**UNITED STATES**
**NUCLEAR REGULATORY COMMISSION**
**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS**
**WASHINGTON, DC 20555 - 0001**

May 9, 2017

MEMORANDUM TO: ACRS Members

FROM: Michael R. Snodderly, Senior Staff Engineer **/RA/**
Technical Support Branch, ACRS

SUBJECT: CERTIFIED MINUTES OF THE MEETING OF THE REGULATORY POLICIES AND PRACTICES SUBCOMMITTEE ON FEBRUARY 7, 2017

The minutes for the subject meeting were certified on April 24, 2017, as the official record of the proceedings of that meeting. Copies of the certification letter and minutes are attached.

Attachment: As stated

cc w / Attachment: A. Veil
M. Banks

**UNITED STATES**
**NUCLEAR REGULATORY COMMISSION**
**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS**
**WASHINGTON, DC 20555 - 0001**

MEMORANDUM TO: Michael Snodderly, Senior Staff Engineer
Technical Support Branch
Advisory Committee on Reactor Safeguards

FROM: Harold B. Ray, Chairman
Regulatory Policies and Practices Subcommittee
Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS REGULATORY POLICES AND PRACTICES SUBCOMMITTEE ON FEBRUARY 7, 2017, IN ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting held on February 7, 2017, are an accurate record of the proceedings for that meeting.

**/RA/** **April 24, 2017**

Harold B. Ray, Chairman
Regulatory Policies and
Practices Subcommittee

Date

Certified on: April 24, 2017
Certified by: Harold Ray

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MINUTES OF THE ACRS REGULATORY POLICIES AND PRACTICES SUBCOMMITTEE
MEETING ON FEBRUARY 7, 2017

The ACRS Regulatory Policies and Practices Subcommittee held a meeting on February 7, 2017 in TWFN 2B1, 11545 Rockville Pike, Rockville, Maryland. The meeting convened at 8:30 a.m. and adjourned at 12:20 p.m.

The entire meeting was open to the public.

No written comments or requests for time to make oral statements were received from members of the public related to this meeting.

ATTENDEES

ACRS Members

Harold Ray, Chairman
Ronald Ballinger, Member
Dennis Bley, Member
Charles Brown, Member
Margaret Chu, Member
Michael Corradini, Member
Walter Kirchner, Member
Jose March-Leuba, Member
Dana Powers, Member
Joy Rempe, Member
Gordon Skillman, Member
John Stetkar, Member
Matthew Sunseri, Member
Steve Schultz, Consultant

NRC Staff

Mike Snodderly, Designated Federal Official
Louise Lund, NRR
Meena Khanna, NRR
Pamela Noto, NRR
Fred Schofer, NRR
Greg Bowman, NRR
Terry Brock, RES
Tina Ghosh, RES
Antonio Gomez, NRR
Aaron Sanders, NRR
Andrea Veil, ACRS
Donald Palmrose, NRO
Jeff Rikhoff, NRR
Antonio Gomez, NRR
Daniel Mussatti, NRO
Tom Boyce, RES
Nanette Valliere, OCM
Brian Zaleski, NSIR

Pat Santiago, RES
Alfred Hathaway, RES

Other Attendees
James Slider, Nuclear Energy Institute (NEI)
Deann Raleigh, Curtiss Wright
Jerry Bananno, NEI

SUMMARY

The purpose of the meeting was 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, "Plan for Updating the U.S. Nuclear Regulatory Commission's Cost-Benefit Guidance." The meeting transcripts are attached and contain an accurate description of the matters discussed during the meeting. The presentation slides and handouts used during the meeting are attached to these transcripts.

| SIGNIFICANT ISSUES | |
|---|---|
| Issue | Reference Pages in Transcript |
| 1. L. Lund, Director, Division of Policy and Rulemaking in the Office of Nuclear Reactor Regulation, made an introductory statement. | 10 |
| 2. Chairman Ray asked about expectations and status of Revision 1 of NUREG-1530. | 14 |
| 3. Member Stetkar asked about the availability of Appendices F through L. | 18 |
| 4. Member Powers asked if any of the new methods proposed by the staff have been used to support cost-benefit analyses associated with the Fukushima Daiichi accident and, more specifically, to the environs of Daiichi itself. | 23 |
| 5. Member Corradini asked the staff to be more specific about what parts of the SRM to SECY-12-0110 this effort responds to. | 29 |
| 6. Member Kirchner asked about the development of replacement energy guidance. | 36 |
| 7. P. Noto refers to Phase 2 as the maintenance phase. | 47 |
| 8. Member Rempe asked about retrospective reviews with regard to the revised guidance. | 48 |
| 9. Member Corradini led a discussion about the impact of the incomplete Appendices F-L versus the completed Appendices A-E. | 57 |
| 10. Member Stetkar inquired about the continued use of $1000 per person-rem value in Appendix I and Regulatory Guide 8.37. | 62 |

| | |
|---|---|
| 11. Member Powers discussed that range of monetary values used by other government agencies to avoid a human death. | 66 |
| 12. Member Corradini asked about the basis for the cancer risk coefficient of 7x10-4, including its range. | 70 |
| 13. Member Stetkar led a discussion on the consideration of uncertainties. | 78 |
| 14. Member Stetkar inquired about the possible use of a distribution to define an uncertainty range with a confidence level. | 81 |
| 15. Member Stetkar asked if the staff clearly states in the draft SECY that forwards NUREG-1530 that it is based on a sensitivity analysis and not an uncertainty analysis. | 95 |
| 16. Member Powers asked about the staff's consideration of the Health Physics Society's recommendation not to quantify the effects of doses less than a rem. | 101 |
| 17. Member Stetkar asked about the conversion factor used for immediate doses to workers onsite following an accident. | 124 |
| 18. Member Stetkar questioned whether the numerical values in Table 2-1, Table 5-1, and Table 5-2 could be misused. | 130 |
| 19. Member Stetkar asked what was meant by the confidence interval and why an 80 percent confidence interval was important. | 161 |
| 20. Member Stetkar asked if Figure C-3 in Appendix C of NUREG/BR-0058 was recreated from another document. He asserted that it may need to be adjusted. | 162 |
| 21. Chairman Ray asked the subcommittee for feedback from the Members in attendance for moving forward. | 177-180 |
| 22. The staff resumed their presentation with a discussion of qualitative factors in cost estimating and regulatory analysis. | 181 |
| 23. Chairman Ray discussed the importance of understanding avoidable costs. | 183 |
| 24. Chairman Ray asked if there were comments from the public. | 192 |
| 25. Chairman Ray adjourned the meeting. | 194 |

| ACTION ITEMS | |
|---|---|
| Action Items | Reference Pages in Transcript |
| 1. No Action Items were noted for this meeting besides support for the March 2017 full Committee Meeting. | N/A |

Documents provided to the Subcommittee

I. U.S. Nuclear Regulatory Commission, Draft SECY-17-0035, “Draft NUREG/BR-0058, Revision 5, “U.S. Nuclear Regulatory Commission Guidance on Performing Cost-Benefit Analyses,” Predecisional Draft to Support February 7, 2017 ACRS Meeting (ML17023A304)
II. U.S. Nuclear Regulatory Commission, NUREG/BR-0058, “U.S. Nuclear Regulatory Commission Guidance on Performing Cost-Benefit Analyses,” Revision 5, Predecisional Draft to Support February 7, 2017 ACRS Meeting (ML16182A369)
III. U.S. Nuclear Regulatory Commission, Draft SECY-17-XXXX, “Proposed Revision to NUREG-1530, “Reassessment of NRC’s Dollar Per Person-Rem Conversion Factor Policy,” Predecisional Draft to Support February 7, 2017 ACRS Meeting (ML16147A319)
IV. U.S. Nuclear Regulatory Commission, NUREG-1530, “Reassessment of NRC’s Dollar per Person-Rem Conversion Factor Policy,” Revision 1, Predecisional Draft to Support February 7, 2017 ACRS Meeting (ML16147A392)
V. U.S. Nuclear Regulatory Commission, Staff Requirements Memorandum, SECY-12-0110, “Consideration of Economic Consequences within the U.S. Nuclear Regulatory Commission’s Regulatory Framework,” March 20, 2013 (ML13079A055)
VI. U.S. Nuclear Regulatory Commission, SECY-14-002, “Plan For Updating the U.S. Nuclear Regulatory Commission’s Cost-Benefit Guidance,” January 2, 2014 (ML13274A495)
VII. U. S. Nuclear Regulatory Commission, SECY-14-0143, “Regulatory Gap Analysis of the NRC’s Cost-Benefit Regulations, Guidance and Practices,” December 16, 2014 (ML14280A426)
VIII. U.S. Nuclear Regulatory Commission, SECY-14-0087, “Qualitative Consideration of Factors in the Development of Regulatory Analyses and Backfit Analyses," August 14, 2014 (ML14127A451)

# 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 1-188

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

REGULATORY POLICIES AND PRACTICES SUBCOMMITTEE

+ + + + +

TUESDAY

FEBRUARY 7, 2017

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ROCKVILLE, MARYLAND

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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

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 SCHOFER, NRR

JAMES SLIDER, NEI, Public Participant

ANDREA D. VEIL, Executive Director, ACRS

*Present via telephone

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

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

what to anticipate in the future.

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

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

CHAIRMAN RAY: Here?

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

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

MEMBER STETKAR: Okay.

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

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

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

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

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

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

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

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

is a deliberately separate process addressed by NUREG-1409.

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

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

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

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

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

12-0110, the staff issued a SECY paper describing the staff's plan for updating the cost-benefit guidance. Since that time, we have met several times with this Committee to address various cost-benefit staff initiatives included in the plan that could affect cost-benefit guidance.

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

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

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

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

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

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

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

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

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

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

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

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

of Research's System Analysis Division.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CHAIRMAN RAY: Do not --

MEMBER STETKAR: It doesn't make any difference.

CHAIRMAN RAY: Not everybody is here.

MEMBER STETKAR: This is not ACRS deliberation.

MS. LUND: Okay.

MEMBER STETKAR: So please stop using that phrase.

MS. LUND: Okay.

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

MS. LUND: That is clear, and --

MEMBER STETKAR: Thank you.

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

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

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

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

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

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

MS. LUND: That's correct.

CHAIRMAN RAY: All right. I just want

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

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

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

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

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

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

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

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

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

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

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

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

MS. NOTO: Right.

MEMBER STETKAR: -- we saw.

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

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

MS. NOTO: We have --

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

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

MS. KHANNA: And if I may add --

MEMBER STETKAR: The --

MS. KHANNA: Sorry, go ahead.

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

MS. NOTO: E.

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

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

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

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

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

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

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

MEMBER STETKAR: Yes. Yes.

MR. SCHOFER: Okay.

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

MR. SCHOFER: No. I --

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

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

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

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

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

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

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

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

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

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

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

coordination with other Commission-directed tasks.

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

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

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

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

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

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

because --

MEMBER POWERS: And that's --

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

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

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

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

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

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

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

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

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

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

MEMBER STETKAR: Fred, don't use acronyms.

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

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

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

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

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

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

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

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

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

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

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

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

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

MR. SCHOFER: Okay. Thank you for that.

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

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

MEMBER POWERS: You have no idea how

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

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

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

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

MEMBER STETKAR: And that's --

MS. KHANNA: -- we get that information.

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

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

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

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

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

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

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

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

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

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

MR. SCHOFER: I'll take that.

MS. NOTO: Yes sir.

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

MEMBER CORRADINI: Regardless of --

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

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

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

MEMBER CORRADINI: Right.

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

MEMBER CORRADINI: So then, Phase 1 of

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

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

MR. SCHOFER: Correct.

MEMBER CORRADINI: Okay.

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

MEMBER CORRADINI: Okay, fine. Thank you.

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

MR. SCHOFER: All right?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

activities.

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

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

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

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

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

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

The scope, reg analysis, and guidance of

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

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

MEMBER KIRCHNER: Before you go on --

MS. NOTO: I'm sorry?

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

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

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

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

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

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

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

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

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

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

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

MR. SCHOFER: Correct.

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

MR. SCHOFER: That is correct.

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

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

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

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

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

scenario that we're considering.

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

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

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

MR. SCHOFER: It's a political decision.

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

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

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

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

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

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

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

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

And doing it in comparison to other

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

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

MR. SCHOFER: And that --

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MS. NOTO: Correct.

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

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

MS. NOTO: Okay. 1409 is backfitting.

MEMBER CORRADINI: So it's a

calculational procedure for backfitting, strictly?

