we see it at  
12 the moment.

13 MEMBER REMPE: But they won't be making  
14 the decision. And so I think our input, rather than  
15 being silent because we've gotten something that's a  
16 draft and it will be changing, I think it would  
17 behoove us to write a letter.

18 CHAIRMAN RAY: With regard to 58, I  
19 certainly agree.

20 MEMBER REMPE: Yes, and even on 1430 I  
21 think we should have --

22 CHAIRMAN RAY: Fifteen thirty.

23 MEMBER REMPE: Fifteen thirty, yes.

24 CHAIRMAN RAY: Well, that again we'll  
25 discuss further. The Chairman will take the ball on

**NEAL R. GROSS**

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

1 that later this week. Charlie?

2 MEMBER BROWN: Nothing else to add.

3 CHAIRMAN RAY: Jose?

4 MEMBER MARCH-LEUBA: I'm going to go a  
5 phrase from Dr. Corradini. I'm a little confused.  
6 Are we, this letter of 58, are we asking for a  
7 letter on the modifications from four to five, or on  
8 the totality of five?

9 CHAIRMAN RAY: WE can do what the  
10 Commission chooses to do, having heard the  
11 presentation of full Commission and the usual  
12 process. At times we ask what the staff is looking  
13 for, and that's a different issue than what we  
14 actually wind up doing.

15 MEMBER MARCH-LEUBA: Yes, but what's the  
16 staff want to do?

17 MS. KHANNA: If I may chime in, I would  
18 say we're looking for comments on the revisions  
19 being made from Rev 4 to Rev 5, but we will accept,  
20 you know, any comments that you would like.

21 MEMBER MARCH-LEUBA: In that case, I  
22 would like to have at least a slide that tells me  
23 what the modifications were because that was not  
24 released at all.

25 MS. KHANNA: We can do that, sure. We

**NEAL R. GROSS**

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

1 can provide that.

2 CHAIRMAN RAY: Okay. Leonard?

3 MEMBER KIRCHNER: No further comments.

4 Thank you, though.

5 CHAIRMAN RAY: John.

6 MEMBER STETKAR: I don't have anything  
7 more. I mean, I made my statements and Steve  
8 summarized very well concerns about uncertainty. I  
9 would say that it would be a shame if we lose an  
10 opportunity to demonstrate how one should indeed  
11 account for uncertainties explicitly in the decision  
12 making process.

13 CHAIRMAN RAY: Dennis?

14 MEMBER BLEY: Yes, just a couple. I  
15 minor nit, I didn't say this earlier. The title of  
16 1530 is, it's about conversion factors and yet we  
17 say value of statistical life is not a value placed  
18 on human life. Using the term conversion factors  
19 gives the opposite impression to me. It's an  
20 unnecessary term and it just bothers me. It's a  
21 personal thing. If we just stayed with monetizing  
22 the value of life, that would be okay.

23 I got in a little late and I apologize  
24 for that, but I'm a little, I was a little surprised  
25 to learn that after all this time, that 1530 got

**NEAL R. GROSS**

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

1 passed us before you came to talk to us about it.  
2 And somehow there are some things there that are  
3 worthy of our comment I think.

4 That middle part of the discussion where  
5 you talked about the five ACRS meetings, if that's  
6 implied to the Commission on 1530 in any way, that  
7 really is upsetting. And I hope that's not true.

8 I think we ought to write a letter. I  
9 would like a CS comment on both of them, and the  
10 whole plan for updating that they're going through.

11 CHAIRMAN RAY: Well again, I think at  
12 PNP we'll have a fuller discussion of whether we  
13 want to signal that we're planning to do that in  
14 March or what.

15 MEMBER BLEY: And that's a hard thing  
16 for us to do without having a full Commission  
17 meeting on it --

18 CHAIRMAN RAY: It is.

19 MEMBER BLEY: -- procedurally.

20 CHAIRMAN RAY: But it's at least  
21 something we could touch on.

22 MEMBER BLEY: But we can touch on it and  
23 we could send up a brief note saying, you know,  
24 we're going to write a letter on this.

25 CHAIRMAN RAY: Okay. Mike.

**NEAL R. GROSS**

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

1                   MEMBER CORRADINI:     I have no other  
2                   comments. I would say that there's no need to touch  
3                   1530 at this point, although the clarification that  
4                   Steve mentions about sensitivity versus uncertainty,  
5                   I didn't catch. And I read what the Commission was  
6                   given as their cheat sheet, I'm not sure they would  
7                   catch it. So to me, that's important.

8                   Other than that, I would just say we're  
9                   going hear in March and we'll decide at the time.  
10                  Thank you.

11                  CHAIRMAN RAY: Dick.

12                  MEMBER SKILLMAN:     Nothing further.  
13                  Thank you.

14                  CHAIRMAN RAY: Margaret?

15                  MEMBER CHU: Nothing, thank you.

16                  MEMBER SUNSERI:     So I appreciate the  
17                  presentations, and I recognize it's a work in  
18                  progress. I just continue to, or I would encourage  
19                  you to continue to be open minded and approach this  
20                  from a consensus to drive it to be as useful a tool  
21                  for the decision makers as practicable. Thanks.

22                  CHAIRMAN RAY: Ron?

23                  MEMBER BALLINGER: No further comment.

24                  CHAIRMAN RAY: Okay. We'll resume the  
25                  agenda now. Those who have to leave us will do so.

**NEAL R. GROSS**

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

1 And then again, we will ask those who want to make  
2 comments from the public to please hang in there.  
3 Hopefully we'll be done with the presentation as  
4 quickly as possible and turn to public comments.  
5 Okay, resume.

6 MR. SANDERS: All right. So the next  
7 slide, 41, discusses the next appendix, the  
8 assessment of qualitative factors in cost estimating  
9 and regulatory analysis.

10 It's important to remember the  
11 Commission direction and therefore NRC policy to  
12 always quantify to the extent possible in accordance  
13 with the references mentioned earlier in our  
14 presentation.

15 When quantification is deemed  
16 impractical for a particular element of the  
17 estimate, qualitative factors may be used and the  
18 next slide will discuss some of the many qualitative  
19 methodologies contained in this appendix.

20 So the use of qualitative factors as  
21 detailed in the appendix will become the structured  
22 process with clear guidance in best practices,  
23 increasing transparency, and consistency of cost  
24 estimates and regulatory analyses, just to finish  
25 off that slide. Now we're on the next slide.

