

**Official Transcript of Proceedings**  
**NUCLEAR REGULATORY COMMISSION**

Title: Advisory Committee on Reactor Safeguards  
595th Meeting: Open Session

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Wednesday, June 6, 2012

Work Order No.: NRC-1672

Pages 1-224

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

## DISCLAIMER

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

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

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

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

595TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

WEDNESDAY

JUNE 6, 2012

+ + + + +

ROCKVILLE, MARYLAND

The Advisory Committee met at the Nuclear  
 Regulatory Commission, Two White Flint North, Room T-  
 2B1, 11545 Rockville Pike, at 8:30 a.m., J. Sam  
 Armijo, Chairman, presiding.

COMMITTEE MEMBERS:

- J. SAM ARMIJO, Chairman
- JOHN W. STETKAR, Vice Chairman
- HAROLD B. RAY, Member-at-Large
- SANJOY BANERJEE, Member
- DENNIS C. BLEY, Member
- CHARLES H. BROWN, JR. Member
- MICHAEL L. CORRADINI, Member
- JOY REMPE, Member
- MICHAEL T. RYAN, Member

1           STEPHEN P. SCHULTZ, Member

2           WILLIAM J. SHACK, Member

3           JOHN D. SIEBER, Member

4           GORDON R. SKILLMAN, Member

5           NRC STAFF PRESENT:

6           DEREK WIDMAYER, Designated Federal Official

7           EDWIN M. HACKETT, Executive Director

8           Chakrapani Basavaraju

9           JOHN BILLERBECK

10          PAUL CLIFFORD

11          DONALD COOL, FSME

12          STEPHEN DINSMORE

13          MIKE FARNAN, NRR

14          VINCE HOLOHAN, FSME

15          JOHN HUANG, NRR

16          ANNIE KAMMERER

17          LOUISE LUND, NRR

18          ANTHONY MCMURTRAY, NRR

19          JOHN MONNINGER

20          HOSSEIN NOURBAKHS

21          AHSAN SALLMAN

22          TOM SCARBROUGH, NRO

23          ALAN WANG

24          ROBERT WOLFGANG, NRR

25          KENT A.L. WOOD

1 ALSO PRESENT:

2 ENRICO BETTI

3 GREG BROADBENT, Entergy

4 MIKE KRUPA, Entergy

5 MARK LEYSE\*

6 MIKE PERITO, Entergy

7 RUSSELL STACHOWSKI, GNF

8 STEVE VERROCHI, Entergy

9 \*Present via telephone

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

CONTENTS

Opening Remarks . . . . . 5

Proposed Revision of 10 CFR Part 20 . . . . . 7

Disposition of Near-Term Task Force Tier 3  
 Recommendations . . . . . 76

Proposed Revision 1 to Regulatory Guide  
 1.192 . . . . . 133

Grand Gulf Nuclear Station 1 Extended  
 Power Uprate Application . . . . . 196

Assessment of the Quality of Selected NRC  
 Research Projects . . . . . 215

Adjourn

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

(8:30:04 a.m.)

CHAIRMAN ARMIJO: Good morning. The meeting will now come to order. This is the first day of the 595<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting the Committee will consider the following, provision of 10 CFR Part 20 for conformance with International Commission on Radiological Protection, ICRP recommendations. Two, disposition of Near-Term Task Force Tier 3 recommendations and guidance documents associated with NTTF Recommendation 2.3. Three, proposed Revision 1 to Regulatory Guide 1.192, Operation and Maintainability Code Case Acceptability ASME OM Code. Four, Grand Gulf Nuclear Station Unit 1 Extended Power Uprate Application. Five, assessment of the quality of selected NRC research projects. And, six, preparation of ACRS reports.

This meeting is being conducted in accordance with the provision of the Federal Advisory Committee Act. Mr. Derek Widmayer is the Designated Federal Official for the initial portion of the meeting.

We have received no written comments from

**NEAL R. GROSS**

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

1 members of the public regarding today's session. Mr.  
2 Mark Leyse has requested time to make an oral  
3 statement regarding the disposition of NTF Tier 3  
4 recommendations.

5           There will be a phone bridge line. To  
6 preclude interruption of the meeting, the phones will  
7 be placed in a listen-in mode during the presentations  
8 and Committee discussion.

9           I should add a transcript of portions of  
10 the meeting is being kept, and it is requested that  
11 the speakers use one of the microphones, identify  
12 themselves and speak with sufficient clarity and  
13 volume so that they can be readily heard. And our  
14 first topic today will be the proposed revision of 10  
15 CFR Part 20, and Dr. Ryan will lead us through that  
16 presentation.

17           MEMBER RYAN: Thank you, Mr. Chairman. It's  
18 my pleasure to present this morning Dr. Donald Cool  
19 from the FSME staff. He's been intimately involved  
20 with radiation protection activities at the NRC for  
21 many years and is here to advise us this morning on  
22 the staff's proposal for modifying 10 CFR 20, the  
23 Radiation Protection Standards for workers, and how  
24 we're hoping to bring that into conformance with  
25 international guidelines and standards. So, without

**NEAL R. GROSS**

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

1 further ado, I'll turn it over to Dr. Cool. Welcome,  
2 doctor.