MS. NOTO: Is that all of this?

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

MEMBER CORRADINI: Okay. And so 0184 is --

MR. SCHOFER: 0184 is a technical handbook that provides a lot of data --

MEMBER CORRADINI: Okay, fine.

MR. SCHOFER: -- with regard to, you know, max runs and --

MEMBER CORRADINI: Okay.

MR. SCHOFER: So it's a data handbook for all intents and purposes.

MEMBER CORRADINI: Right. Okay. Thank you.

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

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

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

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

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

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

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

MS. NOTO: Yes.

MEMBER KIRCHNER: Thank you.

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

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

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

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

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

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

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

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

MS. NOTO: Time frame.

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

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

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

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

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

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

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

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

MEMBER REMPE: 30.

MS. NOTO: -- 30.

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

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

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

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

wouldn't, was going to be high enough.

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

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

MEMBER REMPE: Okay.

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

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

MR. SCHOFER: A percentage versus magnitudes.

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

MR. SCHOFER: In every recent decision.

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

prior decisions?

MR. SCHOFER: There isn't.

MEMBER REMPE: Okay.

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

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

MEMBER REMPE: Okay. Thanks.

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

MR. SCHOFER: I'm trying to --

MEMBER SKILLMAN: Making a change --

MR. SCHOFER: -- process your question.

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

coordinated so that the change you make in this document and the change you make in that document and the change that you make in this policy are all heading in the same decision are heading in the same direction.

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

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

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

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

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

center of expertise.

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

MEMBER SKILLMAN: Thank you. Thank you.

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

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

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

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

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

MR. SCHOFER: But all of the experience

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER CORRADINI: I just want to

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

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

MEMBER CORRADINI: Yes?

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

MEMBER CORRADINI: Okay, but --

MS. NOTO: -- you are --

MEMBER CORRADINI: -- not all --

MS. NOTO: -- correct.

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

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

MEMBER CORRADINI: Okay. So --

MS. GHOSH: So these are just --

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

L? I am looking at the --

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

MEMBER CORRADINI: -- cheat sheet --

MS. GHOSH: -- right, you --

MEMBER CORRADINI: -- to the Commissioners --

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

MEMBER CORRADINI: -- which explains --

MS. NOTO: -- to these boxes.

MEMBER CORRADINI: -- all this.

MS. NOTO: Okay. Yes --

MS. GHOSH: Yes --

MS. NOTO: -- we just haven't appropriately titled things. These just represent technical areas that will become appendices as appropriate.

MEMBER CORRADINI: So -- so somewhere in the little boxes are all included in F through L? I want to understand this.

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

MEMBER CORRADINI: A through L, but as I understood as I read A through E, a lot of this is qualitative. What I heard they were administrative,

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

MS. NOTO: Correct.

MEMBER CORRADINI: Okay.

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

MEMBER CORRADINI: Okay. Fine. Thank you.

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

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

Two public meetings were --

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

MS. NOTO: They were ACRS --

MEMBER STETKAR: Full --

MS. NOTO: -- Full Committee meetings.

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

MEMBER STETKAR: Okay, sorry.

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

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

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

MEMBER REMPE: Well, I would like to --

CHAIRMAN RAY: All right.

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

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

CHAIRMAN RAY: Thank you.

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

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

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

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

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

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

MEMBER STETKAR: Tina, can I interrupt just --

MS. GHOSH: Yes.

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

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

rule --

MEMBER STETKAR: Well --

MS. GHOSH: -- so you would --

MEMBER STETKAR: -- aren't we --

MS. GHOSH: -- need a --

MEMBER STETKAR: -- going to change the rule, then, if it is wrong?

MS. GHOSH: You would need a rule change to update it.

MEMBER STETKAR: Aren't we going to change the rule if it is wrong?

MS. GHOSH: So I think there is some justification provided in NUREG-1530 about why perhaps it is not being pursued. This is for routine effluent releases from power plants. There are limits on how, you know, high it can go in the first place, so it is basically ALARA. You are looking for ALARA to improve, you know, routine releases from very, very, you know, very, very small amounts to maybe potentially even smaller amounts, so I can't answer if that rule change is going to be pursued. I don't know --

MEMBER STETKAR: I --

MS. GHOSH: -- of any --

MEMBER STETKAR: -- I made --

MS. GHOSH: -- plans.

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

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

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

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

So over time -- so the --

MEMBER KIRCHNER: I hate to interrupt, but --

MS. GHOSH: Yes.

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

MS. GHOSH: Yes, so --

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

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

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

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

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

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

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

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

MR. SCHULTZ: Just a point.

MS. GHOSH: Yes.

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

MS. GHOSH: Yes.

MR. SCHULTZ: -- at that point.

MS. GHOSH: Right.

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

MS. GHOSH: Right.

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

MS. GHOSH: Yes.

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

MS. GHOSH: Right.

MR. SCHULTZ: -- decision-making --

MS. GHOSH: Right.

MR. SCHULTZ: -- and pronouncement.

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

So then in 2009, it had been some time

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

Okay. So how is the dollar per person-rem actually calculated? The NRC multiplies a current value of a statistical life by a cancer risk coefficient, and we'll talk a little bit about what does value of statistical life mean in a couple of slides. In NUREG-1530 from 1995, we used a VSL, that is value of statistical life, of $3 million, and a cancer risk coefficient of 7x10^(-4) per person-rem, and that was based on the International Commission on Radiological Protection, or ICRP, 60 report, which was published in 1991, and multiplying those two factors together, rounded to the nearest thousand, gave us $2000 per person-rem.

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

MEMBER CORRADINI: Can I ask a question? Since this is not an area that I am knowledgeable about, the 7x10^(-4) --

MS. GHOSH: Yes.

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

MS. GHOSH: Yes.

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

MS. GHOSH: Yes, so --

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

MS. GHOSH: Yes, epidemiological, right --

MEMBER CORRADINI: Thank you very much -- estimate.

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

MEMBER CORRADINI: Okay. Fine.

MS. GHOSH: -- in 1991.

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

MS. GHOSH: You know --

MEMBER CORRADINI: I am struggling --

MS. GHOSH: -- yes --

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

MS. GHOSH: Yes.

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

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

MEMBER CORRADINI: Okay.

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

MEMBER CORRADINI: Okay.

MS. GHOSH: So there is a lot of

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

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

(Laughter.)

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

MS. GHOSH: Exactly.

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

MS. GHOSH: That is exactly --

MR. SCHULTZ: -- and so forth?

MS. GHOSH: -- right. So --

MR. SCHULTZ: Okay.

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

MR. SCHULTZ: It is selected --

MS. GHOSH: -- growth.

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

MS. GHOSH: Exactly.

MR. SCHULTZ: -- augmented. Thank you.

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

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

MS. GHOSH: There has.

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

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

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

MS. GHOSH: Yes.

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

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

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

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

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

MEMBER CORRADINI: So --

MS. GHOSH: -- in a subsequent slide.

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

MS. GHOSH: Yes.

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

MS. GHOSH: Yes.

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

MS. GHOSH: Yes, it is.

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

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

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

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

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

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

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

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

MR. SCHULTZ: Excuse me --

MS. GHOSH: Yes?

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

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

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

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

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

Okay.

MEMBER STETKAR: Okay, wait.

MS. GHOSH: Yes?

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

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

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

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

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

MEMBER STETKAR: Yes.

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

MEMBER STETKAR: No, no, no --

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

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

MS. GHOSH: Sorry.

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

MEMBER KIRCHNER: Yes.

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

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

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

MS. GHOSH: What we're --

MEMBER STETKAR: So what did you -- why

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

MS. GHOSH: Yes --

MEMBER STETKAR: -- estimate.

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

MEMBER STETKAR: Okay.

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

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

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

MEMBER STETKAR: No --

MS. GHOSH: -- this is for --

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

And you have to provide me some distribution between those.

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

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

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

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

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

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

MEMBER CORRADINI: John --

MEMBER STETKAR: -- for that.

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

MEMBER STETKAR: I am.

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

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

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

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

MEMBER STETKAR: They are values that the Nuclear --

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

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

MEMBER KIRCHNER: Sorry.

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

MEMBER STETKAR: So go to the next slide.

CHAIRMAN RAY: -- staff.

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

MS. GHOSH: Okay. So the cancer risk coefficient, and I think we already mentioned this, that the NUREG-1530 from 1995 used the ICRP 60 cancer risk coefficient, which was 7x10^(-4) per person-rem, which included morbidity and heredity effects. It wasn't just the cancer mortality, but all cancer incidents and heredity effects. And the 2007 update in ICRP 103 presents an updated cancer

risk coefficient representing the same thing, so not just mortality, but everything, of 5.7x10^(-4) per person-rem.

In 2011, the EPA published a cancer mortality risk coefficient of 5.x10^(-4) per person-rem, and this is for mortality only, so it is cancer mortality only, and they reported a 90 percent confidence interval of 2.8x10^(-4) to 1x10^(-3).

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

MS. GHOSH: Yes. They are --

MEMBER STETKAR: It is.

MS. GHOSH: And they --

MEMBER STETKAR: That's just a --

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

MEMBER STETKAR: -- statement of fact.

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

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

MS. GHOSH: Yes.

MEMBER STETKAR: -- parameters.

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

MEMBER STETKAR: That is -- that is --

MEMBER POWERS: -- of distributions.

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

(Laughter.)

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

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

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

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

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

So then the dollar per person-rem value, actually we talked about this before. It is -- it is a simple formula. We're basically multiplying the estimates for the value of a statistical life times the cancer mortality risk coefficient in order to get the dollar per person-rem conversion factor, so with our updated best estimates, that is $9 million times 5.8x10^(-4) per person-rem. That is how we get $5200 per person-rem for the best estimate.

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

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

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

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

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

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

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

MEMBER CORRADINI: Thank you.

(Laughter.)

MEMBER POWERS: And this is a whole body dose.

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

MS. GHOSH: Yes, so actually, thank you

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

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

MS. GHOSH: Yes.

MEMBER MARCH-LEUBA: -- cost.

MS. GHOSH: Yes, so stay tuned --

MEMBER MARCH-LEUBA: It is not --

MS. GHOSH: -- for that.

MEMBER MARCH-LEUBA: -- insignificant.

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

MEMBER MARCH-LEUBA: And --

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

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

society is willing to pay --

MS. GHOSH: Yes.

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

MS. GHOSH: Yes.

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

MS. GHOSH: Yes.

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

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

MEMBER MARCH-LEUBA: Correct.

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

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

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

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

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

MEMBER MARCH-LEUBA: That is real cost.

This is imaginary.

MEMBER POWERS: Well, the --

MEMBER MARCH-LEUBA: And I will shut up.

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

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

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

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

MEMBER MARCH-LEUBA: You could argue with it.

MEMBER POWERS: You can argue, but the

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

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

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

(Laughter.)

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

MEMBER POWERS: And that is --

MS. GHOSH: -- acceptable going --

MEMBER POWERS: I mean --

MS. GHOSH: -- forward.

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

MR. SCHULTZ: Tina, we have on this

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

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

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

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

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

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

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

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

MEMBER STETKAR: I need to --

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

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

MR. SCHULTZ: Right.

MEMBER CORRADINI: Before John comes

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

MS. GHOSH: Oh, okay.

MEMBER CORRADINI: Okay.

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

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

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

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

CHAIRMAN RAY: Please proceed.

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

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

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

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

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

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

We also say that we would inform the

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

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

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

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

MS. GHOSH: Two slides, sure.

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

MS. GHOSH: Okay.

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

product or the VSL times the mortality risk coefficient?

MS. GHOSH: Yes, yes.

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

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

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

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

in accordance with the product and it does not.

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

MEMBER SKILLMAN: Thank you.

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

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

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

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

dose rate regimes.

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

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

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

(Simultaneous speaking.)

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

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

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

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

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

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

I mean you could say, yes, we recognize

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

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

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

MEMBER POWERS: It would be.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CHAIRMAN RAY: Well, actually --

MS. GHOSH: Yes, sorry?

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

MS. GHOSH: Okay.

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

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

And the way that is phrased I think is

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

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

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

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

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

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

MS. GHOSH: Yes. I think --

(Simultaneous speaking.)

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

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

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

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

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

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

(Simultaneous speaking.)

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

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

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

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

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

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

resumed at 10:40 a.m.)

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

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

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

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

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

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

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

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

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

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

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

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

CHAIRMAN RAY: Fourteen, what's the number?

MS. NOTO: 09, backfitting?

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

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

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

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

cost.