**NEAL R. GROSS**

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

1           The appendix provides a toolkit of  
2 qualitative assessment methods as shown here. The  
3 first four in the left column are the most commonly  
4 utilized here at the NRC, and I'm going to focus on  
5 those for this discussion and in the interest of  
6 time as well.

7           It's important to note though, if in the  
8 process of analyzing qualitative factor the factor  
9 is deemed to be significant enough, further research  
10 in an attempt to quantify it might be appropriate.

11           So the first on the left there, the  
12 qualitative narrative is just what it looks like.  
13 It's a discussion of each qualitative factor  
14 including the magnitude of the benefit or costs and  
15 the strengths and limitations of the qualitative  
16 information.

17           Cost effectiveness analysis is also  
18 known as least cost analysis. In this approach, the  
19 analyst assumes the benefits are the same for all  
20 alternatives and seeks to determine which  
21 alternative has the lowest cost. This becomes the  
22 most qualitatively cost effective alternative using  
23 that tool.

24           Threshold analysis is utilized when  
25 purging and estimates of economic value can be

**NEAL R. GROSS**

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



1       quantitatively estimated but the analyst does not  
2       know the risk estimate or the total number of units,  
3       et cetera.

4               So this analysis can determine the  
5       number of units where the benefits become positive  
6       or the regulatory action will break even. And  
7       bounding analysis can be utilized when valuation  
8       estimates are known that are clearly worse or  
9       clearly not as bad, and these can be used on bounds  
10      for the value of the effect of concern.

11             Analysts should very carefully describe  
12      their judgements and assumptions if they're using  
13      the bounding analysis when they're selecting the  
14      bounding values.

15             CHAIRMAN RAY: Let me make a comment  
16      here because now I can do so without impacting the  
17      12 o'clock thing so much, but I'll keep it real  
18      short. The real issue here is what are the  
19      avoidable costs of doing something.

20             And when questions were being asked  
21      about how does the actual cost compare with what you  
22      estimated it to be, the thing I wanted to say  
23      desperately was the actual costs include both the  
24      avoidable costs that are the issue and a huge amount  
25      of unavoidable costs.

**NEAL R. GROSS**

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

1 I've done it a zillion times myself for  
2 many years. When you have a project, you do lots of  
3 things that have to get done anyway. You use people  
4 who are going to charge the payroll anyway.

5 And so trying to separate out what's  
6 avoidable from what was going to occur anyhow,  
7 whether it's as simple as painting something after  
8 you're done doing the work or it's much more  
9 substantial, which it often is, and you load as much  
10 overheads in there as you can and so on and so on  
11 and so on.

12 So the upshot of it is that I would be  
13 very skeptical about any analysis which purports to  
14 compare actual costs with estimated costs unless you  
15 do the work to separate out what was actually  
16 avoidable from what was going to be incurred anyway.

17 Okay, so I just want to make that  
18 comment, and --

19 MEMBER KIRCHNER: Can I jump in on that  
20 then? If I understood correctly then, you do that  
21 when you count your, book keep your NRC costs,  
22 right, your staff costs?

23 CHAIRMAN RAY: Correct.

24 MEMBER KIRCHNER: That's what Harold  
25 said. Okay.

**NEAL R. GROSS**

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

1 CHAIRMAN RAY: Okay, go ahead.

2 MR. SANDERS: That's all I wanted to do  
3 on this slide, if anyone has any comments. No? All  
4 right. This one should be quick. The most  
5 important thing about this topic of this appendix is  
6 we are not changing our current guidance and our  
7 current practice.

8 So I'll just briefly say that, you know,  
9 this appendix covers ASME code changes such as  
10 incorporation by reference of ASME code and code  
11 cases in 10 CFR 50.55(a). These are consensus  
12 standards which involve hundreds or thousands of  
13 provisions that have already been agreed upon by  
14 stakeholders and undergone extensive external review  
15 and endorsed by industry.

16 So it tends to be non-controversial.  
17 And the current practice is to assess additional  
18 costs and benefits resulting from NRC conditions and  
19 restrictions above and beyond those specified in the  
20 consensus standard. Again, there's no proposed  
21 changes for this appendix, just documents how we  
22 form this analysis.

23 And the final draft of the appendix is  
24 special circumstances. And these are the categories  
25 that are described in the appendix safety goal

**NEAL R. GROSS**

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

1 screening. We've touched upon already, but  
2 basically if it's a small change in core damage  
3 frequency, the initiative under analysis needs an  
4 alternative justification for the proposed  
5 requirement for the regulatory analysis to proceed.

6 There may be other special circumstances  
7 that should be analyzed, but in general, for the  
8 safety goal screening, that's how you apply it as  
9 described earlier.

10 Sub costs, just in case I need to  
11 describe those. So it's mistake that can get you  
12 into some trouble if you don't understand which  
13 costs are sub costs. These are costs incurred  
14 before the start of the analysis period, and the  
15 resources have no value in some alternative use.

16 So policy development, feasibility  
17 studies, voluntary actions undertaken at an earlier  
18 date. Sub costs are not included in cost benefit  
19 analyses because there's no opportunity cost  
20 involved, and their inclusion may distort the  
21 analysis by requiring a very high return on  
22 investment. Essentially though, the outcome of past  
23 decisions and should therefore be excluded from  
24 future decisions.

25 Industry initiatives are typically

**NEAL R. GROSS**

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

1 actions performed by licensees that either form the  
2 bases for continued compliance with the regulations  
3 or obviate the need for new regulations.

4 We must be clear to the public that  
5 substituting industry initiatives for NRC regulatory  
6 action can provide effective and efficient  
7 resolution of issues, will in no way compromise  
8 plant safety, and does not represent a reduction in  
9 the NRC's commitment to safety and sound regulation.

10 The NRC and the industry are jointly  
11 responsible for the long-term success of using  
12 industry initiatives as substitutes for regulatory  
13 action. Licensees must effectively manage and  
14 implement their commitments associated with these  
15 initiatives, and the NRC must provide a credible and  
16 predictable regulatory response if licensees fail to  
17 satisfy these commitments.

18 Generally, they fall into one of three  
19 categories, those put in place in lieu of or to  
20 compliment a regulatory action to ensure that  
21 requirements are met, those used in lieu of or to  
22 compliment the regulatory action in which a  
23 substantial increase in overall protection could be  
24 achieved with costs of implementation justifying the  
25 increased protection or those initiated to address

**NEAL R. GROSS**

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

1 an issue of concern to the industry that may or may  
2 not be of regulatory concern.