3 DR. COOL: Thank you, Dr. Ryan. Good  
4 morning, ladies and gentlemen. I want to spend a few  
5 minutes with you to outline very quickly what the  
6 staff has been doing over the last number of years in  
7 response to Commission direction. I'll go through some  
8 brief background for you, the activities that we've  
9 conducted over the last several years, the purpose of  
10 the paper, our conclusions, technical issue  
11 recommendations which is most of the detailed meat  
12 that you'll probably want to discuss, the different  
13 policy options and the staff's recommendations if we  
14 haven't already thoroughly discussed them by the time  
15 we get to the last slide.

16 So, by way of background for you all, 10  
17 CFR Part 20 was last revised, a major revision in  
18 1991. It was effective in 1994. That revision was an  
19 update to the recommendations of the International  
20 Commission on Radiological Protection, ICRP, from  
21 1977. The rulemaking took 12 years to conduct and go  
22 through the entire process. Radiation protection  
23 requirements not only in Part 20 but in a number of  
24 the licensing parts for specific activities which may  
25 contain specific criteria.

**NEAL R. GROSS**

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

1           During the revision process all of the  
2           connections to other portions of our regulations which  
3           were cross-references were updated. Not all of the  
4           specific sections and other portions that were stand  
5           alone were revised at that time, and that is why you  
6           have today a rather interesting situation where you  
7           have some three generations of ICRP recommendations in  
8           use in various and sundry places.

9           Part 20 is the 1977 ICRP Publication 26  
10          version. Some fuel cycle licensees requested  
11          amendments to their licenses in order to be able to  
12          use more updated information that's available  
13          following the publication of ICRP's Publication 60 in  
14          1990. With Commission agreement, those licensees are  
15          using those updated technical information annual  
16          limits of intake to drive their concentrations.

17          On the opposite end of the spectrum you  
18          have licensees such as our reactor licensees who in  
19          compliance with 10 CFR Part 50, Appendix I, are  
20          continuing to do and produce calculations using the  
21          methodology from 1958 to 1959 contained in ICRP  
22          Publication 1 and 2. So, we have a range of  
23          information that's out there in various parts.

24          We, the NRC Staff in 2000 looked at the  
25          playing field noting that ICRP's recommendations for

**NEAL R. GROSS**

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

1 1990 had been there about 10 years. Most of the rest  
2 of the world just fell along in the process of moving  
3 to update those requirements. At the same time, we  
4 knew that ICRP was already talking about things that  
5 they might further change in an update, so we actually  
6 recommended to the Commission at that time that we  
7 wait for ICRP to be done before initiating an action  
8 so that we could take account of whatever was coming  
9 along since rulemaking is a rather long process.

10 They didn't quite realize at the time that  
11 the ICRP was going to take seven years, but they did.  
12 They did that with three rounds of public  
13 consultations on their drafts which the NRC staff  
14 reviewed and commented on. It resulted in evolution of  
15 those recommendations back to something which was  
16 actually much closer to a small evolution of the  
17 recommendations and not some of the rather more out  
18 there, if you will, ideas that were floated early on  
19 in the process.

20 When ICRP published their recommendations,  
21 Publication 103, in December of 2007, we undertook an  
22 analysis to see if there were areas that warranted  
23 updates and revisions. We've provided those  
24 recommendations to the Commission in December of 2008.  
25 April of 2009 the Commission agreed with the staff's

**NEAL R. GROSS**

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

1 recommendation to begin to develop the technical basis  
2 that might be necessary for a proposed rule, and  
3 started to engage with the stakeholders.

4 So, what have we done since then because  
5 it has been three years? We have talked to lots and  
6 lots of people in lots and lots of places. Some 24  
7 different professional society and meeting  
8 presentations and discussions, three Federal Register  
9 notices for requesting comments both in general and  
10 specific issues, three facilitated public workshops  
11 which were transcribed with individuals around the  
12 table sort of like this except in that case it was not  
13 just five on a side, it was more like a dozen on each  
14 side with a range of stakeholders in each case  
15 specifically selected so that we had representatives  
16 from the reactors and the medical, and industrial  
17 radiography, and all of the other interests that are  
18 out there because all licensees have to comply with 10  
19 CFR Part 20.

20 So, I'm not going to go through all the  
21 different Federal Register notices and things. We had  
22 59 formally docketed comments. We have a very large  
23 pile of transcripts and information that came from  
24 that which was all part of our considerations which  
25 have led us now to the staff's SECY Paper, SECY-12-

**NEAL R. GROSS**

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

1 0064 which went to the Commission on April 25<sup>th</sup> of  
2 this year.

3 The purpose of our paper was, as directed  
4 by the Staff Requirements Memo that we got to  
5 summarize for them what we had done interacting with  
6 stakeholders, what we've heard. Two, request approval  
7 of our recommendations for policy and technical  
8 direction for the development of a detailed regulatory  
9 basis.