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

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

CHAIRMAN RAY: Thank you.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

No statute, NRC regulation, or Executive

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

those.

MEMBER CHU: Can I ask a real quick question?

MR. GOMEZ: Yes.

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

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

MEMBER CHU: The same?

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

MEMBER CHU: Okay, thank you.

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

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

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

calculation for each alternative.

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

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

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

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

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

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

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

For example, let's go ahead and look at some of these. This attribute measures expected changes in radiation exposures for the public due to changes in accident frequencies or accident consequences associated with the proposed action. In most cases the effect on the proposed action would be on public exposures.

Let's move to another example, public health routine. This attribute accounts for changes in radiation exposures for the public during normal

facility operations, that is non-accident situations.

When used this attribute would employ an actual estimate because accident probabilities are not involved in this.

Let's go on to the next one, occupational health accident. This attribute accounts for health effects both immediate and long-term associated with site workers, that would be both plant personnel and external workers that would be brought in to assist in the plant in response to an accident as a result of changes in accident frequency or accident mitigation.

MEMBER STETKAR: Antonio, can I stop you right there --

MR. GOMEZ: Yes, yes.

MEMBER STETKAR: -- because there is no other place I can ask this question so I'll ask it now.

MR. GOMEZ: Oh, okay, sure.

MEMBER STETKAR: In the guidance for quantifying occupational health effects due to an accident there is the infamous dollar per person rem conversion factor. There are equations for immediate doses and long-term doses and the same

dollar per person rem conversion factor is used for both.

Why for immediate doses to workers onsite following an accident isn't the higher conversion factor from NUREG-1530 used, because my suspicion is that at least a number of those workers are going to get the higher dose rates over shorter periods of time that NUREG-1530 explicitly addresses that factor of one-and-a-half?

So why do you use the long-term averaged conversion factor for those immediate doses to onsite workers after an accident?

MR. SCHOFER: Fred Schofer. You are correct. If it turns out that the dose received is above 20 rem or a high dose rate field we would use the higher conversion factor, yes.

MEMBER STETKAR: There is no guidance in this report. If I was going to use this report there is nothing in this report that tells me to do that.

MR. GOMEZ: You're saying it's not clear and we shouldn't use it and we should --

MEMBER STETKAR: There is simple equations that says for immediate doses Z-I-O equals R-Y-I-O, and for long-term doses Z-L-T-O equals R-Y-

L-T-O and dollar R is the same dollar per person rem conversion factor.

There is nothing in the guidance that says for those people I would expect to get much higher doses, use a different R value.

MR. SCHOFER: Yes, and more likely that equation was a carryover from the past.

MEMBER STETKAR: Okay.

MR. SCHOFER: Likewise, we didn't have the DDREF that we are talking about in the revision to 1530 in the past so we probably need to reevaluate that equation.

MEMBER STETKAR: Thank you. Sorry, that was the only place I could that one in.

MR. GOMEZ: No, that's fine, that's fine. All right, let's move on to economic consequences, offsite property.

This attribute measures the expected total monetary effects on offsite property resulting from the proposed action. Changes to economic consequences can take various forms, that is both direct, for example, land, food, and water, and indirect, tourism.

This attribute is typically the product of a change in accident frequency and of property

consequences resulting in the occurrence of an accident, for example, cost of interdiction measures such as decontamination, cleanup, and evacuation.

Moving to offsite property, this attribute measures all consequences of an accident that arise when a facility's boundaries an area controlled by the licensee.

The expected monetary effects of offsite property include replacement power for power reactors, decontamination, and refurbishment costs. This attribute is typically the product of the change in accident frequency and the onsite property consequences in the event of an accident.

For industry implementation, this impacts the accounts project net economic benefit on the effected licensees to install or replace mandated changes.

Costs will include procedural and administration activities, equipment, labor, materials, and shutdown costs, including the cost of replacement power in the case of power reactors.

For industry operation this attribute measures the projected net economic effect due to routine and recurring activities required of the proposed action on all affected licensees, if

applicable, replacement power costs for the power reactors only, directly attributable to the proposed action will be included.

Now we're moving for the NRC. For NRC implementation this attribute measures the projected net economic benefit on the NRC to place a proposed action into operation.

I would like to state that costs already incurred, including all pre-decisional activities performed by the NRC are viewed as sunk costs and are not to be included, because you don't include sunk costs.

The NRC may seek compensation from affected licensees to provide needed services. Any fees provided by licensees are viewed as transfer payments.

For NRC operation this attribute measures the projected net economic effect on the NRC after proposed action is implemented. Additional inspection, evaluation, or enforcement activities would be examples of these costs.

Note that, as I have stated before, we are evaluating incremental costs for an RA. Okay, when we perform an RA we are comparing the as-is status quo condition to the alternatives.

Incremental costs are the difference in the cost between the status quo and the alternatives.

Let's move on to the next slide, Estimation of Costs and Benefits. Costs and benefits are estimated in relation to the baseline case, which I have also said it's the no action or status quo alternative.

When establishing the regulatory baseline an assumption is made about existing NRC and agreement state requirements and other written license commitments are already being implemented and that the cost plus benefits associated with these requirements are not part of the enumerated estimates prepared for the RA.

These are some examples of the costs and benefits that are shown on this slide. Go on to the next slide, Safety Goals Screening Criteria. The safety goal evaluation is intended to determine whether the residual risk is already acceptably low that a regulatory requirement should not be imposed generically on nuclear power plants.

The intent is to eliminate some proposed requirements and for the consideration independently of whether they should be justified on RA on their net value basis.

The evaluation of the core damage frequency, CDF reduction, provides a calibration on the significance of proposed regulatory action. If the initiative results in a small change in the CDF, that it's less than 1 times 10 to the minus 5 per reactor here the RA should more than likely proceed only of alternative justification for the proposed requirement can be formulated.

The NRC's philosophy for safety goal evaluations involve a concept of defense-in-depth and a balance between prevention and mitigation. The safety goal evaluation focuses on accident prevention, that is on issues intended to reduce core damage frequency.

However, to achieve a measure of balance between prevention and mitigation the safety goal screening criteria established for these evaluations include a mechanism to use when relatively poor containment performance results in the need for greater consideration of issues and associated accident sequences.

MEMBER STETKAR: Antonio, let me stop you there because I have several questions here.

MR. GOMEZ: Yes.

MEMBER STETKAR: In the interest of time

I'll just try to hit a few highlights. First of all the implications are that we will never be able to justify any regulatory actions for new reactors because all of them publish total core damage frequencies and large early release frequency -- total core damage frequencies well below 10 to the minus 5 per year so the increase will never meet these criteria and large early release frequencies that are well below 10 to the minus 6 or 7 or whatever.

MR. GOMEZ: That's correct.

MEMBER STETKAR: So we'll never be able to justify anything according to these very narrowly-defined criteria that are based on our evaluation of plants that were operating in the 1980s as they were configured in the 1980s.

So it's always been curious to me why we institutionalize these precise numbers forever. That's a philosophical issue. A practical concern that I have is that the NUREG contains a few tables that have numbers in them, in particular Table 2-1, Table 5-1, and Table 5-2.

2-1 is snapshots of internal event at full power, core damage frequencies derived from PRAs that were submitted over a range of times.

Tables 5-1 and 5-2, 5-1 is release frequencies from the five plants that were evaluated in NUREG-1150 and then 5-2 is some sort of frequency-weighted, an amalgamation of those release frequencies, and I don't know why, why do we have those tables of numbers in this NUREG, because they scream for misuse.

I think that there should be guidance, this is my opinion. There should certainly be guidance for someone who is going to do an analysis, and, in fact, subcommittees of the ACRS and the full committee have seen analyses that have been done that are quite well thought out in terms of looking at a particular class of reactors, what their internal event core damage frequency might be using the best available current information.

Scaling or additions for internal fires, internal floods, which are not included in those tabulations, external events, seismic events, external flooding and so forth, there certainly should be guidance for places for people to look for in how to do those analyses, but tabulating those numbers just begs somebody to say I picked this number from this table and that's what I am going to use.

And certainly the large early release frequencies and the frequency-weighted stuff in Table 5-2 are totally unjustified, so why do we need to carry that stuff forward rather than having guidance?

You have now appendices, why don't we have an appendix that says those of you who are going to do accident analyses here are some sources of information that you can go look for, not tables of numbers, but go look at these things, and here is kind of how to do that.

MR. SCHOFER: Yes, thank you for that question. And in actuality, Appendix H I believe it is --

MEMBER STETKAR: Yes.

MR. SCHOFER: -- severe accidents, the whole purpose is to do just that. However --

MEMBER STETKAR: That's good because I read the whole appendix and it was pretty short right now.

(Laughter.)

MR. SCHOFER: Kind of. I mean because it's all new and it's doing an update of all the analyses that we have done, you know.

MEMBER STETKAR: But, again, until we --

You know, until that appendix gets generated my recommendation is be cautious about just tabulating numbers, that somebody can read row and column and I pick this number and therefore it applies to all BWRs with Mark-1 containments regardless of what the issue is.

And if you are going to do that why have these tables in the main body of the NUREG which will essentially be more difficult for people to miss, to use.

CHAIRMAN RAY: Let me be a contrarian here and say that I think we should spend enough time that everybody is satisfied with John's comment because we need to come to some conclusion about this.

Tony has been doing a terrific job of catching up but I think this is an area that I want to make sure all the members are satisfied they understand what John is pursuing and the response of the staff.

So if anybody has any, wants to follow-up go ahead.

MEMBER STETKAR: There were a couple of issues. One is the philosophical issue about this particular chart. The other one is regardless of

this chart why are we putting tables of numbers in the body of the NUREG if in fact an appendix is going to provide practical guidance for someone doing an analysis or how to think about accidents, whether it's core damage frequency or release frequency or contributors.

CHAIRMAN RAY: Tina is at the microphone.

MS. GHOSH: Yes, this is Tina Ghosh again from NRC's Office of Research. Just so you know we already put quite a bit of thought into how to update those tables.

We recognize that they are terribly out of date and we struggled on the working group with a variety of questions to the point where we ran out of time and we couldn't get the updates in in this version because there are deep questions that we are struggling with, you know, with regard to what sources of information can we use to update those tables, you know, where is it appropriate.

So at a minimum I can tell you that right now in the planned Appendix H we plan to have a discussion of if you were to do what is called a standard analysis where as a first cut you would take some screening values for our inputs, we're

going to have that updated and we are trying to develop that updated information and approach to include in Appendix H.

For now in the body of NUREG-0058 we kept those tables but we are still struggling with the questions of what exactly should be the context of those tables, because we recognize that especially with 5-1 and 5-2 those numbers are terribly outdated at this point but we ran out of time, so we didn't have a replacement.

MEMBER STETKAR: Okay, Tina, but, again, listen to what I am saying.

MS. GHOSH: Okay.

MEMBER STETKAR: I am saying take out tables and numbers, do not publish tables and numbers, provide guidance and source references so if I am going to do an analysis and it says here are some references, contemporary references, that might be updated as life progresses.

If I wanted, for example, to look at estimates of internal event core damage frequencies for a class of pressurized water reactors, here is a set of references to go look for.

If I wanted to look at people doing fire analyses, it may not make any difference whether

it's a boiler or pressurized water reactor, it might make a difference, here are some references to look for there, and so forth, flooding analyses, seismic analyses, and so forth.

But don't put tables of numbers in there that you'll run into the problem of how do I update that number and what is the most contemporary number and how do I change that table and provide more guidance about look for this, look for that, here are places you can go look, and make sure you cover things like contributions from seismic, which might have conditional containment failure probabilities of like one, and things like that so that when you do the analysis the analyst will have a library of reference material rather than just kind of looking at a table, reading a row and a column and picking a number and say, well, I didn't have to think because they told me what number to use.

MR. SCHOFER: And that is our planned end state.

MEMBER STETKAR: Okay.

MR. SCHOFER: The reason that that table is still in there is to get to that end state I wanted some data available that one might be able to do a calculation to kind of figure out what the

significance is before you start getting into a full analysis, so fundamentally it's intended for that purpose.

MEMBER STETKAR: My approach to life would be is if Appendix H is blank I would have taken the tables out of there and said go look at Appendix H.

MR. SCHOFER: I thought about that, yes.

MEMBER STETKAR: Appendix H contains the guidance for how you do this kind of thing.

MR. SCHULTZ: And that would be a good place to put this information and perhaps just summarize it rather than plant-by-plant name and information.

MEMBER STETKAR: Yes.