3 Issues related to adequate protection of  
4 public health and safety are deemed a responsibility  
5 to the NRC and should not be addressed through  
6 industry initiatives.

7 There are a few features of the industry  
8 initiatives that analysts should consider for each  
9 one. Relevant characteristics are the costs  
10 associated with the initiative, the extent to which  
11 written commitments exist, the degree to which the  
12 initiative is non-controversial and standard  
13 industry practice, and the scope and schedule for  
14 industry initiatives that are still pending.

15 A couple of examples. The severe  
16 accident mitigation guidelines was an example of an  
17 industry initiative, and buried piping is another  
18 example, just to bring to mind what we're talking  
19 about here.

20 And next, the analyst should be careful  
21 when considering aggregating or bundling different  
22 individual requirements into a single analysis, that  
23 the analysis does not mask the inclusion of an  
24 unnecessary individual requirement that we started  
25 talking about before.

**NEAL R. GROSS**

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

1           As an example, if aggregated, the  
2 benefit from the relaxation of one requirement could  
3 support a second unnecessary requirement that  
4 otherwise is not cost justified. The NRC staff and  
5 the analyst must determine if it is appropriate to  
6 include each individual requirement.

7           In other words, if the requirement is  
8 needed to resolve the problems and concerns and meet  
9 the stated objectives of the initiative. The  
10 analyst should retain separate cost estimates for  
11 each requirement in deriving the total cost estimate  
12 for the aggregated requirements.

13           A recent example of separating  
14 individual requirements can be found, for example,  
15 in the regulatory analysis for 10 CFR 50.46 8. And  
16 in the final regulatory analysis we created four  
17 separate requirements or initiatives that were all  
18 costed independently.

19           Just briefly, there are new performance  
20 based fuel standards, technology neutral expansion  
21 of the approved fuel cladding types such as to  
22 include Zirc-4 and M5 to avoid the need for  
23 exemption requests, crud effects, and then finally  
24 risk informed modeling to obviate the need to remove  
25 problematic progress asbestos insulation.

**NEAL R. GROSS**

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

1           If you take all those together, the  
2           total costs combined create a completely different  
3           cost benefit picture than if you look at each  
4           individual requirement separately. This enables  
5           better decision making. The Commission can see the  
6           impacts so nothing is masked within the requirements  
7           of another initiative.

8           Regarding inter-generational cost  
9           benefit assessments, there are some regulatory  
10          actions where the regulatory analysis may have to  
11          consider consequences that occur over hundreds or  
12          even thousands of years.

13          A few examples of inter-generational  
14          assessments would be for spent fuel storage, or for  
15          the Generic Environmental Impact Statement, GEIS.  
16          Under these circumstances, OMB continues to see  
17          value in applying discount rates of three and seven  
18          percent as previously described.

19          The analysis should contain an explicit  
20          discussion of the inter-generational concerns and  
21          how future generations will be impacted. Further,  
22          the analysis could include the un-discounted costs  
23          and benefits which are incurred as supplemental  
24          information.

25          Instead of just showing a discount

**NEAL R. GROSS**

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



1 table, you can also say this is the cost without any  
2 discount rates applied. And finally, the analyst  
3 should consider a sensitivity analysis using a lower  
4 but still positive discount rate for additional  
5 sensitivity.

6 And then finally, the last bullet,  
7 procedural requirements are also covered in this  
8 appendix. And we're referring to the Paperwork  
9 Production Act, Regulatory Flexibility Act, National  
10 Environmental Policy Act, information requests from  
11 10 CFR 50.54(f), and supporting analyses for  
12 compliance and adequate protection as examples.

13 And that's the end of that appendix.  
14 That's all I have.

15 CHAIRMAN RAY: Thank you. This is a  
16 little out of normal sequence, but anything else  
17 that you guys have to share with us? Fred?

18 MR. SCHOFER: No, we have the list and  
19 the appendices, and then we have, what, the next --

20 MS. NOTO: Just the next steps.

21 MR. SCHOFER: Next steps. So we're  
22 pretty much --

23 CHAIRMAN RAY: Okay. Well, I've  
24 mentioned a couple times to our chairman here that  
25 we'll try and see if there's anything further to add

**NEAL R. GROSS**

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

1 to what we've said today relative to timing and  
2 sequence and scope of going forward at the what's  
3 called PNP as you're familiar with.

4 And Mike will let you know when we might  
5 be discussion that if you want to listen. We may or  
6 may not have anything more to say. But obviously at  
7 this point in time, it's something that needs some  
8 further closure.

9 And with that, we'll see if there's,  
10 open the bridge line. Mike --

11 CHAIRMAN RAY: Bridge is open, thank  
12 you. And is there anyone on the bridge line who  
13 wishes to make a comment at this time? Or in the  
14 audience here?

15 MR. SLIDER: Yes.

16 CHAIRMAN RAY: Okay.

17 MR. SLIDER: Yes, Mr. Ray. I'm Jim  
18 Slider from NEI and I have responsibility for our  
19 interactions with the staff on this subject. I  
20 first wanted to commend the subcommittee members,  
21 your questions are, many of them are exactly the  
22 questions that we have as well. And many of them  
23 were mentioned in our comments previously.

24 So I appreciate your perspective on the  
25 documents that were discussed today. One of the

**NEAL R. GROSS**

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

1 things that we on the industry side are doing to try  
2 to support the staff in developing better cost  
3 estimates in the future is to engage the industry  
4 cost estimating professionals and providing higher  
5 quality estimates.

6 The challenge in that I believe was  
7 alluded to early in this discussion that when the  
8 regulatory proposals are at the conceptual stage,  
9 it's hardest to develop a precise scope of work  
10 which our industry members need in order to provide  
11 a precise and reliable cost estimate.

12 So that's the challenge that we all face  
13 and we want to support that --

14 CHAIRMAN RAY: The solution to that  
15 challenge is an appropriate contingency is my  
16 feedback I'd give from my experience. And if  
17 somebody says at an early stage that 100 percent  
18 contingency's too big, tell them to pound sand and  
19 they don't know what they're talking about.

20 MR. SLIDER: Exactly so. And that goes  
21 right to the whole discussion this morning about the  
22 treatment of uncertainties as well.