10 I emphasize that point because this is not  
11 at a proposed rule stage now. We do not have the  
12 detailed technical information such as revised  
13 calculations that would be necessary for annual limits  
14 of intake derived air concentrations to be able to do  
15 that now. The staff felt that it was very important  
16 given the central nature of Part 20 to have the  
17 Commission's agreement on the direction to pursue if  
18 we were going to continue to expend resources to  
19 further development of this particular action.

20 The paper also recommendations to the  
21 Commission that we develop in parallel with this  
22 regulatory basis for 10 CFR Part 50, Appendix I, using  
23 the same recommended basis so as to start the process  
24 of moving all of the NRC regulatory framework back to  
25 a single consistent set of activities, which it has

**NEAL R. GROSS**

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

1 not been in a very long time.

2 So, some conclusions for you. First, the  
3 regulations, as I just noted, are a mixture of  
4 concepts, quantities, terminology for the past 50  
5 years. Furthermore, they do not reflect, at least in  
6 part, threat assessments of radiation risk. I say that  
7 in part because, as you might suspect, different  
8 pieces have some different underlying radiation risk  
9 basis. The majority of Part 20, certainly the  
10 occupational exposure, is still based on the estimates  
11 from 1977 where radiation risk was estimated to be  
12 1.25. Too many significant figures, but that's what  
13 they used, times 10 to the minus four per rem of  
14 radiation. That was cancer mortality effects.

15 Since that time there have been re-  
16 analysis of the Hiroshima Nagasaki data. There have  
17 been analysis of a number of other populations, Mayak  
18 and others from the former Soviet Union. There have  
19 been different studies of medically exposed  
20 populations. There has been an ongoing huge effort on  
21 the underlying methodology associated with radiation  
22 effect at the cellular and sub-cellular levels, all of  
23 which have led now to a generally accepted level of  
24 radiation risk of approximately five times ten to the  
25 minutes four per rem of radiation, recognizing that

**NEAL R. GROSS**

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

1 that builds into not just cancer mortality and some  
2 genetic, but it also morbidity, years of life lost and  
3 several other factors that I'm not going to try and  
4 get into the details of here, all of which come  
5 together in the radiation risk estimate.

6 So, you have regulations which reflect a  
7 risk estimate which we all now accept, and which we  
8 all now, in fact, use in our normal staff activities,  
9 which is some four to five times too low.

10 Secondly, we have occupational exposure  
11 levels that are close to the existing limits for at  
12 least some categories of licensees. Now, I say that  
13 with the immediate caveat that most exposures are well  
14 below the limits, because the as low as reasonably  
15 achievable concept works. But you have individuals who  
16 are up close to the limits. Of course, we have  
17 occasion situations particularly in our friends in  
18 industrial radiography where you will have an  
19 accidental exposure where an individual will get more  
20 than the occupational dose limit.

21 The current recommendations of the ICRP  
22 for occupational dose limit have as a key underlying  
23 basis an effort to restrict the total occupational  
24 exposure over a lifetime to roughly 100 rem, one  
25 sievert. At that point, given the radiation risk

**NEAL R. GROSS**

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

1 estimate the individual would be at something on the  
2 order of a 5 percent change of induced radiation risk  
3 which the ICRP and the NCRP, the National Council on  
4 Radiation Protection measurements here in the United  
5 States both concluded was a level at which point you  
6 really should not have people exceed it.

7 MEMBER CORRADINI: That's accumulated.

8 DR. COOL: That's accumulated over their  
9 working lifetime, correct. So, for ICRP's  
10 recommendations they say you got 100 rem, people could  
11 conceivably work for something on the order of 50  
12 years so the limit should be on the order of 2 rem per  
13 year, 20 millisieverts with a maximum of five in any  
14 one year because there was always -- this is not a  
15 precise science, it was used for some flexibility in  
16 things.

17 NCRP, the National Council on Radiation  
18 Protection measurements took the same number and  
19 suggested that an appropriate value would limit  
20 individuals to 1N where N was their age in years. So,  
21 if you started working at age 20, you had a 20 rem  
22 dose bank available to you up to a maximum of 5 rem in  
23 any one year. And as you progress you actually have to  
24 have lower and lower exposures to avoid the  
25 accumulated levels.

**NEAL R. GROSS**

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

1           We know that we have individuals who are  
2 up in the three, four, five rem range who will  
3 approach or perhaps exceed the 100 rem level. If you  
4 look in the Rears database you've got some 40  
5 something, I'm not going to quote an exact number, of  
6 individuals who are over that cumulative level. Now,  
7 that's not a very large number given that there's  
8 about 500,000 individual records in the Rears database  
9 over the years.

10           MEMBER CORRADINI: What was the number you  
11 quoted to begin with? I'm sorry. You said the total  
12 population was 500,000, but the first number I'm sorry  
13 that I --

14           DR. COOL: For individuals who are over 100  
15 rem accumulated in the database is 40 something. I  
16 think it's 47 or 48 individuals in the database.

17           I would also note that this database does  
18 not contain the records of all of the individuals who  
19 are occupationally exposed. In fact, it's only those  
20 who are in categories who are required to report, and  
21 it's only those who are NRC licensees.