MR. SCHULTZ: It's just if you want to have a separate discussion in the appendix associated with values that can be used to get started in a sense, or to be used in a first cut analysis then that would be an appropriate -- It's still appropriate to put it in the appendix.

MR. SCHOFER: Yes.

MEMBER STETKAR: It's also consistent with the philosophy that you heard earlier that it is easier to update appendices than necessarily to

reissue the entire NUREG itself as more information, people do more fire analyses, people do more seismic and flooding analyses, outside of Fukushima they will become sources of reference information that people can use.

CHAIRMAN RAY: Dennis, do you want to comment?

MEMBER BLEY: I did. This is a Subcommittee meeting. You are not getting advice from the committee and as much as I agree with what I have heard here you get rid of all that stuff and the next time you come in somebody will say, hey, you need some examples in here so we can figure out what to do with this stuff.

So however you put it together, I kind of agree, avoiding things that people can specifically snatch and think they are doing the right thing when they are doing the wrong thing, be a little careful of that.

CHAIRMAN RAY: Well as it stands now, and I don't know if we have covered this before you came Dennis, this is intended to be on the March, not the one before, but this one, the March Full Committee.

MEMBER BLEY: Right.

CHAIRMAN RAY: We will have PNP later this week to talk about what the scope exactly will be of what's done at the Full Committee and then whatever happens after that is yet to be determined.

But this isn't the only input on 58 and maybe not on 1530, that's yet to be discussed. So please proceed.

MR. GOMEZ: Okay. All right, let's go ahead and move on to the next slide, Backfitting and Issue Finality. I'll be very brief on this one.

10 CFR 50.109 is what requires us to do backfits. We apply the same cost estimating techniques to backfits that we apply to RAs and NEPA. The message here is that if you have a backfitting issue or imposing generic requirements you have to have an RA.

Okay, let's move on to the next slide, NEPA. For NEPA, as I have said before, we will use the same cost benefit approach as regulatory analysis for backfits, and the reason you might be asking is why.

The reason is because the NRC uses only one document, and it's this one, NUREG/BR-0058. Note that NEPA is a procedural statute which requires a federal agency to consider the

environmental consequences of a proposed action prior to making the decision to approve or disapprove the action.

NEPA requires federal agencies to take a hard look at environmental impacts of the proposed action as well as the impacts from any reasonable alternatives to that proposed action, but also recall that this hard look is tempered by the rule of reason.

NEPA requires agencies to address only impacts that are reasonably foreseeable, not those that are remote and speculative. As a procedural statute NEPA does not mandate any particular result nor can it be the basis for the NRC to require any of its licensees to take any measures that may avoid or mitigate radiological damage to offsite property.

While the NRC does have this authority it derives it from the Atomic Energy Act, not NEPA. For the second bullet, Environmental Justice, note that there are no environmental justice regulations.

What that is is it's an Executive Order, and that's EO-12898, issued in 1994 and supported by Commission policy, that's 69-FR-52040, which was published in 2004, and it's also backed up by office guidance in NRR and NMSS.

For design certification under 51.55(a) it states "the environmental report plus the risk of costs and benefits of severe accident mitigation design alternatives and the basis for not incorporating severe accident mitigation design alternatives to be certified." Are there any questions?

(No audible response.)

MR. GOMEZ: Good. I will now de-accelerate from Warp 9. I will turn it over now to Aaron.

MR. SANDERS: Hello, my name is Aaron Sanders. I'm also a cross analyst here at the NRC in the rulemaking branch of NRR. And I'll be discussing the slides which represent the five drafted appendices, not the outlined ones but the drafted ones A through E for this update.

So the first appendix I'm going to discuss is cost estimation is the topic of the first appendix. And updating and revising our cost estimating procedures at the NRC, we incorporated best practices in large part from GAO, OIG, and NEI.

OIG and NEI's recommendations were discussed earlier by Pam. I would go a little further into the four sub-bullets here from GAO that

are shown on the slide.

Credible means essentially that we take into account limitations of the analysis due to uncertainty or biases around data and assumptions. Further, it means we need to determine the sensitivities of the outcomes to the input parameters. And finally, it recommends an independent cost estimate to see if other methods yield different results.

Well documented means that data are tracked back to the source documentation. There's a technical baseline description. All steps in developing the estimate are documented so a different cost analyst can recreate it with the same result, and the analysis also documents how the data was normalized and describes in full the methodology used for each work break-down structure element.

Accurate means that estimates are not overly conservative or optimistic, adjusted for inflation, and contain few mistakes, if any, if I can be so optimistic.

Estimates are revised when schedules change, and clearly to verify the accuracy of a model, it must be thoroughly understood by the reviewer which again highlights the importance of it

being well documented.

And finally, cost estimates need to be comprehensive. Analysts must insure all costs are taken into account, all elements included and not double counted. All cost influencing ground rules and assumptions must be detailed, and the work breakdown structure must be fully defined and described.

And that's this slide. In order to improve our cost estimating, we've revised and expanded the items, this new reg we're currently discussing, to incorporate these best practices.

In this cost estimating appendix, several methods and procedures are described such as engineering buildup which is a type of activity base costing commonly understood and frequently used.

Activities are separated into detail tasks with labor hours, material costs, equipment costs, and subcontract costs. Analysts are also instructed to use parametric estimating techniques where you develop a statistical relationship between historical costs and program physical and performance characteristics.

This method is sometimes called a top-down approach. Types of physical characteristics

used in parametric estimating are weight, power, lines of code, that sort of variable.

Other program and performance characteristics may include site deployment plans for IT installations, maintenance plans, test and evaluation schedules, technical performance measures and crew size.

It requires access to historical data which could be difficult to obtain. So you have to, for each factor in your cost estimating you need to determine what the best technique is.

If the data are available, they can be used to determine the cost drivers and to provide statistical results and can be adjusted to meet the requirements of the new program.

In addition, analysts can also use analogies to produce cost elements if one element is like another known element or a scale estimate for similar elements that are of different sizes.

Unlike parametric estimating, an analogy relies on data from perhaps a single program and covers a narrow range. And also in this appendix are practices for estimating life cycle costs, in other words, cost elements that have a cost over time in addition to potentially an initial

investment.

Net present value calculations are described in this appendix along with discount rates for the analysts to use such as three percent which covers inflation and typical economic growth, and seven percent which also includes typical capital investment gains for businesses.

Along with these principles, the selection of the proper time horizon is discussed based on the expected duration of the activities and the work breakdown structure. For example, the ASME code cases have three year lifetimes.

We typically extent each one for one extension, so a total of six years would be a lifetime for that. Other regulations might use the average expected remaining reactor life, or each reactor on an individual basis depending on what factor you're assessing.

Understanding all these aspects of life cycle costs is critical to accurate cost estimating. The next slide?

And the appendix goes into the development process for cost estimate. These are relatively self-explanatory, so I'll try to go quickly. Planning is essentially when an estimate's

needed, who's going to prepare it, what input sources you'll use, how you're going to determine the scope, and what estimating techniques you think you'll use.

And then you determine your inputs like the sources of cost estimate data and the development considerations. And you're ready to prepare the cost estimate starting with development of your work breakdown structure, collecting, validating and adjusting data, selecting methods and models for estimating, and estimating the actual cost, doing the actual work, and conducting uncertainty analyses and presenting the results.

When the cost estimate is prepared, we have an established review and concurrence process at the NRC. May personnel will be looking at your estimate, so it's typically an iterative process towards estimate, reconciliation.

During the process of review and reconciliation, an independent cost estimate may be performed. This is a good time for that to be conducted. You'll make conforming changes as a result of the feedback you receive, and all your assumptions need to continually be analyzed as you make changes to make sure you're still working in

the right direction and you haven't become sidelined.

And finally, it's time to document the cost estimate package. This is essentially here at the NRC placing it into an RA, a regulatory analysis. Usually they're developed in parallel, but this is the time when I'll describe it.

It should be detailed enough to provide an accurate assessment of the quality, it should identify your data sources, justify all assumptions, and describe the methods for the work breakdown structure cost elements.

Milestones and deliverables need to be consistent and traceable, and estimating methods should be thoroughly documented for replication, verification, and updating.

So that's the process appendix.

MEMBER KIRCHNER: I have a question.

MR. SANDERS: Yes?

MEMBER KIRCHNER: When would you do an independent cost estimate? Is it based on complexity or total cost estimate from the first steps? Or is it just management judgement?

MR. SANDERS: That's a good question.

MEMBER KIRCHNER: Which is a good

answer.

MR. SCHOFER: It is management judgement. It is an identified good practice that's provide the GAO and their guidance. But in practice, we tend to have a lot of moving parts, especially when you're looking at new regulations.

There's, you know, quite a bit of changes that go all the way through in terms of, let's say proposed role, or even in the reg basis stage. So to do independent cost estimates, you know, contracted out, are difficult because of that change.

However, as part of the review process, one might do an order of magnitude estimate to check the validity of the estimate that they're reviewing, and that also would fulfill that function. But a traditional independent cost estimate is done by a group that is separate from the estimating group. And right now we have all those resources in one spot.

MEMBER MARCH-LEUBA: So there is no input of review by industry?

MR. SCHOFER: There is. In fact, when we talk about human effects of regulation earlier, part of the changes or recommendations that were

made was to do cost estimating earlier in the process.

And so even before we get to a decision on rulemaking, we are doing formal regulatory analyses and providing that to for public comment. So at the regulatory bases stage, we put out that regulatory bases which is looking at the technical and legal aspects of the rule, of a potential change with a cost estimate in terms of what we foresee the cost benefits of that change might be.

We put that out for public comment before we finalize the reg bases which is when we make a determination as to whether rulemaking might be the appropriate solution.

MEMBER MARCH-LEUBA: So the industry or licensee becomes of part of the public comments?

MR. SCHOFER: Exactly.

MEMBER MARCH-LEUBA: You don't request it. You just say, I mean, I want to change the windows in my house and I go to Home Depot and they're $2,000. The US it could cost $20,000. You know, I mean, it's --

MR. SCHOFER: It includes the public, includes industry groups, industry as well as non-government organization.

MR. SCHULTZ: Is that part of the process while documented in the description, in the appendices description? I didn't get that. What I got from it is that we're trying to describe best practices. And that's very well done, but how that gets implemented the way you've described it.

MR. SCHOFER: That's actually in a separate document.

MR. SCHULTZ: Okay.

MR. SCHOFER: That's in our office instructions for rulemaking. And that's where it establishes, you know, the steps that one would go through for a change in regulations. So part of that is describing the development of a rulemaking plan, a regulatory bases, proposed rule, final rule, et cetera.

And an RA, or regulatory analysis, supports all those steps. So we use our guidance to develop those analyses supporting that rulemaking process.

MR. SCHULTZ: It seems it would be good to capture at least a summary of that in the document here because what this seems to be documenting is something I think that's different. It seems to suggest that in performing a cost

benefit analysis, it's up to the agency to do a cost benefit, a cost evaluation of what is to be done.

And what you've described, having industry involved in the appropriate way, was missed in at least my reading of the document.

MR. SCHOFER: Yes, it's not in the document.

MR. SCHULTZ: Then I didn't miss it.

MEMBER CHU: Quick question.

MEMBER STETKAR: It's in Appendix M.

MEMBER CHU: Just curious. You know, your regulatory analysis on one branch after all these analyses you may say no action. Okay. Just out of curiosity, how often that happens, ten percent, five percent, twenty percent? Fifty percent?

MR. SCHOFER: That's a good question. I don't know if I have percentages on that. However, we do, you know, analyses and turn things off.

MEMBER CHU: So it does happen?

MR. SCHOFER: It does happen. I mean, I wouldn't say it happens 50 percent of the time because typically you wouldn't have that kind of, I mean, people within the agency are aware of, you know, regulatory analysis. It has to be cost

beneficial, and they recognize the backfitting principle as well.

And so you know, the initial screen is can it be backfilled? I mean, can you justify that there is a substantial safety enhancement first. And if you can't justify that --

MEMBER CHU: Then it's gone, yes.

MR. SCHOFER: Yes, you're cut off. And then if you can justify that, then is that, can you achieve that level of safety improvement at an acceptable cost? And then it may, you know, stop at that point.

But in some cases it goes further. And we've had some examples where, you know, we've done full analyses and then not implemented a regulatory change. I mean, containment vents is a key example. Another one is expedited spent fuel, you know, is another one where some cases you want to do a fuller analysis so that it's documented for the future.