23 One of the things that I also heard  
24 today is very important to is and that's looking at  
25 the experience, comparing past estimates with

**NEAL R. GROSS**

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

1 actuals. And I also appreciated the discussion  
2 today about looking at the implications of the cost  
3 estimate, the changes in the cost estimating  
4 proposals and how that relates to actual experience  
5 and projections and so forth. So again, the  
6 discussion here this morning greatly amplified the  
7 concerns that we've already expressed to the staff.  
8 And we will follow that up with our public comments  
9 when the document is released. So thank you very  
10 much for this opportunity and appreciated your  
11 discussion today.

12 CHAIRMAN RAY: Thank you, John.  
13 Anything else? Okay. If not, then we will  
14 considered this subcommittee meeting adjourned.

15 (Whereupon, the above-entitled matter  
16 went off the record at 12:20 p.m.)  
17  
18  
19  
20  
21

**NEAL R. GROSS**

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

# **Cost-Benefit Guidance Update**

ACRS

Regulatory Policies and Practices  
Subcommittee Meeting  
February 7, 2017

# Purpose

---

- Provide an overview of the plan to update agency-wide cost-benefit guidance
- Obtain ACRS subcommittee endorsement of NUREG-1530, Revision 1, “Reassessment of NRC’s Dollar per Person-Rem Conversion Factor”
- Discuss proposed changes to NUREG/BR-0058, Revision 4, “Regulatory Analysis Guidelines of the U.S. NRC” and address ACRS subcommittee feedback

# Background

---

- Fukushima Dai-ichi accident initiated questions regarding how NRC considers potential economic consequences (EC) of a nuclear accident
- SECY-12-0110, “Consideration of EC within the U.S. NRC’s Regulatory Framework”
- Staff Requirements Memorandum (SRM)-SECY-12-0110
  - SECY-14-0002, “Plan for Updating NRC’s Cost-Benefit Guidance”
  - SECY-14-0143, “Regulatory Gap Analysis of the NRC’s Cost-Benefit Guidance and Practices”

## Background (cont'd)

- SRM-SECY-12-0157, “Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments”
  - SECY-14-0087, “Qualitative Consideration of Factors in the Development of Regulatory Analyses and Backfit Analyses”
- Government Accountability Office (GAO) Audit Report Findings
- Office of Inspector General (OIG) Audit Report Findings



# Plan Overview

## SECY-14-0002, “Plan for Updating NRC’s Cost-Benefit Guidance”

- Other staff initiatives
- Related NRC initiatives
- Two-phased approach
- Price Anderson Act

## Other Staff Initiatives

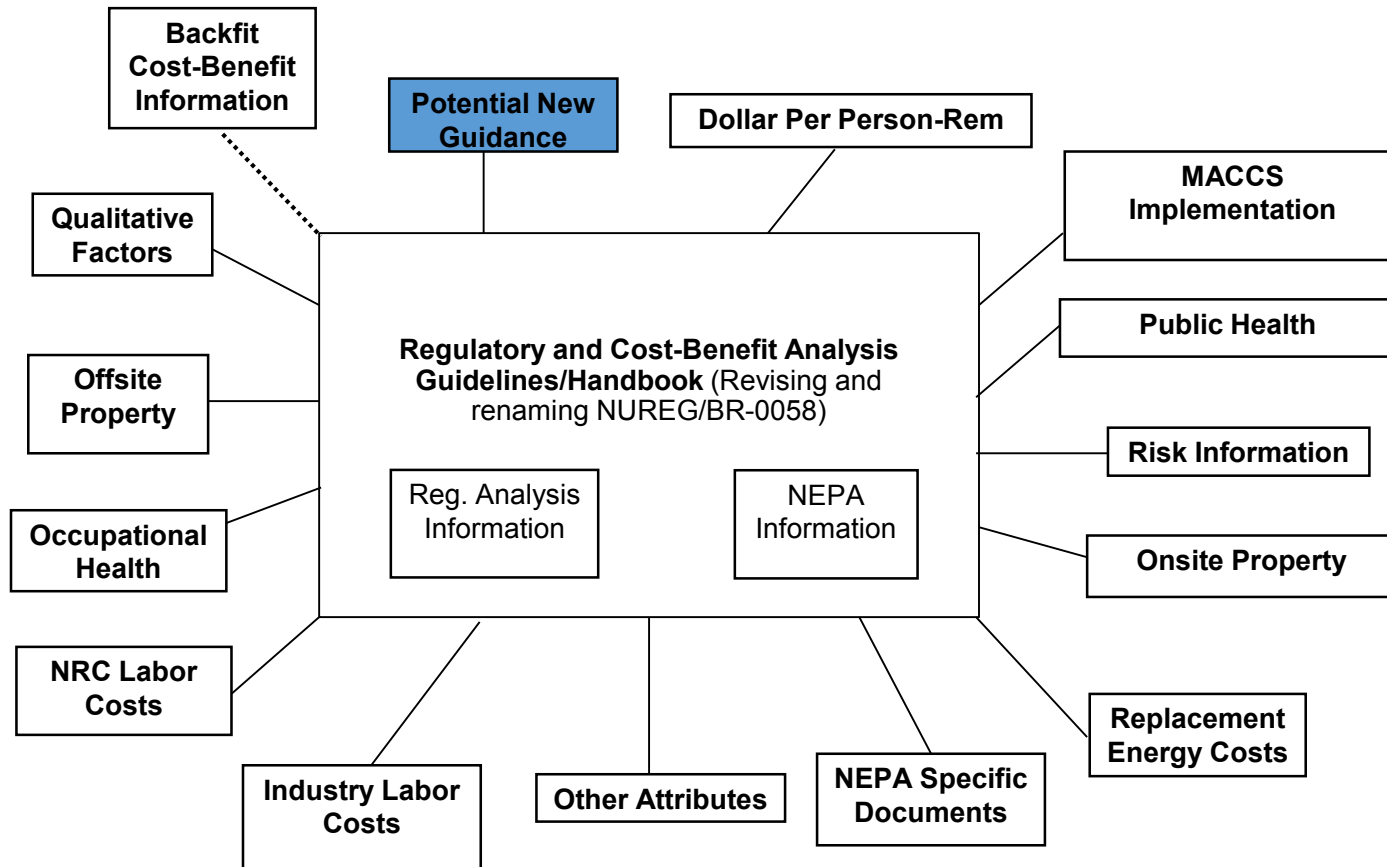
- Replacement energy guidance
- Dollar per person-rem conversion factor guidance
- Regulatory gap analysis
- Qualitative factors
- Cumulative effects of regulation (CER)