22           MEMBER CORRADINI: May I ask a question  
23 about that?

24           DR. COOL: Sure.

25           MEMBER CORRADINI: I'm aware of a study

1 that Dr. Boyce is doing at Vanderbilt which is the  
2 Million Man study relative to workers, and my  
3 impression is that database is enormous. And is NRC I  
4 assume just following this study that has begun or  
5 ongoing? Do you know the study I'm talking about?

6 DR. COOL: I am aware of the study. The NRC  
7 Staff is not only following, the NRC has participated  
8 in some of the symposium activities. And I believe the  
9 Office of Research is providing some partial funding  
10 through cooperative arrangements to that funding.

11 MEMBER CORRADINI: Okay. Because my  
12 impression -- well, okay, fine.

13 DR. COOL: The point that I was about to  
14 make to you is that in the United States there are 38  
15 states which are Agreement States who have authority  
16 for the regulation of byproduct materials in their  
17 states, not the reactors, all the radiographers,  
18 medicals, and otherwise. Those licensees do not have  
19 to report their data to the NRC. They have to report  
20 to the state as directed by the state.

21 So, more than 80 percent of the licensees  
22 in the byproduct world, let's take the 105 reactors  
23 out and that's what's left, 22,000 plus licensees. We  
24 only have a very small fraction of the data, and most  
25 of the effort in industrial radiography, Texas,

**NEAL R. GROSS**

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

1 Louisiana and others is all Agreement State data. So,  
2 I'm quoting you numbers recognizing that we know that  
3 that is not a complete picture of the data that's  
4 available.

5 The Staff concluded on the basis of the --

6 DR. NOURBAKSH: I'm not a Rad Con guy, but  
7 you said -- I'm trying to focus in on the NRC licensee  
8 aspect of it, and based on your comments I would draw  
9 the conclusion, maybe erroneously, that you have  
10 really a relatively small population with which you're  
11 dealing. There's a vast range -- there's a number of  
12 facilities that I would think of that are not under  
13 the NRC's licensing umbrella.

14 DR. COOL: Correct.

15 DR. NOURBAKSH: So, how do you get all  
16 that other stuff -- how can we vouch for the goodness  
17 -- not the goodness, okay, the usefulness of the  
18 information to draw conclusions when we've got all  
19 this huge population that's outside of the purview of  
20 your legal jurisdiction I guess if you want to call it  
21 that?

22 DR. COOL: A very good question. As part of  
23 the efforts over the last three years we've been  
24 reaching out to the states and gotten voluntary data  
25 from some of them which has helped to contribute to

**NEAL R. GROSS**

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

1 that. And, in fact, you will see when we get to the  
2 recommendations that one of the things that we wish to  
3 explore in detail is mechanisms to increase the  
4 sharing of the information and greater alignment of  
5 what's being collected between the 38 different states  
6 and the NRC, and to perhaps have categories of  
7 occupations for those individuals who are not required  
8 to report at all, to have a reporting requirement.

9 I say that with a bit of emphasis because  
10 none of the medical licensees, the doctors and all of  
11 those different categories of medical use are required  
12 to report their occupational exposure, not to us, not  
13 to the states. So, we have been looking at that and,  
14 in fact, that's part of what we're recommending, but  
15 we continue to explore in detail to move to  
16 potentially proposed --

17 CHAIRMAN ARMIJO: Are the occupational  
18 exposures to the patients reported in --

19 MEMBER RYAN: That's not occupational  
20 exposure.

21 CHAIRMAN ARMIJO: Well, the exposures to  
22 the patient, not occupational, but you're going to get  
23 a lot of patients getting massive amounts of radiation  
24 exposure.

25 DR. COOL: That is not recorded at all.

**NEAL R. GROSS**

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

1 There is no requirement at any location for reporting  
2 of the exposure to the patient. NRC regulations, in  
3 fact, in that area are aimed at the physicians and the  
4 licensees directed to try to insure that what the  
5 physician directs that the patient get is delivered  
6 correctly. We do not exercise any authority over the  
7 actual treatment of patients --

8 CHAIRMAN ARMIJO: If they're getting  
9 dangerous levels of radiation by your criteria, why is  
10 that it logical that it's not reported and controlled?

11 DR. COOL: We could get into perhaps a very  
12 long discussion.

13 CHAIRMAN ARMIJO: Well, I just want a short  
14 answer. I don't want a long discussion.

15 DR. COOL: Fundamentally, it's based on  
16 what is the justification for the exposure. For  
17 patients, the justification is a direct benefit to the  
18 individuals. Cancer treatment is by its very nature  
19 the attempt to kill one portion of you and leave the  
20 rest of you alive. Radiation happens to do a pretty  
21 good job with that if you pour enough of it in the  
22 right place.

23 CHAIRMAN ARMIJO: But it also, presumably,  
24 creates other cancer sources.

25 DR. COOL: And there are secondary cancers

**NEAL R. GROSS**

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

1 and other things which are being explored. There are  
2 considerable efforts within the medical community to  
3 try and right size the exposure particularly for  
4 pediatric patients where you have a smaller body,  
5 therefore, don't use the same parameters and otherwise  
6 for their treatment and diagnosis.