MR. SANDERS: I would add to that something I'll discuss on a later slide. Individual requirements is another case where a regulatory analysis may say all right, we'll look at these few individual requirements of this larger initiative are not going to be pursued. But yet these others

will remain. So that's also a function that RA might find itself performing. But it's common if not more than --

(Simultaneous speaking.)

MR. SCHOFER: That's much more common where there may be items that, you know, staff recommends. And then when you evaluate them individually, they don't meet the requirements for substantial safety enhancement or cost beneficial. And therefore, those requirements go away even though that regulatory action may continue to go forward.

MR. SANDERS: All right, I'm done with this slide. So in the past, oh the next appendix that we'll discuss concerns uncertainty and sensitivity analyses. In the past, regulatory analyses at the NRC used point estimates and sensitivity analysis on a case by case basis.

There was infrequent use of uncertainty analysis, typically only when the actions were expected to have a significant economic impact, in other words over $100 million per year in cost.

In the revised guidance, analysts are instructed to perform uncertainty and sensitivity analyses for each cost estimate as additional

analysis tools for decision makers. And I will go into the specifics on the next --

CHAIRMAN RAY: You used the word current there on the slide but you said the word revised.

MR. SANDERS: We've been acting in accordance with the planned guidance for several years now in our regulatory analyses. And I'm happy to go into more detail as to I'm going to describe what is meant by sensitivity uncertainty in this. But also I'm happy to go into how we employ that in regulatory analysis. I was planning on doing that next.

MEMBER STETKAR: Where in your slides are you going to explain what you mean by sensitivity analyses?

MR. SANDERS: I am --

MEMBER STETKAR: I guess I missed that.

MR. SANDERS: Well, the next slide gives examples of --

MEMBER STETKAR: Qualitative.

MR. SANDERS: I'm sorry. We're on the, we skipped to, don't skip to -- actually, I'm just going to do it all here.

MEMBER STETKAR: Oh, okay.

(Simultaneous speaking.)

MEMBER STETKAR: Because if there were other slides, I was going to ask about them. But all --

MR. SANDERS: This will be the slide. Do you want me to go first or you go first?

(Off the record comments.)

MR. SANDERS: All right. So sensitivity analysis addresses how sensitive outcomes are to variations and input. Typically, they characterize one input at a time, but multiple inputs can also be assessed at the same time.

And through sensitivity analyses, decision makers can understand which elements of the proposed action have the most impact on the final outcome and may alter their action accordingly to increase benefits or lower costs.

Uncertainty analysis such as the range of outcomes and the relative probabilities of different outcomes from many trial runs of different model inputs. They consider all activities and their associated risks and would therefore be considered part of a risk analysis or assessment.

Monte Carlo analysis is a method that we're using here at the NRC for both uncertainty and sensitivity analyses. What it does is it uses trial

values from random sampling technique from model input variables where the values are uncertain.

After many trials, the frequency distribution is generated for the inputs and outputs which approximates the true probability of the system. Often when graphed, the X axis of the analysis will represent the range of cost estimate values and the Y axis represents the probability that the project will have costs less than or equal to that value on the Y axis.

In general, the detail -- the value on the X axis, sorry. In general, the detail and breadth of the uncertainty analysis should be commensurate with the overall policy significance complexity and level of controversy as well as the perceived importance of the uncertainties to the bottom line conclusion.

Sources of magnitudes of uncertainty and the quantification methods used should be discussed an all regulatory analyses. And I can go into detail about that. It's consistent with GAO cost guide and GAO recommendations mentioned before.

MEMBER KIRCHNER: I would like to ask a question now, put you on the spot.

MR. SANDERS: Yes.

MEMBER KIRCHNER: How often after you implement a regulatory action do you go back and check the actual costs incurred versus what you estimated going in? Now it's easier to do when you when you have a bricks and mortar project, obviously.

And the experience in industry, despite all these nice techniques, is often surprising. Anywhere from 1.2 to 1.5, best practice, good estimate of the cost. So do you ever go back and look at your work and see how you came out versus what you predicted?

MR. SANDERS: Well, if we try to do that, and actually NEI has provided us with some information in case studies to demonstrate that. There are a couple of considerations that should be taken into account when looking at those sorts of results.

First is that we're not able to assume or estimate what the profit margin might be. For example, if we're dealing with vendor actions and then they're going to place the cost upon the licensee.

And then in the other case, if you're reporting back, you know, this is how much the

project costs, we tracked the whole project on this code so we know this is how much your action affected us from the industry.

The important thing to note is that our regulatory analyses, our cost estimates are for the delta in costs, from the current regulatory environment to a change. So that project may already have actions that are already forced upon it, in essence sub-costs if you want to think about it in that term.

And then the additional costs would be the ones we would want to compare to the regulatory action which is a bit trickier to do. But Fred, I don't know if you want --

MR. SCHOFER: Fred Schofer. I'll just add to Aaron's points. One thing to keep in mind is that we're doing forecasts. I mean, we are very early in the cycle with regard to developing these estimates.

You know, in your case where you're talking about 1.2 to 1.5, typically the engineering has already been conceptualized as well as you then go into detailed engineering and then procurement and then so forth and so on. And then you're looking at the cost growth as a result of that

initial project budget. We're more at the conceptual phase which is --

CHAIRMAN RAY: Okay, but you could put an allowance in there which is what the best practice should be to account for those uncertainties. I think this is probably not the best use of our time, so let's move on.

MEMBER STETKAR: Let's not move on.

CHAIRMAN RAY: Well, move on from that discussion.

MEMBER CORRADINI: I know John's got a detailed question. Can I ask a short question, if you allow me? So let's take a specific example, let's take spent fuel level indication, and what you estimated the cost to be versus what it turned out to be. Do you ever do a post mortem and see how far off you were?

MR. SCHOFER: That's not a good example because we did not do a cost estimate on that. That was --

MEMBER CORRADINI: Because that was -- okay, excuse me. I guess it was in the wrong pile. Okay, fine.

CHAIRMAN RAY: Look, debating cross, actual, and projected, I don't want to go there.

MEMBER CORRADINI: But I just want --

CHAIRMAN RAY: We could spend the rest of the morning on it.

MEMBER CORRADINI: I understand. But I just want to make sure, it was on the column of regulatory analysis or perform for, and it was orders.

MR. SCHOFER: Yes.

MEMBER CORRADINI: But you didn't do one?

MR. SCHOFER: There was not one done for that.

MEMBER CORRADINI: Thank you.

CHAIRMAN RAY: John?

MEMBER STETKAR: I read through appendices B and C, and just again, this is individual comments. I thought taken as a whole the discussion of the need to address uncertainties throughout the document is done pretty well. I mean, it's emphasized in a few places. So in terms of drawing attention to that, I was pleasantly surprised.

In appendix B, there's a table B-2 that's basic characteristic of credible cost estimates. And one step in that table is provision

for uncertainties and risk. And again, that's good because it emphasizes that's an integral part of the process.

In the table it says identify the confidence level, for example 80 percent appropriate for the cost estimate. What do you mean by the confidence interval and why is 80 percent important?

When I think of confidence interval, I think of there's an 80 percent probability that I'm within that range or a 20 percent probability that I'm outside of that range. Is that what you mean, and why do we -- is there an intentional focus on an 80 percent confidence interval rather than estimating the full range of uncertainty and displaying it?

MR. SANDERS: Well, that's a good point. Actually, in fact, I commonly have been putting into my regulatory analyses, and I think our team has been doing the same 90 percent confidence, 5 and 95. So perhaps you've caught something that we need to correct as our example.

The other thing is yes, we do consider the full range of uncertainty, in particular in these regulatory analyses is the description of the uncertainty analysis results and inputs, and we'll

show common parameters of course like the main, the 5 and 95 percent sometimes standard deviation.

But then we discuss, for example if you had the full range of uncertainty results were entirely within the benefits section, then that would be mentioned and pointed out on that graph.

Or if it broke across into the cost side for the output, it would be important to say, and I have stressed these in my analyses, that the uncertainty results show that 93 percent chance that you have a benefit and then a 7 percent chance that you have a cost, and further descriptions of course, I'm abbreviating.

MEMBER STETKAR: I think, take a look at that. It's I'm hung up on that and because other parts of the guidance, the text implies that you should do a full uncertainty analysis and display that.

Now one thing that I want, and this is detailed and I have to apologize for it. There's a figure C-3 in Appendix C. Appendix C is kind of a reference appendix. It's got good guidance and it's got different tools that you can use.

But C-3 is an example of a cumulative distribution function. And what bothers me about

that example, and it's not explained, is there's a point on that cumulative function that is labeled the risk adjusted primary estimate equals 825 or 40 percent probable.

Now in the guidance, you often talk about a point estimate value and the probability that that point estimate value applies. Most people think of point estimate values as they ought to be close, if not equal, to the mean value or the expected value of the uncertainty distribution.

And indeed there's, depending on the uncertainty distribution, there's some probability that you'll exceed that and some probability that you'll be less than that.

In my previous example for NUREG 1530, you notice that my mean value is indeed the mean value, $5,200 per person. My uncertainty grounds were broader than the nominal values that were listed.

The thing that bothers me about this cumulative is that the risk adjusted primary estimate equals 825. Is that the point estimate because if it is, it certainly is not the mean value of this distribution.

MR. SANDERS: Right.

MEMBER STETKAR: It is well, well below the mean value of that distribution. So now I'm confused about what I'm -- am I supposed to do all my calculations with point estimate values and then go assess uncertainties as an afterthought and develop these distributions because if I'm supposed to do that, that's wrong.

MR. SANDERS: Right.

MEMBER STETKAR: If I'm supposed to use the mean values from my uncertainty distributions as my point estimates, I don't know what this point on that curve means. So what is that point on that curve?

MR. SANDERS: Well first of all that's, and I know the ref you're referring to. I had to recreate it from the old guidance. And not to use the old guidance had it in it as an excuse, but perhaps that graph does need a little more of an evaluation on our part because it might be unclear as to what is implied. Certainly --

MEMBER STETKAR: The reason I hung up on it is that I struggled as a read through the guidance about this notion. It mentions point estimate and an evaluation of the probability of that point estimate, or words to that effect.

And okay, I get that in terms of probability distributions. But if the point estimate is intended to be the mean value, that is indeed the expected value. And if this graph is telegraphing the fact that I'm supposed to do a point estimate, the risk adjusted primary estimate and then sort of back the uncertainties, that's not good.

And the problem is I've seen a lot of people do that. And then they try to justify why the mean value of the uncertainty analysis is a factor of four times different from my point estimate value.

MR. SCHOFER: Let me add some clarification to this. This figure was not in prior guidance, NRC guidance. This figure actually came from GAO and we were trying to, you know, provide some context to that.

But my recollection from how GAO was using it. It was not, that is not a point estimate. I think what they're doing is this is an example of a project which has a risk register where they're trying to manage, you know, risks against the project and that was that point. But it doesn't apply here.

MEMBER STETKAR: Okay. If you could, this is just my individual comment because you do provide those tools, you talk about uncertainty distributions. If you're going to plot something as an example, don't make it more confusing than it should be.

If you're going to put a point on there, put a point on where the mean value is and call it a mean value and not this other, because you've got the median value, you've got the 70th percentile. You know, you could put the 5th and 95th.

The range of the plot is the 90 percent confidence interval. But it's just really confusing and people could, if I wanted to misuse it, I could misuse it.

MR. SCHOFER: That's a good point, thank you.

MEMBER SKILLMAN: I would like to ask you a question before we time out here. I'm respectful of Chairman Ray's guidance.

CHAIRMAN RAY: Too late.

(Laughter.)

MEMBER SKILLMAN: On chapter, on section 53212, monetary valuation of accident related health effects. You identify mortality and morbidity. We

cover that with a VSL.

That gets tied to the dollar rem conversion. But there's another one hiding at the base of that paragraph which is the psycho-social effects. But you end this whole section with this one sentence.

These impacts, psycho-social, are not readily monetized but should be considered within cost benefit analysis with the exception of the NEPA analysis. And I just raised that as a maybe the 500 pound gorilla in the room.

That one is huge. And I just wonder how that gets contained or how you actually draw a perimeter around that and communicate. And here's how we're going to treat that.

MR. SCHOFER: Yes. You indicate we do have it identified as an attribute for consideration. Historically that has not been something that has been included in NRC's analyses. There has been some court, or at least some court cases on Three Mile Island vintage where, you know, there were associated with psycho-social effects and where, you know, and decisions were made where there was not going to be compensation for that.

However, in reviewing the Fukushima

event, we do see that that is a major cost factor from, you know, that accident being a foreign by the Japanese. So we're including it in our guidance. We're still developing what methodology would be applied and what the bounds would be, and that is a future appendix.