# Two-Phased Approach

---

- Phase 1 – Administrative and methodology enhancements
  - Revise and restructure documents (NUREG/BR-0058 and NUREG/BR-0184, “Regulatory Analysis Technical Handbook”)
  - Refocus and expand guidance on cost-benefit analysis across the agency
  - Update data, methods, and references
  - Address audit findings and case study recommendations
- Phase 2 – Address potential changes in policy and methodology and maintain/update guidance
  - Further refinement of cost estimate values
  - Process for addressing emergent policy issues identified by gap analysis
  - Consequence and probabilistic methodology review
  - MELCOR Accident Consequence Code System (MACCS)
  - Periodic review of cost-benefit guidance
  - Begin after Phase 1
  - Activities will be ongoing

# Mapping of Cost-Benefit Guidance Structure



# Public Interactions

---

- Six public meetings/workshops
  - May 24, 2012 (ML12130176)
  - August 29, 2012 (ML12283A373)
  - July 29, 2013 (ML13227A201)
  - May 28, 2014 (ML14114A034)
  - July 16, 2015 (ML15189A470)
  - March 3, 2016 (ML16084A165)
- Five ACRS meetings (public)
  - October 2012
  - November 2012
  - June 2014
  - September 2014
  - December 2014
- One Commission Meeting (public)
  - September 11, 2012
    - Representatives from U.S. Environmental Protection Agency (EPA), Union of Concerned Scientists, American Nuclear Insurers, Health Physics Society, and Nuclear Energy Institute attended meeting



**NUREG-1530, Revision 1,  
“Reassessment of NRC’s Dollar per  
Person-Rem Conversion Factor  
Policy”**

# NUREG-1530, Revision 1 Topics

---

- Definition
- Background
- Calculating the dollar per person-rem
- Proposed changes
  - Value of a statistical life (VSL)
  - EPA cancer mortality risk coefficient
  - Dollar per person-rem value
  - Two significant figures
  - Methodology for keeping figure current
  - Dose and dose rate effectiveness factor
- Regulatory applications
- Summary of public comments
- Next steps

# Dollar per Person-Rem

---

- **Definition:** This factor translates radiological dose “to a monetary value and, as such, allows for direct comparison between the potential health and safety benefits and the costs of a proposed regulatory initiative.”
  - 60 FR 65694
- In short, dollar per person-rem is the dollar-value of the health impact of radiation dose.



# Background

---

- The NRC first used a dollar per person-rem value in 1974. The value set was \$1,000 per person-rem.
- This value was revisited, resulting in the publication of NUREG-1530 in 1995, which established a value of \$2,000 per person-rem and separated the offsite economic consequences from this factor.
- In 2009, the staff began research to update the dollar per person-rem value.
- SECY-12-0110 indicated that the staff would update guidance documents relating to cost-benefit analyses, including NUREG-1530. The Commission approved the staff's recommendation in 2013.

# Calculating Dollar per Person-Rem

---

How is dollar per person-rem calculated?

- The NRC multiplies a current VSL by a cancer risk coefficient.
- NUREG-1530, published in 1995, uses a VSL of \$3 million and a cancer risk coefficient of  $7.0 \times 10^{-4}$  per person-rem from International Commission on Radiological Protection (ICRP) 60 published in 1991. This approximates a dollar per person-rem value of \$2,000.
- Currently, NUREG-1530 does not provide a method for adjusting this value into real dollars.

# Proposed Changes to NUREG-1530

---

- Update the dollar per person-rem conversion factor from \$2,000 to \$5,200 per person-rem for the best estimate.
- Vary the dollar per person-rem conversion factor by plus or minus 50%, resulting in low and high values of \$2,600 and \$7,800 per person-rem, respectively.
- Report dollar per person-rem factor to two significant figures.
- Propose methods for maintaining the dollar per person-rem conversion factors.
- Provide guidance to staff on when to use the dose and dose-rate effectiveness factor (DDREF).

# Value of a Statistical Life (VSL)

---

- VSL concept used widely throughout the Federal government to monetize the health benefits of a safety regulation.
- VSL is **NOT** a value placed on a human life, but a value that society would be willing to pay for reducing health risk.
- NRC utilizes the willingness-to-pay (WTP) method for calculating VSL, consistent with other Federal agencies.
- NRC used the research done by other Federal agencies in calculating VSL.
- The NRC staff applied a best estimate VSL calculation of \$9 million in 2014 dollars in NUREG-1530, Revision 1.
  - This estimate is derived from the average of the Department of Transportation's VSL (\$9.3 million) and the EPA's VSL (\$8.7 million) in 2014 dollars

# Cancer Risk Coefficient

---

- NUREG-1530 (1995) uses the cancer risk coefficient value from ICRP 60, published in 1991, of  $7.0 \times 10^{-4}$  per person-rem.
- ICRP 103 (2007) presents an updated cancer risk coefficient of  $5.7 \times 10^{-4}$  per person-rem.
- In 2011, the EPA published a cancer mortality risk coefficient of  $5.8 \times 10^{-4}$  per rem (90% confidence interval:  $2.8 \times 10^{-4}$  to  $1.0 \times 10^{-3}$ ).



# Cancer Risk Coefficient (cont'd)

The staff selected the EPA's cancer mortality risk coefficient based on:

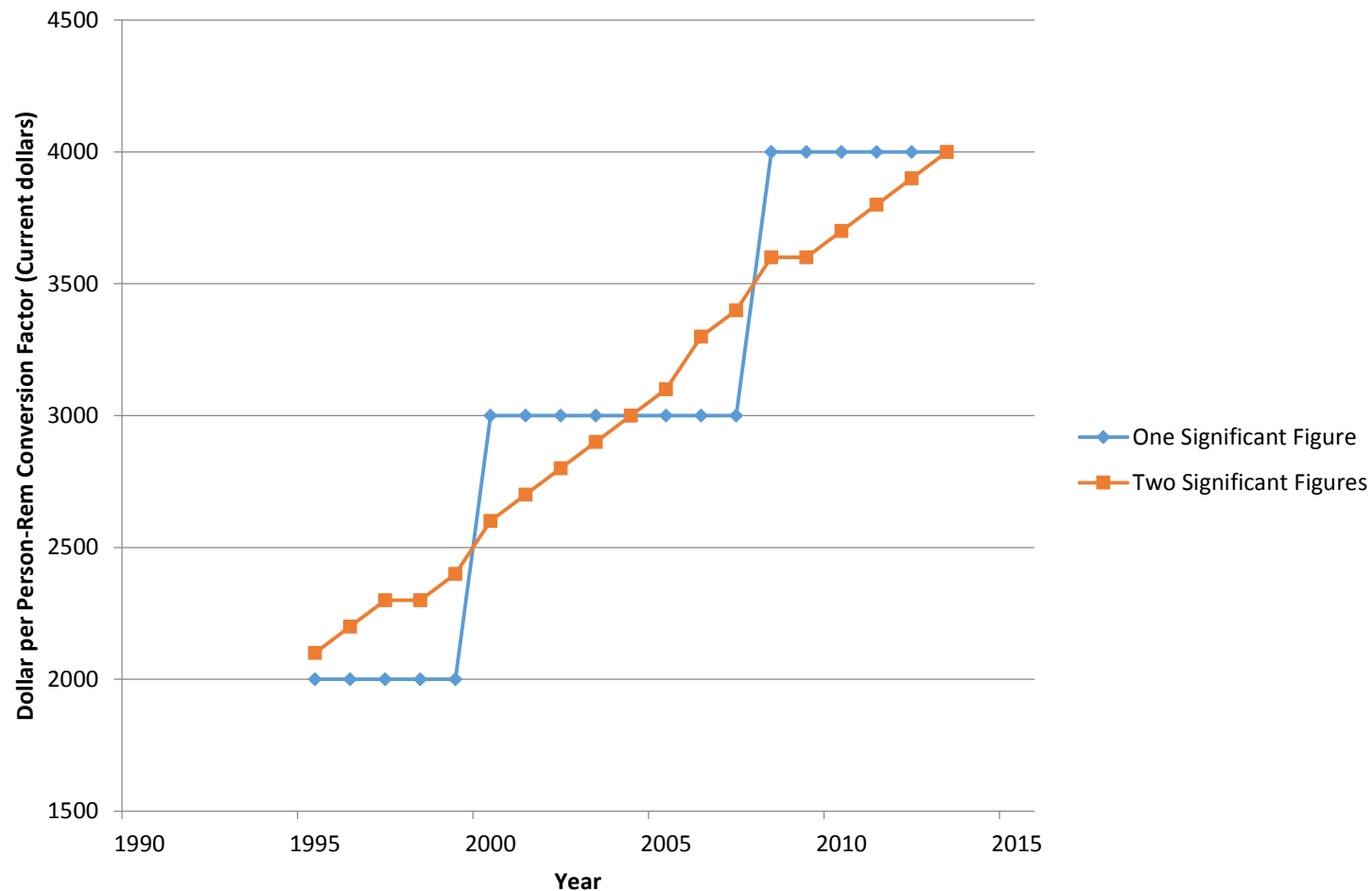
- Public comment
- U.S. population

# Dollar Person-Rem Value

- $\text{VSL} \times \text{cancer mortality risk coefficient} = \text{dollar per person-rem}$
- $(\$9 \text{ million}) \times (5.8 \times 10^{-4} \text{ per person-rem}) = \$5,200 \text{ per person-rem}$  for the best estimate
  - For **sensitivity analyses**, the dollar per person-rem conversion factor varies by  $\pm 50\%$ .

Estimate	Dollar per Person-Rem (2014 dollars)	VSL Sensitivity Values (2014 dollars)	Cancer Mortality Risk Coefficient (per person-rem)
Best	\$5,200	\$9.0 Million	$5.8 \times 10^{-4}$
Low	\$2,600	\$4.5 Million	$2.9 \times 10^{-4}$
High	\$7,800	\$13 Million	$8.7 \times 10^{-4}$

# Effect of Two Significant Figures





# Methodology for Keeping Factor Current

---

- NRC proposed formula for keeping the dollar per person-rem factor current is:

Dollar per Person-Rem<sub>current year</sub> =

(Dollar per Person-Rem<sub>base year</sub>) x (Inflation) x (Real Income Growth)<sup>Income Elasticity</sup>

- The staff would inform the Commission if the EPA adopts a new cancer mortality risk coefficient.
- The staff would reevaluate its baseline values for VSL and cancer mortality risk coefficient periodically and provide a recommendation to the Commission whether to update guidance and regulations if the conversion factor is expected to change by more than \$1,000 per person-rem.

# Dose and Dose Rate Effectiveness Factor (DDREF)

---

- Intrinsic to the EPA cancer mortality risk coefficient is a judgment that the per person-rem health detriment below certain doses and dose rates would be lower by a factor of 1.5, compared to the higher dose and dose rates where human health effects have been observed.
- This factor is called the DDREF and is included in the EPA cancer mortality risk coefficient and the NRC staff's proposed dollar per person-rem conversion factor.
- This factor would be removed for special cases involving high dose or high dose rates.

# Summary of Public Comments

- 38 individual comments received
- Topics of comments include:
  - ICRP vs EPA cancer risk coefficient
  - Significant figures
  - Method of keeping the factor current

## Next Steps

- ACRS recommendation to the Commission
- Commission review
- Publication

# **NUREG/BR-0058, Revision 5, “U.S. NRC Regulatory and Cost-Benefit Analysis Guidance”**



# Proposed Changes

---

- Refocuses and expands guidance on cost-benefit analysis across the agency.
- Focuses on quantification and methods for creating realistic estimates.
- Provides methods for assessing factors that are difficult to quantify.
- Incorporation of cost estimating best practices.
- Expands on the treatment of uncertainties.
- Enhances transparency of analysis for the decisionmaker.