7 MEMBER SIEBER: I think it's also a fact  
8 that most medical exposures are not whole body  
9 exposures, that are localized therapeutic exposures so  
10 it becomes extremely difficult to measure what the  
11 total somatic effect is for localized exposure, so I'm  
12 not sure what you would do with the data if you had  
13 it.

14 DR. COOL: That's true in many cases.

15 MEMBER SIEBER: Okay.

16 MEMBER RYAN: I think it's important to  
17 emphasize, too, that Don mentioned that a number of  
18 states are Agreement States, so they have regulatory  
19 organizations that are much aligned with how NRC is  
20 organized with radioactive material and radiation-  
21 producing sources at the state level. So, some have  
22 kind large programs, California, for one, Texas, South  
23 Carolina, a few others that have the larger programs,  
24 but there's quite a number of programs that, in  
25 essence, in my opinion mimic what the NRC would do if

**NEAL R. GROSS**

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

1 they were regulated directly instead of the local  
2 level, particularly in the materials area.

3 DR. COOL: Specifically for the materials  
4 area because an agreement state has to have  
5 regulations which are adequate and compatible.

6 MEMBER RYAN: Right.

7 DR. COOL: Things like the occupational  
8 dose limit are a measure of direct specific  
9 compatibility, have to be one to one. Those don't have  
10 to have the same. It's also important to note,  
11 probably, that NRC by its very enabling legislation is  
12 radioactive materials, so all of the x-ray, CT,  
13 fluoroscopy and other procedures that occur in medical  
14 and other things which are machine-produced radiation  
15 are not under our jurisdiction. They are only under  
16 the jurisdiction of the states.

17 Being mindful of the amount of time we've  
18 got, I'm going to try and move on. We've concluded  
19 that there are a number of areas where changes are  
20 appropriate and scientifically justified to try and  
21 reflect updated radiation risk levels and to make some  
22 other changes.

23 Lots of words get said about how it's  
24 important to be aligned with international  
25 recommendations and standards, and that certainly has

**NEAL R. GROSS**

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

1 qualitative benefits. We see that in all sorts of  
2 places. The nuclear power industry has people coming  
3 back and forth during the spring outages. I didn't  
4 hear the final numbers. There were individuals from  
5 nine or ten other countries who were in working  
6 outages at various reactors, so we've had movement of  
7 people; obviously, have movement of materials and  
8 other things that go back and forth, so there is a  
9 great deal of value in having a degree of alignment.

10 We also are well aware that you have  
11 concerns about communication and other information.  
12 Post the Fukushima event, there has been a lot of  
13 increased discussion and questions fielded by the  
14 Staff and other people, so why is the U.S. not using  
15 the same standards as the rest of the world? And oh,  
16 by the way, why are you still using rads and rems when  
17 the Japanese and all of the reporters are now talking  
18 in Becquerels and millisieverts. Okay?

19 All of that is good and important  
20 qualitative information that can be factored into the  
21 discussion. The recommendations that we're making  
22 recognize that, but that is not the sole basis for  
23 justification for making the recommendations.

24 One of the things we looked at very  
25 carefully was the question of the dose limits. We'll

**NEAL R. GROSS**

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

1 talk about that a bit in a moment, because that was  
2 the place that is most obviously different in the  
3 occupational exposure area.

4 We had lots of interactions with  
5 stakeholders, many of whom thought that it might be  
6 easier to some more things to the ALARA optimization  
7 concept rather than changing the limit, so they gave  
8 us some rather interesting and very specific sort of  
9 discussions. But when the Staff looked at it, what  
10 works well for a large program with the resources, and  
11 activities, and the kind of planning that we all think  
12 of such as a reactor, that's one model. That model  
13 does not translate very well to a two-person  
14 radiography company. It doesn't transfer very well to  
15 a hospital administration. In fact, it doesn't  
16 translate very well at all, necessarily, where all of  
17 the exposures are piece-driven as in number of shots  
18 of radiography, number of patients treated and  
19 otherwise. And our conclusion was that the only way  
20 for that to work would be if you had a rather  
21 stringent criteria that you used as your planning  
22 value, what we talked about.

23 In order to have that level of stringency,  
24 you ended up with something that looked, quacked, and  
25 sounded like a limit. So, in fact, the Staff in making

**NEAL R. GROSS**

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

1 these recommendations is recommending a change in the  
2 limit rather than adding some requirements to the  
3 ALARA process.

4 The other thing I would note, the  
5 rulemaking if we go ahead and do it, will require a  
6 backfit. It will require a backfit analysis. Some  
7 portions of this may well be a definition, or a  
8 redefinition of adequate protection. Certainly, other  
9 components of it will not be.

10 CHAIRMAN ARMIJO: Well, let's get on  
11 adequate protection for the reduction of the  
12 occupational limit, which is a substantial reduction.  
13 Do you have a strong technical basis for that, or is  
14 it just well, that's what the ICRP wants to do, and we  
15 should join up?