MEMBER SKILLMAN: Thank you.

MEMBER BLEY: I have two quick ones. This kind of brings up to me how we ought to be looking at this report right now. It's I assume you want us to think of this as a work in progress.

MR. SCHOFER: Exactly.

MEMBER BLEY: And it's continuing. So as long as I have the right head about that. And then sort of not to beat a dead horse, but when you went through the list of reasons why if one is forced to or ought to do an uncertainty analysis, it was a good list. And the last one was controversial and maybe important, something like that.

And I have to go back to our discussion with Tina and Fred earlier. What's your basis for not doing uncertainty analysis on the value of statistical life stuff? I don't understand. You've told us that's what you're doing.

MR. SCHOFER: Yes.

MEMBER BLEY: I don't understand the basis for how you decided that, especially in light of where this guidance is going and other guidance from the Commission has put us.

MR. SCHOFER: And my recollection on this is that, you know, dollar per person rem, I mean initially and for the past since 1995 has been based upon a constant value point estimate with no sensitivity, no uncertainty.

In that guidance document, it told us too that it was in constant dollars. And therefore, we didn't even, you know, as part of that policy we couldn't inflate that value either. So I mean, it truly was $2,000 then, $2,000 now.

With NUREG 1530, we've made a number of recommendations which was still waiting for the Commission to weigh in on. And it is to inflate that number, to have it in, you know, tied to a year, a base year as well as to formalize doing sensitivity analysis which is a departure from where we've been at.

Now granted, you know, should we be doing more and do full uncertainty. The working group did talk about that but decided that at this juncture to go forward with the 50 percent lower and

higher, and to do it as sensitivities.

MEMBER BLEY: In the overall context and then the context of the fact you're in the process of reevaluating all this, I don't get how that decision came out.

CHAIRMAN RAY: Okay, we're down to nine minutes till. Where are we? There will be members leaving. I want to get everyone's input before the noon hour. How much longer do you need?

MR. SANDERS: Five slides might take 15 minutes more. Get that input, yes.

(Simultaneous speaking.)

CHAIRMAN RAY: Okay. Well, what is the piece that's left?

MR. SANDERS: Qualitative factors. So there might be some of important to you there. And special circumstances, and consensus standards which is not changing as the rulemakings and so on.

CHAIRMAN RAY: All right. Well --

MEMBER BLEY: You could just do those --

CHAIRMAN RAY: Well, I could but I thought all members should hear what the other members wish to say, and our consultant also. And we'll complete then the rest of the agenda after those who have to leave are gone. I hope as many

can stay as possible.

And then we will take public comment before we adjourn. And I foresee that by I hope 12:15 because we do have another, yet another meeting this afternoon, another subcommittee meeting.

So with that, let me interrupt the agenda and ask at this point, and recognizing we haven't completed the agenda, Steve Schultz, if there's anything you would like to say to the members about what we've heard so far.

And I should say while you ponder that, we as I've said and others have as well, we have yet to work through exactly how the full committee will wish to address 1530 as well as 0058. There is an agenda item at the full committee in March. It's set up as if it's going to handle just 0058.

Recognizing that 1530 is ready to go, be issued. And yet I'll note that a slide here on 1530 did indicate that a next step would be an ACRS recommendation to the Commission. So I'm not sure exactly what we're going to do with either of those two other than to say there is a place in March for us to talk about some aspect of this, whether it's both 1530 and 0058 or just the latter.

Okay, Steve?

MR. SCHULTZ: I would just emphasize a couple of points.

CHAIRMAN RAY: Microphone.

MR. SCHULTZ: Thank you. I emphasize a couple of points. And the first is a follow up to what Dennis just said. In terms of the evaluation of sensitivity and uncertainty, it's described in this document, 0058. We talked about it with regard to the other NUREG.

And it's not really stated clearly with regard to dollar per person rem. There's more information really about how the cost of money is evaluated as a sensitivity.

But that seems to be something that I think has been used in the past clearly, and everyone knows. The opportunity to evaluate properly the uncertainty associated with dollar per person rem and would be, I think, an appropriate addition given that everything is being looked at freshly.

And so that ought to be considered in really both documents. And it's not well stated. If it's not going to be done, if it's only going to be a sensitivity, it is not well stated in either

document that that is in fact the case, and that's to form some of the basis of what decisions were made with regard to the 50/50, 50 percent/50 percent associated with those factors that go into the dollar per person rem evaluation.

Secondly, with regard to the expectation of information that flows to decision makers is there's one statement that comes out in the NUREG that would suggest when evaluating, when the discussion goes into evaluating what is going to be done with previous regulation decisions, there's one statement that suggests well, a decision maker would really need to evaluate and see that the cost benefit of a change would really have to show a substantial impact before a decision would be made to go forward. I think a factor of five is mentioned, for example, because of uncertainty.

I'm not questioning that that might be the case. But again, for many people that's not how cost benefit evaluations have been interpreted.

And I say most people, I would certainly say the public would look at a cost benefit evaluation and say well, it certainly looks like we're right on the line, we ought to do it, not that given uncertainty we really ought to weigh this

carefully and, you know, I think we really need to understand how we are going to present the results, especially with regard to the mean value and uncertainty of the overall evaluations and presented in such fashion that the decision maker knows what to do with that information, or at least has a better appreciation than what has been done in the past.

Again, with all of this reevaluation, we're focusing a lot on how the analysis and the data can be improved. But the connection between this information that we provide for the decision maker and how it can be used in decision making is also important.

CHAIRMAN RAY: Joy?

MEMBER REMPE: Well, I think we, if this goes forward as it's outlined in the presentation with going forward and having it issued and going to the Commission, I think we should have a letter.

(Off the record comments.)

CHAIRMAN RAY: Okay, you're --

MEMBER REMPE: If you go on to --

CHAIRMAN RAY: Let me clarify what you just said. Are you talking about a letter on 1530 or --

MEMBER REMPE: On 58. If you go on to slide 46 which we haven't seen, it says the draft guidance document status update's due to the Commission on February 22nd.

CHAIRMAN RAY: Yes, you're talking about 58 then?

MEMBER REMPE: Right.

CHAIRMAN RAY: Okay.

MEMBER REMPE: And that's what I thought you wanted to have this meeting in March on is 58, right?

CHAIRMAN RAY: That's not what I wanted, it is what is currently --

MEMBER REMPE: Scheduled. If you have it --

CHAIRMAN RAY: -- planned to be. And the reason is that 1530 is pending release right now as we sit here.

MEMBER REMPE: Right.

CHAIRMAN RAY: And so trying to intercept that is a different activity than a letter in -- but what you're referring to I think will be part of the discussion at full Commission in March.

MEMBER REMPE: Right. And so if we have that, it in effect goes forward, there aren't

substantial changes. I think enough topics were raised today on 58 that yes, we should have a letter on it.

If 1430 comes into the discussion at the full Commission meeting also, I think a lot of topics were raised and it should be, a letter should be issued too. But I'm not sure what's happening right now with respect to what we're talking about at the Commission meeting from the discussion today.

CHAIRMAN RAY: Right now the timing is such that it would be after the fact as we see it at the moment.

MEMBER REMPE: But they won't be making the decision. And so I think our input, rather than being silent because we've gotten something that's a draft and it will be changing, I think it would behoove us to write a letter.

CHAIRMAN RAY: With regard to 58, I certainly agree.

MEMBER REMPE: Yes, and even on 1430 I think we should have --

CHAIRMAN RAY: Fifteen thirty.

MEMBER REMPE: Fifteen thirty, yes.

CHAIRMAN RAY: Well, that again we'll discuss further. The Chairman will take the ball on

that later this week. Charlie?

MEMBER BROWN: Nothing else to add.

CHAIRMAN RAY: Jose?

MEMBER MARCH-LEUBA: I'm going to go a phrase from Dr. Corradini. I'm a little confused. Are we, this letter of 58, are we asking for a letter on the modifications from four to five, or on the totality of five?

CHAIRMAN RAY: WE can do what the Commission chooses to do, having heard the presentation of full Commission and the usual process. At times we ask what the staff is looking for, and that's a different issue than what we actually wind up doing.

MEMBER MARCH-LEUBA: Yes, but what's the staff want to do?

MS. KHANNA: If I may chime in, I would say we're looking for comments on the revisions being made from Rev 4 to Rev 5, but we will accept, you know, any comments that you would like.

MEMBER MARCH-LEUBA: In that case, I would like to have at least a slide that tells me what the modifications were because that was not released at all.

MS. KHANNA: We can do that, sure. We

can provide that.

CHAIRMAN RAY: Okay. Leonard?

MEMBER KIRCHNER: No further comments. Thank you, though.

CHAIRMAN RAY: John.

MEMBER STETKAR: I don't have anything more. I mean, I made my statements and Steve summarized very well concerns about uncertainty. I would say that it would be a shame if we lose an opportunity to demonstrate how one should indeed account for uncertainties explicitly in the decision making process.

CHAIRMAN RAY: Dennis?

MEMBER BLEY: Yes, just a couple. I minor nit, I didn't say this earlier. The title of 1530 is, it's about conversion factors and yet we say value of statistical life is not a value placed on human life. Using the term conversion factors gives the opposite impression to me. It's an unnecessary term and it just bothers me. It's a personal thing. If we just stayed with monetizing the value of life, that would be okay.

I got in a little late and I apologize for that, but I'm a little, I was a little surprised to learn that after all this time, that 1530 got

passed us before you came to talk to us about it. And somehow there are some things there that are worthy of our comment I think.

That middle part of the discussion where you talked about the five ACRS meetings, if that's implied to the Commission on 1530 in any way, that really is upsetting. And I hope that's not true.

I think we ought to write a letter. I would like a CS comment on both of them, and the whole plan for updating that they're going through.

CHAIRMAN RAY: Well again, I think at PNP we'll have a fuller discussion of whether we want to signal that we're planning to do that in March or what.

MEMBER BLEY: And that's a hard thing for us to do without having a full Commission meeting on it --

CHAIRMAN RAY: It is.

MEMBER BLEY: -- procedurally.

CHAIRMAN RAY: But it's at least something we could touch on.

MEMBER BLEY: But we can touch on it and we could send up a brief note saying, you know, we're going to write a letter on this.

CHAIRMAN RAY: Okay. Mike.

MEMBER CORRADINI: I have no other comments. I would say that there's no need to touch 1530 at this point, although the clarification that Steve mentions about sensitivity versus uncertainty, I didn't catch. And I read what the Commission was given as their cheat sheet, I'm not sure they would catch it. So to me, that's important.

Other than that, I would just say we're going hear in March and we'll decide at the time. Thank you.

CHAIRMAN RAY: Dick.

MEMBER SKILLMAN: Nothing further. Thank you.

CHAIRMAN RAY: Margaret?

MEMBER CHU: Nothing, thank you.

MEMBER SUNSERI: So I appreciate the presentations, and I recognize it's a work in progress. I just continue to, or I would encourage you to continue to be open minded and approach this from a consensus to drive it to be as useful a tool for the decision makers as practicable. Thanks.

CHAIRMAN RAY: Ron?

MEMBER BALLINGER: No further comment.

CHAIRMAN RAY: Okay. We'll resume the agenda now. Those who have to leave us will do so.

And then again, we will ask those who want to make comments from the public to please hang in there. Hopefully we'll be done with the presentation as quickly as possible and turn to public comments. Okay, resume.

MR. SANDERS: All right. So the next slide, 41, discusses the next appendix, the assessment of qualitative factors in cost estimating and regulatory analysis.

It's important to remember the Commission direction and therefore NRC policy to always quantify to the extent possible in accordance with the references mentioned earlier in our presentation.

When quantification is deemed impractical for a particular element of the estimate, qualitative factors may be used and the next slide will discuss some of the many qualitative methodologies contained in this appendix.

So the use of qualitative factors as detailed in the appendix will become the structured process with clear guidance in best practices, increasing transparency, and consistency of cost estimates and regulatory analyses, just to finish off that slide. Now we're on the next slide.

The appendix provides a toolkit of qualitative assessment methods as shown here. The first four in the left column are the most commonly utilized here at the NRC, and I'm going to focus on those for this discussion and in the interest of time as well.

It's important to note though, if in the process of analyzing qualitative factor the factor is deemed to be significant enough, further research in an attempt to quantify it might be appropriate.

So the first on the left there, the qualitative narrative is just what it looks like. It's a discussion of each qualitative factor including the magnitude of the benefit or costs and the strengths and limitations of the qualitative information.