# NUREG/BR-0058

## Overview

---

- Regulatory Analysis
- Backfitting and Issue Finality
- National Environmental Policy Act (NEPA)
- Cost Estimating and Best Practices
- Treatment of Uncertainty
- Qualitative Factors Assessment Tools
- Regulatory Analyses Related to American Society of Mechanical Engineers (ASME) Code Changes
- Special Circumstances and Relationship to Other Procedural Requirements
- Phase 2 Appendices

# Appendices Overview

---

## Phase 1 Appendices

- Qualitative Factors Assessment Tools
- Cost Estimating and Best Practices
- Treatment of Uncertainty
- Guidance on Regulatory Analyses Related to ASME Code Changes
- Special Circumstances and Relationship to Other Procedural Requirements

## Phase 2 Appendices

- Data Sources
- Historical Data
- Severe Accident Consequence Analysis
- NEPA Cost-Benefit Analysis
- Backfitting Cost-Benefit Analysis Procedures
- Morbidity
- Replacement Power Costs



# Regulatory Analysis

---

- A formal, highly-structured, reasoned analysis of a proposed government agency requirement containing estimates of costs and benefits that are quantified to the fullest extent possible
- Includes societal cost-benefit analysis
- An analytical tool provided to decisionmakers
  - Rationale for action
  - Enhances transparency of analyses
  - Consistency with Executive Orders on regulatory analysis and related issues
  - Compliance with Office of Management and Budget guidance and Executive Orders

# When are Regulatory Analyses Performed?

---

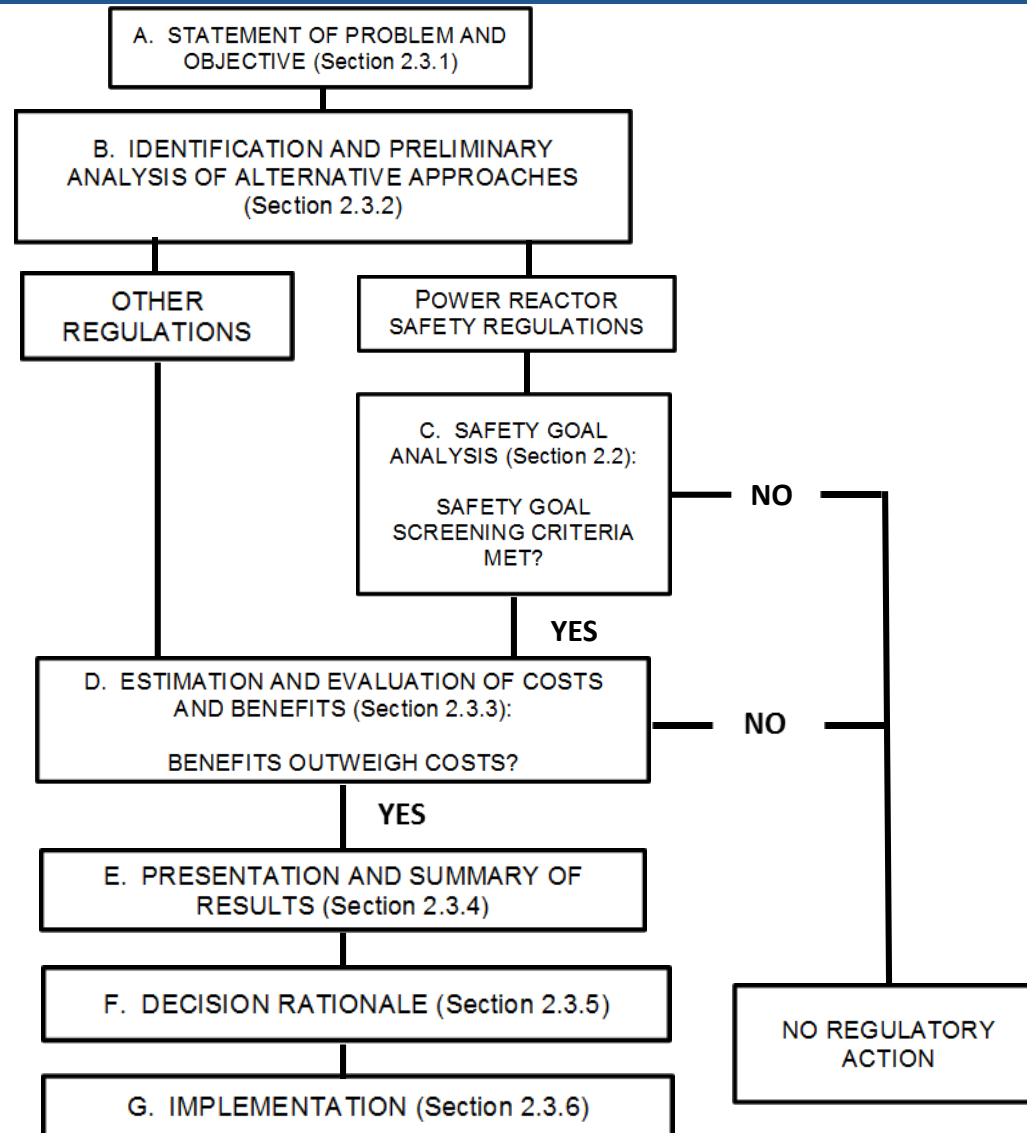
## **Regulatory analyses are performed for:**

- Rules
- Bulletins
- Generic Letters
- Regulatory Guides
- Orders
- Standard Review Plans
- Standard Technical Specifications
- Branch Technical Positions

## **Regulatory analyses are not performed for:**

- Licensing Actions
- Topical Reports
- Regulatory Issue Summaries
- Information Notices
- Policy Statements
- Inspection Reports
- Generic Letters (transmittal of information)

# Steps for Conducting a Regulatory Analysis



# Attributes Considered in Regulatory and Cost-Benefit Analyses

---

- Public Health (Accident)
- Public Health (Routine)
- Occupational Health (Accident)
- Occupational Health (Routine)
- Offsite Property
- Onsite Property
- Industry Implementation
- Industry Operation
- NRC Implementation
- NRC Operation
- Other Government
- General Population
- Improvements in Knowledge
- Regulatory Efficiency
- Safeguards and Security Considerations
- Environmental Considerations
- Other Considerations

# Estimation of Costs and Benefits

---

To the extent applicable, attributes to be assessed include the following:

## **Cost estimates:**

- costs to licensees
- costs to the NRC
- costs to State, local, or tribal governments
- adverse effects on health, safety, or the natural environment
- adverse effects on regulatory efficiency or scientific knowledge needed for regulatory purposes
- adverse effects on the efficient functioning of the economy and private markets

## **Benefit estimates:**

- reductions in public and occupational radiation exposure
- enhancements to health, safety, or the natural environment
- averted onsite impacts
- averted offsite property damage
- savings to licensees
- savings to the NRC
- savings to State, local, or tribal governments
- improved plant availability
- promotion of the efficient functioning of the economy
- reductions in safeguards risks