16 DR. COOL: We have a technical basis for  
17 it.

18 CHAIRMAN ARMIJO: Okay. And will we get a  
19 chance to see that and review that?

20 DR. COOL: I believe you will. We'll have  
21 some further discussion here over the next little bit.  
22 And the details of that are what we're asking the  
23 Commission to authorize our expending resources to  
24 further development.

25 DR. NOURBAKSH: So, you want to change the

**NEAL R. GROSS**

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

1 1.25 or something like that, and that's what you want  
2 the resources to justify that. I'm trying to connect  
3 this back to the earlier --

4 MEMBER RYAN: Five to two.

5 DR. NOURBAKSHSH: Oh, five to two, the upper  
6 limit.

7 MEMBER RYAN: The annual basis is five now,  
8 two is the --

9 DR. NOURBAKSHSH: I got it. Thank you.

10 MEMBER SKILLMAN: Don, would you explain  
11 your comment regarding backfit? I'm trying to think  
12 about a live nuke that's been out 10, 15 years, has a  
13 robust radiological protection program. The limit gets  
14 changed. How does backfit fit into that environment?  
15 I'm just struggling to understand -- I understand back  
16 fit when a piece of equipment has to be changed, but  
17 I'm trying to think of backfit when it's a  
18 programmatic change.

19 DR. COOL: The same underlying thought  
20 process has to apply because it will result in them  
21 needing to re-examine the program, perhaps make  
22 changes to procedures, set point levels, a variety of  
23 other things that go along with insuring protection  
24 for the reactors. And I've got to be careful because  
25 we're in generalizations here. The vast, vast, vast,

**NEAL R. GROSS**

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

1 vast, vast majority of individuals are receiving  
2 exposures less than the two rem that level that we're  
3 suggesting.

4 MEMBER CORRADINI: So, can I just follow-up  
5 because I'm trying to under -- I understand what  
6 you're proposing. I understand it's consistent with  
7 ICRP. I don't under NCRP's -- you explained it to us  
8 but I don't get that one, let's just stick with ICRP.  
9 So, there would be a period -- assuming the Commission  
10 gives you the go-ahead, et cetera, there would be a  
11 transition period, then a going forward. And the  
12 backfit part is in terms of processes and set points,  
13 but you made a comment early, maybe I misheard the  
14 number, 48 out of 500,000. Remind me what that is --  
15 the 48 are approaching the integrated amount.

16 DR. COOL: Forty-eight have exceeded --

17 MEMBER CORRADINI: Oh, excuse me.

18 DR. COOL: -- the integrated amount.

19 MEMBER CORRADINI: The integrated amount.

20 I'm sorry, I thought were approaching.

21 DR. COOL: That's the 100 rem underlying  
22 assumption number of cumulative. We do not --

23 MEMBER CORRADINI: If I took two multiplied  
24 by 50 years of service.

25 DR. COOL: Right.

**NEAL R. GROSS**

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

1 MEMBER CORRADINI: Okay. So, that helps.  
2 Then I guess what I'm going through in my mind is then  
3 the five to two in terms of backfit is strictly  
4 procedures and set points.

5 DR. COOL: Procedures, activities, set  
6 points, all the things that they would need to do in  
7 their program. But let's step back, because while the  
8 majority of individuals are below, well below the two  
9 number, all of their programs are designed to insure  
10 compliance with regulatory permits and otherwise, so  
11 if you change the limit, even though, essentially, all  
12 of their individuals are below what the new limit  
13 might be, you've wacked out all the margin.

14 MEMBER CORRADINI: Yes, you create a new  
15 dead band.

16 DR. COOL: You have to --

17 (Laughter.)

18 MEMBER CORRADINI: You create a buffer zone  
19 approaching two that might be one, where before it was  
20 two.

21 DR. COOL: Right.

22 MEMBER CORRADINI: Okay.

23 DR. COOL: Correct. So, lots of things will  
24 need to be looked at, changes made to their ALARA  
25 program when they will start to take actions, when

**NEAL R. GROSS**

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

1 they would look harder at particular individuals.

2 MEMBER RYAN: One other issue here, as  
3 well, as this point that's probably worth bringing up,  
4 and that is that the current rule, it's five per year,  
5 test of five times N minus 18 so you can have  
6 flexibility year to year of having a different  
7 exposure, but the average would be the same. So,  
8 that's not in the proposal, as I understand it now,  
9 but it is in the current regulation.

10 MEMBER CORRADINI: I don't understand.

11 DR. COOL: I'm sorry, Dr. Ryan.

12 MEMBER RYAN: Go ahead.

13 DR. COOL: Current regulation today for  
14 occupational exposure is a straight five, period, end  
15 of discussion.

16 MEMBER RYAN: But you have a test where you  
17 can test different exposures, correct?

18 DR. COOL: Not under our present  
19 regulations, five N minus 18 as a concept was  
20 eliminated in 1991 with the revision of Part 20.