Cost effectiveness analysis is also known as least cost analysis. In this approach, the analyst assumes the benefits are the same for all alternatives and seeks to determine which alternative has the lowest cost. This becomes the most qualitatively cost effective alternative using that tool.

Threshold analysis is utilized when purging and estimates of economic value can be

quantitatively estimated but the analyst does not know the risk estimate or the total number of units, et cetera.

So this analysis can determine the number of units where the benefits become positive or the regulatory action will break even. And bounding analysis can be utilized when valuation estimates are known that are clearly worse or clearly not as bad, and these can be used on bounds for the value of the effect of concern.

Analysts should very carefully describe their judgements and assumptions if they're using the bounding analysis when they're selecting the bounding values.

CHAIRMAN RAY: Let me make a comment here because now I can do so without impacting the 12 o'clock thing so much, but I'll keep it real short. The real issue here is what are the avoidable costs of doing something.

And when questions were being asked about how does the actual cost compare with what you estimated it to be, the thing I wanted to say desperately was the actual costs include both the avoidable costs that are the issue and a huge amount of unavoidable costs.

I've done it a zillion times myself for many years. When you have a project, you do lots of things that have to get done anyway. You use people who are going to charge the payroll anyway.

And so trying to separate out what's avoidable from what was going to occur anyhow, whether it's as simple as painting something after you're done doing the work or it's much more substantial, which it often is, and you load as much overheads in there as you can and so on and so on and so on.

So the upshot of it is that I would be very skeptical about any analysis which purports to compare actual costs with estimated costs unless you do the work to separate out what was actually avoidable from what was going to be incurred anyway.

Okay, so I just want to make that comment, and --

MEMBER KIRCHNER: Can I jump in on that then? If I understood correctly then, you do that when you count your, book keep your NRC costs, right, your staff costs?

CHAIRMAN RAY: Correct.

MEMBER KIRCHNER: That's what Harold said. Okay.

CHAIRMAN RAY: Okay, go ahead.

MR. SANDERS: That's all I wanted to do on this slide, if anyone has any comments. No? All right. This one should be quick. The most important thing about this topic of this appendix is we are not changing our current guidance and our current practice.

So I'll just briefly say that, you know, this appendix covers ASME code changes such as incorporation by reference of ASME code and code cases in 10 CFR 50.55(a). These are consensus standards which involve hundreds or thousands of provisions that have already been agreed upon by stakeholders and undergone extensive external review and endorsed by industry.

So it tends to be non-controversial. And the current practice is to assess additional costs and benefits resulting from NRC conditions and restrictions above and beyond those specified in the consensus standard. Again, there's no proposed changes for this appendix, just documents how we form this analysis.

And the final draft of the appendix is special circumstances. And these are the categories that are described in the appendix safety goal

screening. We've touched upon already, but basically if it's a small change in core damage frequency, the initiative under analysis needs an alternative justification for the proposed requirement for the regulatory analysis to proceed.

There may be other special circumstances that should be analyzed, but in general, for the safety goal screening, that's how you apply it as described earlier.

Sub costs, just in case I need to describe those. So it's mistake that can get you into some trouble if you don't understand which costs are sub costs. These are costs incurred before the start of the analysis period, and the resources have no value in some alternative use.

So policy development, feasibility studies, voluntary actions undertaken at an earlier date. Sub costs are not included in cost benefit analyses because there's no opportunity cost involved, and their inclusion may distort the analysis by requiring a very high return on investment. Essentially though, the outcome of past decisions and should therefore be excluded from future decisions.

Industry initiatives are typically

actions performed by licensees that either form the bases for continued compliance with the regulations or obviate the need for new regulations.

We must be clear to the public that substituting industry initiatives for NRC regulatory action can provide effective and efficient resolution of issues, will in no way compromise plant safety, and does not represent a reduction in the NRC's commitment to safety and sound regulation.

The NRC and the industry are jointly responsible for the long-term success of using industry initiatives as substitutes for regulatory action. Licensees must effectively manage and implement their commitments associated with these initiatives, and the NRC must provide a credible and predictable regulatory response if licensees fail to satisfy these commitments.

Generally, they fall into one of three categories, those put in place in lieu of or to compliment a regulatory action to ensure that requirements are met, those used in lieu of or to compliment the regulatory action in which a substantial increase in overall protection could be achieved with costs of implementation justifying the increased protection or those initiated to address

an issue of concern to the industry that may or may not be of regulatory concern.

Issues related to adequate protection of public health and safety are deemed a responsibility to the NRC and should not be addressed through industry initiatives.

There are a few features of the industry initiatives that analysts should consider for each one. Relevant characteristics are the costs associated with the initiative, the extent to which written commitments exist, the degree to which the initiative is non-controversial and standard industry practice, and the scope and schedule for industry initiatives that are still pending.

A couple of examples. The severe accident mitigation guidelines was an example of an industry initiative, and buried piping is another example, just to bring to mind what we're talking about here.

And next, the analyst should be careful when considering aggregating or bundling different individual requirements into a single analysis, that the analysis does not mask the inclusion of an unnecessary individual requirement that we started talking about before.

As an example, if aggregated, the benefit from the relaxation of one requirement could support a second unnecessary requirement that otherwise is not cost justified. The NRC staff and the analyst must determine if it is appropriate to include each individual requirement.

In other words, if the requirement is needed to resolve the problems and concerns and meet the stated objectives of the initiative. The analyst should retain separate cost estimates for each requirement in deriving the total cost estimate for the aggregated requirements.

A recent example of separating individual requirements can be found, for example, in the regulatory analysis for 10 CFR 50.46 8. And in the final regulatory analysis we created four separate requirements or initiatives that were all costed independently.

Just briefly, there are new performance based fuel standards, technology neutral expansion of the approved fuel cladding types such as to include Zirc-4 and M5 to avoid the need for exemption requests, crud effects, and then finally risk informed modeling to obviate the need to remove problematic progress asbestos insulation.

If you take all those together, the total costs combined create a completely different cost benefit picture than if you look at each individual requirement separately. This enables better decision making. The Commission can see the impacts so nothing is masked within the requirements of another initiative.

Regarding inter-generational cost benefit assessments, there are some regulatory actions where the regulatory analysis may have to consider consequences that occur over hundreds or even thousands of years.

A few examples of inter-generational assessments would be for spent fuel storage, or for the Generic Environmental Impact Statement, GEIS. Under these circumstances, OMB continues to see value in applying discount rates of three and seven percent as previously described.

The analysis should contain an explicit discussion of the inter-generational concerns and how future generations will be impacted. Further, the analysis could include the un-discounted costs and benefits which are incurred as supplemental information.

Instead of just showing a discount

table, you can also say this is the cost without any discount rates applied. And finally, the analyst should consider a sensitivity analysis using a lower but still positive discount rate for additional sensitivity.

And then finally, the last bullet, procedural requirements are also covered in this appendix. And we're referring to the Paperwork Production Act, Regulatory Flexibility Act, National Environmental Policy Act, information requests from 10 CFR 50.54(f), and supporting analyses for compliance and adequate protection as examples.

And that's the end of that appendix. That's all I have.

CHAIRMAN RAY: Thank you. This is a little out of normal sequence, but anything else that you guys have to share with us? Fred?

MR. SCHOFER: No, we have the list and the appendices, and then we have, what, the next --

MS. NOTO: Just the next steps.

MR. SCHOFER: Next steps. So we're pretty much --

CHAIRMAN RAY: Okay. Well, I've mentioned a couple times to our chairman here that we'll try and see if there's anything further to add

to what we've said today relative to timing and sequence and scope of going forward at the what's called PNP as you're familiar with.

And Mike will let you know when we might be discussion that if you want to listen. We may or may not have anything more to say. But obviously at this point in time, it's something that needs some further closure.

And with that, we'll see if there's, open the bridge line. Mike --

CHAIRMAN RAY: Bridge is open, thank you. And is there anyone on the bridge line who wishes to make a comment at this time? Or in the audience here?

MR. SLIDER: Yes.

CHAIRMAN RAY: Okay.

MR. SLIDER: Yes, Mr. Ray. I'm Jim Slider from NEI and I have responsibility for our interactions with the staff on this subject. I first wanted to commend the subcommittee members, your questions are, many of them are exactly the questions that we have as well. And many of them were mentioned in our comments previously.

So I appreciate your perspective on the documents that were discussed today. One of the

things that we on the industry side are doing to try to support the staff in developing better cost estimates in the future is to engage the industry cost estimating professionals and providing higher quality estimates.

The challenge in that I believe was alluded to early in this discussion that when the regulatory proposals are at the conceptual stage, it's hardest to develop a precise scope of work which our industry members need in order to provide a precise and reliable cost estimate.

So that's the challenge that we all face and we want to support that --

CHAIRMAN RAY: The solution to that challenge is an appropriate contingency is my feedback I'd give from my experience. And if somebody says at an early stage that 100 percent contingency's too big, tell them to pound sand and they don't know what they're talking about.

MR. SLIDER: Exactly so. And that goes right to the whole discussion this morning about the treatment of uncertainties as well.

One of the things that I also heard today is very important to is and that's looking at the experience, comparing past estimates with

actuals. And I also appreciated the discussion today about looking at the implications of the cost estimate, the changes in the cost estimating proposals and how that relates to actual experience and projections and so forth. So again, the discussion here this morning greatly amplified the concerns that we've already expressed to the staff. And we will follow that up with our public comments when the document is released. So thank you very much for this opportunity and appreciated your discussion today.

CHAIRMAN RAY: Thank you, John. Anything else? Okay. If not, then we will considered this subcommittee meeting adjourned.

(Whereupon, the above-entitled matter went off the record at 12:20 p.m.)

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# Cost-Benefit Guidance Update

ACRS

Regulatory Policies and Practices Subcommittee Meeting
February 7, 2017

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# 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

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# 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”

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# 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

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# 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

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# Other Staff Initiatives

- Replacement energy guidance
- Dollar per person-rem conversion factor guidance
- Regulatory gap analysis
- Qualitative factors
- Cumulative effects of regulation (CER)

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# 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

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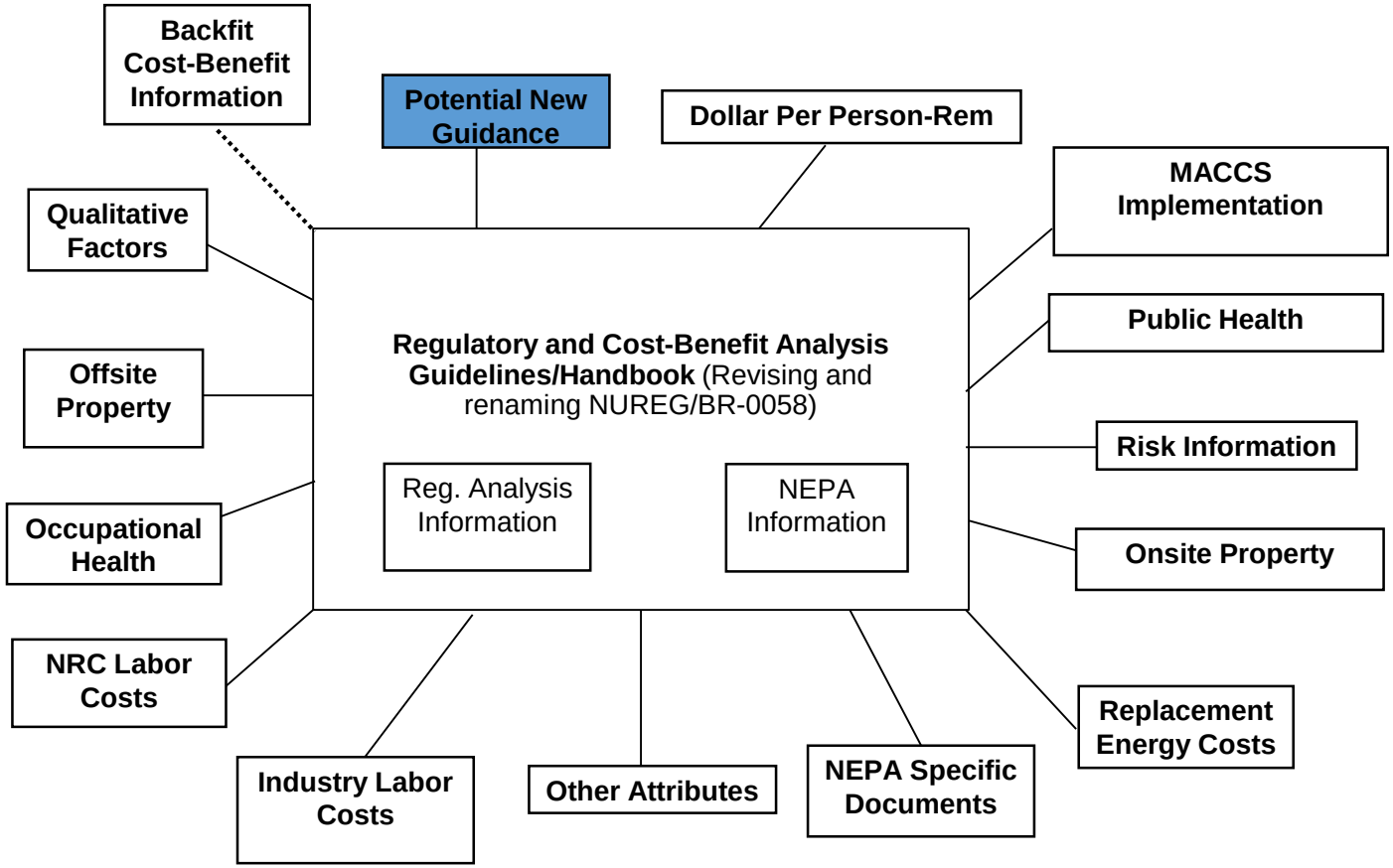
# Mapping of Cost-Benefit Guidance Structure



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# 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

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# NUREG-1530, Revision 1, "Reassessment of NRC's Dollar per Person-Rem Conversion Factor Policy"

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# 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

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# 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.