# Safety Goal Screening Criteria

Change in Core Damage Frequency ( $\Delta$ CDF)/RY	$1 \times 10^{-3}$	Proceed To Cost-Benefit Portion of Regulatory Analysis	Proceed to Cost-Benefit Portion of Regulatory Analysis* (Priority)
	$1 \times 10^{-4}$	Management Decision Whether to Proceed with Cost-Benefit Portion of Regulatory Analysis	Proceed to Cost-Benefit Portion of Regulatory Analysis
	$1 \times 10^{-5}$		
	$1 \times 10^{-6}$	No Action Taken**	Management Decision Whether to Proceed with Cost-Benefit Portion of Regulatory Analysis
		$1 \times 10^{-2}$	$1 \times 10^{-1}$
Estimated Conditional Containment Failure Probability***			

- \* A determination is needed regarding adequate protection or compliance. The extent to which costs are considered is discussed in NUREG-1409.
- \*\* Unless an office director decides that the screening criteria do not apply (see Additional Consideration of Containment Performance)
- \*\*\* Conditional upon core damage accident that releases radionuclides into the containment (see Additional Consideration of Containment Performance)

# Backfitting and Issue Finality

---

## Regulatory analysis

- Required for all regulatory actions that involve backfitting licensed facilities and all regulatory actions that impose generic requirements
- Should account for the costs and averted costs discussed in NUREG-1409, “Backfitting Guidelines”

# National Environmental Policy Act (NEPA)

---

- Cost-benefit analysis in 10 CFR Part 51
- Environmental Justice
- Public and occupational health impact analysis



# Cost Estimating and Best Practices

---

- Incorporated best practices
- Characteristics of a high quality cost estimate
  - Credible
  - Well-documented
  - Accurate
  - Comprehensive

# Cost Estimating and Best Practices (cont'd)

---

## Improvements in cost estimating practices

- Expand guidance to incorporate cost estimating best practices
- Describe methods and procedures recommended for use in preparing cost estimates that are specific to all work
- Describe practices relative to estimating life cycle costs

# Cost Estimating and Best Practices (cont'd)

---

## Development Process

- Planning
- Inputs
- Preparation
- Review
- Reconciliation
- Documentation

# Treatment of Cost Estimate Uncertainty

---

- Past NRC Regulatory Analysis
  - Point estimates
  - Sensitivity analysis on a case-by-case basis
  - Infrequent use of uncertainty analysis
- Current Regulatory Analysis
  - Parametric estimates
  - Sensitivity and uncertainty analyses performed
  - Revised guidance reflects this new approach

# Qualitative Factors Assessment Tools

---

## This Appendix

- Establishes a structured process for when quantification is not practicable
- Provides guidance and best practices for use in evaluating qualitative factors
- Provides a number of standard methods
- Increases transparency and consistency



# Qualitative Factors Assessment Tools (cont'd)

---

## Toolkit Methods

- Qualitative Narrative
- Cost Effectiveness Analysis
- Threshold Analysis
- Bounding Analysis
- Rank-order/weight based analysis
- Maximin and Maximax Analysis
- Conjunctive and Disjunctive Analysis
- Lexicographic Analysis
- Decision Matrix
- Outranking Methods Technique

# Regulatory Analyses Related to ASME Code Changes

---

- Consensus Standards
  - May involve hundreds or thousands of individual provisions already agreed upon by industry
  - Participants have broad and varied interests
  - Consistent with the National Technology Transfer and Advancement Act
- No Proposed Change to Current Cost-Benefit Analysis Guidance

# Special Circumstances

---

- Safety goal screening
- Sunk costs
- Treatment of industry initiatives
- Criteria for the treatment of individual requirements
- Intergenerational cost-benefit assessments
- Procedural requirements



## Phase 2 Appendices

---

- Data Sources
- Historical Data
- Severe Accident Consequence Analysis
- NEPA Cost-Benefit Analysis
- Backfitting Cost-Benefit Analysis Procedures
- Morbidity
- Replacement Power Costs

# Status and Next Steps

---

- Draft NUREG/BR-0058, Revision 5 is with the Office of Nuclear Reactor Regulation (NRR) for review/concurrence
- Draft guidance document and status update is due to the Commission on February 22, 2017
- ACRS full committee meeting scheduled for March 9, 2017
- 60-day public comment period begins March 20, 2017
- Goal is to issue document for use by March 2018
- Phase 2 begins after March 2018 issuance of document

# Acronyms

---

ADAMS	Agencywide Documents Access and Management System
ALARA	As low as is reasonably achievable
ASME	American Society of Mechanical Engineers
CER	Cumulative effects of regulation
CFR	Code of Federal Regulations
DDREF	Dose and dose rate effectiveness factor
EC	Economic consequences
EDO	Office of the Executive Director for Operations
EPA	U.S. Environmental Protection Agency
FR	Federal Register
GAO	U.S. Government Accountability Office
ICRP	International Commission on Radiological Protection
IRR	Internal rate of return
MACCS	MELCOR Accident Consequence Code System
ML	Main library
NEPA	National Environmental Policy Act
NRR	Office of Nuclear Reactor Regulation
NPV	Net present value
NUREG	NRC technical report designation
OIG	Office of the Inspector General
SAMA	Severe accident mitigation alternative
SAMDA	Severe accident mitigation design alternative
SRM	Staff Requirements Memorandum
VSL	Value of a Statistical Life
WTP	Willingness to Pay

# References

---

- CRGR Charter
- GAO Audit Report, GAO-15-098
- GAO Cost Estimating and Assessment Guide, GAO-09-3SP
- ICRP 60, 1991
- ICRP 103, 2007
- NEI Cumulative Impact Case Study Analysis and Recommendations available at ML14028A455
- NUREG/BR-0058, Rev. 4 available at ML042820192
- NUREG/BR-0058, Rev. 5 available at ML17023A180
- NUREG/BR-0184 available at ML050190193
- NUREG-1409 available at ML032230247
- NUREG-1530 available at ML063470485
- NUREG-1530, Rev. 1 available at ML17018A239
- OIG Report OIG-15-A-15, Audit of NRC's Regulatory Analysis Process available at ML15175A344

## References (cont'd)

---

- SECYs
  - available at <http://www.nrc.gov/reading-rm/doc-collections/commission/> or in ADAMS
  - SECY-12-0110 available at ML12173A478
  - SECY-14-0002 available at ML13274A519
  - SECY-14-0087 available at ML14127A458
  - SECY-14-0143 available at ML14280A426
  - SRM-SECY-12-0110 available at ML13079A055
  - SRM-SECY-12-0157 available at ML13078A017
  - SRM-SECY-14-0087 available at ML15063A568