21 MEMBER RYAN: Oh, that's -- I'm sorry, I'  
22 misunderstood.

23 DR. COOL: The ICRP's recommendation --

24 MEMBER RYAN: Yes, the ICRP recommendation--

25 DR. COOL: -- was an average of two, often

**NEAL R. GROSS**

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

1 expressed as 10 over five years.

2 MEMBER RYAN: Right, ten over five.

3 DR. COOL: With a maximum of five that  
4 provided some flexibility in the recommendation.

5 MEMBER REMPE: Why didn't you go for that  
6 flexibility?

7 DR. COOL: We'll talk about that in a  
8 moment.

9 MEMBER RYAN: Okay.

10 MEMBER CORRADINI: Before we go to the  
11 flexibility, there was one other piece to the backfit  
12 question that I wanted to understand. If when they  
13 were to become two and you were doing a population of  
14 500,000 people within NRC regs that have to be  
15 affected, are we talking mainly power plant workers?  
16 I'm more interested about medical professionals and  
17 non-power plant. I would think large organizations  
18 have a much more tighter control over this, and you're  
19 going to start affecting folks in the medical  
20 industry. Am I wrong in that assumption?

21 DR. COOL: You are precisely correct. It is  
22 not the reactor community that I'm particularly  
23 concerned about. Yes, there are issues. Yes, they will  
24 need to be doing some additional things. They are and  
25 have been for quite some time in a engineered process

**NEAL R. GROSS**

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

1 to have all of their individuals below two. It makes  
2 sense for them as well as INPO ratings, quartiles,  
3 insurances, a variety of external factors which make  
4 good radiation protection and good ALARA-reducing  
5 doses very, very important and cost-effective.

6 There are no such things in the rest of  
7 the community, and it is the industrial radiographers,  
8 it is the medical professionals and otherwise who have  
9 the vast majority of those exposures that are  
10 approaching a cumulative level, and are individuals  
11 who are approaching the current individual  
12 occupational dose limit of five rem per year.

13 MEMBER CORRADINI: And how do the current  
14 nations that accept the ICRP recommendations deal with  
15 that, because having some -- a member of a family who  
16 is a medical professional that has to deal with it in  
17 another country, my impression is that it's quite  
18 difficult, and it creates an enormous -- it creates a  
19 larger infrastructure.

20 MEMBER RYAN: It --

21 DR. COOL: Yes.

22 MEMBER CORRADINI: I'm trying to understand  
23 the burden associated with the risk that we're  
24 averting.

25 MEMBER RAY: The burden is more people.

**NEAL R. GROSS**

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

1 CHAIRMAN ARMIJO: More people, more cost,  
2 and the question is -- I'm still looking for the real  
3 quantitative safety benefit of this reduction factor  
4 of two or more, so that's -- we're talking about  
5 convenience of guys traveling from the United States  
6 to work in Europe or vice versa, that's trivial to me.  
7 You know, what is the safety benefit of this reduced  
8 occupational limit? And the word "limit" strikes me as  
9 a word that's kind of a problem because there's an  
10 impression that crossing that limit puts you in grave  
11 danger, some sort of severe danger rather than some  
12 statistical possibility that you might have greater --

13 MEMBER RYAN: Sam, I think that's a little  
14 bit overstated.

15 CHAIRMAN ARMIJO: Well, you know, that's my  
16 feeling --

17 MEMBER RYAN: The one statistical limit to  
18 another statistical limit.

19 MEMBER CORRADINI: But I do think though,  
20 Sam, he quoted the one thing that at least rings true,  
21 and I want to make sure I got it right. You said at  
22 100 rem there's a -- can you repeat that because the  
23 limit that I keep on remembering, I try to at least  
24 remember.

25 DR. COOL: At 100 rem accumulate exposure

**NEAL R. GROSS**

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

1 over an individual's lifetime, they would have a 5  
2 percent chance of radiation-induced effect.

3 MEMBER RYAN: Radiation-induced effect.

4 MEMBER CORRADINI: Not death, but effect.

5 DR. COOL: So, cancer and all -- and the  
6 things in there, cancer morbidity, cancer mortality,  
7 potential genetic, although that's significantly lower  
8 than before, years of life lost for related diseases.  
9 There's ongoing discussions now about the significance  
10 of cardiovascular issues like stroke and other things  
11 also being related to radiation exposure. A whole  
12 suite of things fit into that averaged 5 percent  
13 effect.

14 So, what you have is you have an  
15 individual protection question, and you have a  
16 correlated population or group protection question.  
17 And the Chairman is quite correct, one way to get  
18 around it is to have multiple people do pieces of the  
19 job if you wish to do it in the same old way.

20 My impression, for the most part, is that  
21 there are also other mechanisms for doing it better.  
22 Now, you asked a question -- I've lost track even who  
23 asked the question.

24 MEMBER CORRADINI: That's okay. You can  
25 move on. You don't have to --

**NEAL R. GROSS**

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

1 DR. COOL: In Europe and other places where  
2 these recommendations have been in place for some  
3 time. We have tried very hard to get them to tell us  
4 what the benefits and impacts were as they moved from  
5 ICRP 26 to ICRP 60 in the 1990s.