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# 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.

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# 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.

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# 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).

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# 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

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# 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 $1.0 \times 10^{-3}$).

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# Cancer Risk Coefficient (cont'd)

The staff selected the EPA's cancer mortality risk coefficient based on:

- Public comment
- U.S. population

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# Dollar Person-Rem Value

- VSL x cancer mortality risk coefficient = dollar per person-rem
- ($9 million) x ($5.8 \times 10^{-4}$ per person-rem) = $5,200 per person-rem for the best estimate
  - For **sensitivity analyses**, the dollar per person-rem conversion factor varies by ± 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 | $8.7 \times 10^{-4}$ |

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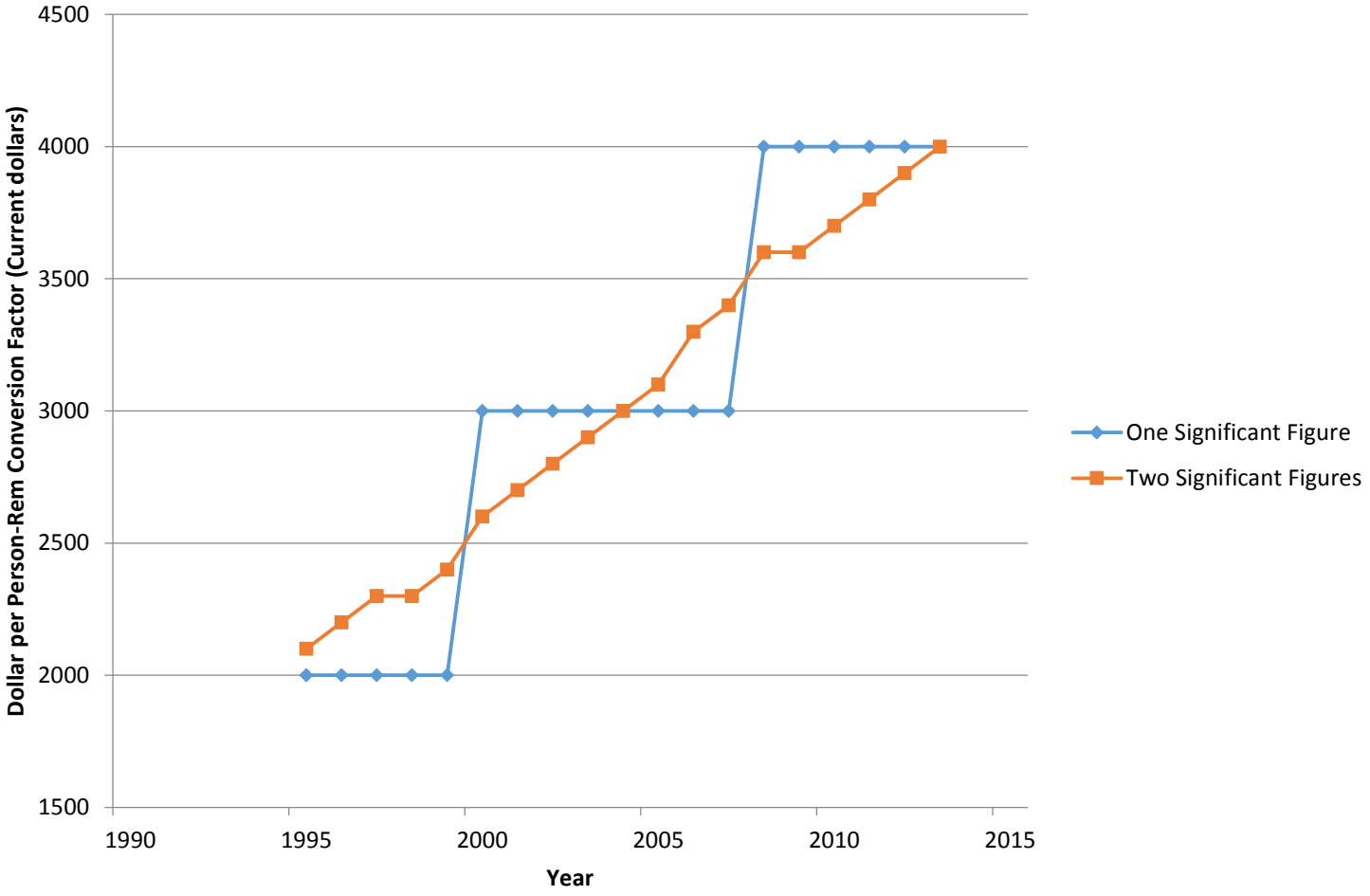
# Effect of Two Significant Figures



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# Methodology for Keeping Factor Current

- NRC proposed formula for keeping the dollar per person-rem factor current is:

$$\text{Dollar per Person-Rem}_{\text{current year}} = (\text{Dollar per Person-Rem}_{\text{base year}}) \times (\text{Inflation}) \times (\text{Real Income Growth})^{\text{Income Elasticity}}$$

- 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.

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# 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.

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# 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

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# Next Steps

- ACRS recommendation to the Commission
- Commission review
- Publication



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# NUREG/BR-0058, Revision 5, "U.S. NRC Regulatory and Cost-Benefit Analysis Guidance"

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# 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.

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# 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

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# 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

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# 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

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# 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)

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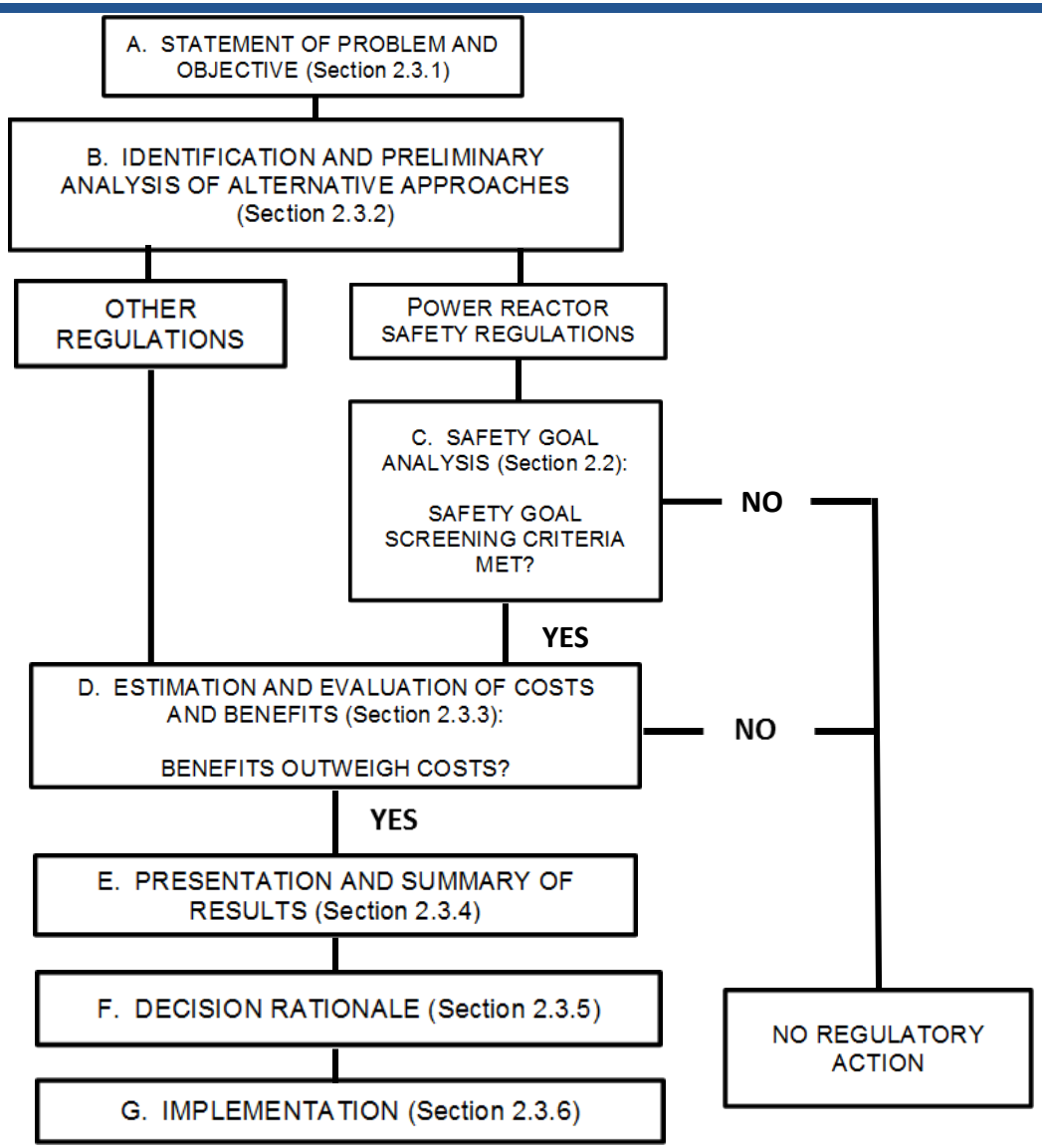
# Steps for Conducting a Regulatory Analysis



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# 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

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# 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

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# Safety Goal Screening Criteria

Change in Core Damage Frequency (ΔCDF)/RY

| | | |
|---|---|---|
| $1x10^{-3}$ | Proceed To Cost-Benefit Portion of Regulatory Analysis | Proceed to Cost-Benefit Portion of Regulatory Analysis* (Priority) |
| $1x10^{-4}$ | Management Decision Whether to Proceed with Cost-Benefit Portion of Regulatory Analysis | Proceed to Cost-Benefit Portion of Regulatory Analysis |
| $1x10^{-5}$ | No Action Taken** | Management Decision Whether to Proceed with Cost-Benefit Portion of Regulatory Analysis |
| $1x10^{-6}$ | | |
| | $1x10^{-2}$ | $1x10^{-1}$ |

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)

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# 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”

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# National Environmental Policy Act (NEPA)

- Cost-benefit analysis in 10 CFR Part 51
- Environmental Justice
- Public and occupational health impact analysis

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# Cost Estimating and Best Practices

- Incorporated best practices
- Characteristics of a high quality cost estimate
  - Credible
  - Well-documented
  - Accurate
  - Comprehensive

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# 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

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# Cost Estimating and Best Practices (cont'd)

Development Process

- Planning
- Inputs
- Preparation
- Review
- Reconciliation
- Documentation

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# 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

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# 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

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# 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

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# 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

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# Special Circumstances

- Safety goal screening
- Sunk costs
- Treatment of industry initiatives
- Criteria for the treatment of individual requirements
- Intergenerational cost-benefit assessments
- Procedural requirements

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# Phase 2 Appendices

- Data Sources
- Historical Data
- Severe Accident Consequence Analysis
- NEPA Cost-Benefit Analysis
- Backfitting Cost-Benefit Analysis Procedures
- Morbidity
- Replacement Power Costs

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# 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

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# 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 |

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# 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
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