6 What we have found out is that it is  
7 impossible to get quantitative data on that. There are  
8 no such things as regulatory analysis, or backfit  
9 analysis associated with the IAEA, the International  
10 Atomic Energy Agency's safety standards, or the  
11 European Commission's Radiation Protective Directive,  
12 so there's nothing that you can go back and pull out  
13 numbers and see what it is that they do. They state  
14 they believe it has been beneficial. It has improved  
15 radiation programs, it's improved control.

16 When we then look and say so what is the  
17 actual experience in industrial radiography and  
18 medical, we again come up with blanks, which suggests  
19 one, they just may not be looking at the same level of  
20 data, or they don't have the same reporting  
21 structures, or as we have heard from many of our  
22 licensees that you have some degree of non-compliance  
23 which is operating in there, and which is not  
24 receiving, perhaps, the attention it deserves. We have  
25 no basis of information.

**NEAL R. GROSS**

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

1 I will simply state here that many times  
2 during our interactions we have had people in the  
3 medical community, including individuals who are  
4 members of the Council of NCRP state that physicians  
5 will simply leave their badges back in the office  
6 because their fundamental directive and mindset is to  
7 treat the patient. And they will do all sorts of  
8 things in order to be able to carry out their primary  
9 directive.

10 MEMBER REMPE: And one of the stakeholder  
11 comments that I think I read, they said that some of  
12 the proposed limits would be difficult to adhere to or  
13 to monitor the lens, eye, so when you talk to  
14 Europeans or international community did you ask were  
15 there any difficulties that stakeholders had in  
16 implementing these limits? And did they respond to  
17 that question?

18 DR. COOL: We asked similar questions to  
19 that. We didn't get any answers to that. The lens of  
20 the eye is a very unique issue because that is a very  
21 recent issue which everyone, including in Europe and  
22 otherwise is just now struggling to grapple with. And  
23 you are exactly right, the question of dosimetry for  
24 the lens of the eye is a big issue and is difficult.

25 I was yesterday with the International

**NEAL R. GROSS**

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

1 Dosimetry and Recordkeeping Conference and they were  
2 talking about some of those issues. There are not  
3 solutions, but it's being discussed in those  
4 communities how you would go about doing that.

5 MEMBER REMPE: And limits that are  
6 difficult to monitor are difficult --

7 DR. COOL: That's right.

8 MEMBER REMPE: -- environment where we  
9 have that problem.

10 MEMBER SIEBER: But the lens of the eye is  
11 mostly affected by beta radiation. Is that not  
12 correct? You say you have to have dosimetry that  
13 singles that type of radiation out in order to be  
14 accurate as to what the exposure really is.

15 DR. COOL: The lens of the eye would be  
16 subject to exposure, not just from beta, although beta  
17 becomes more important because the measure depth of  
18 the target tissue is less than the depth for the deep  
19 dose --

20 MEMBER SIEBER: Well, alpha has some  
21 impact, and gamma also --

22 DR. COOL: You're correct. So, there are a  
23 variety of things that have to go into play there. So,  
24 try and keep going and we'll come back to your other  
25 question in a moment.

**NEAL R. GROSS**

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

1           What we are asking the Commission to do is  
2           to agree that we should be expending resources to  
3           continue the development of a basis for a proposed  
4           rule to specifically look at what the draft rule text  
5           would look like, because that's the only way you can  
6           really get to benefits and impacts, and questions, to  
7           look at what the implementing guidance would be, not  
8           just what the rule says but how you're going to do  
9           that, and how are you going to do that in different  
10          types of licensee activities? To continue the work  
11          that would be necessary on the dose coefficient, the  
12          underlying pieces of information to give you all the  
13          values in Appendix B of Part 20 for annual limits of  
14          intake drive the consideration, and to work out the  
15          detailed information related to the cost benefit to  
16          justify those specific proposals.

17                 Technical issues. Okay, the first one is  
18                 perhaps a little bit easier in one sense. We've  
19                 recommended that we update the scientific information  
20                 models to the ICRP 103 system, that we leap frog Part  
21                 20 with ICRP 103, that in parallel we leap frog 10 CFR  
22                 Part 50, Appendix I from ICRP 1 to ICRP 103 and to try  
23                 and re-establish a consistent underlying basis for  
24                 calculation of dose across the U.S. regulatory  
25                 structure, rules, and guidance. There are a lot of

**NEAL R. GROSS**

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

1 pieces to that puzzle.

2 At the same time, we've recommended that  
3 we update the terminology to reflect the information  
4 in the models. That one gets to be a little bit  
5 trickier because, quite frankly, it's a bit hard to  
6 explain why you should talk about total effective dose  
7 now when the term in the regulations "total effective  
8 dose equivalent," TEDE, they represent the same  
9 underlying concept, but the term was modified when the  
10 underlying calculation was modified at the time of  
11 ICRP 60, moving from quality factors to tissue  
12 weighting factors. So, there are some differences in  
13 the calculation, so the correct term to be used and  
14 the term used every place else is the effective dose,  
15 and equivalent dose. So, to update those processes.

16 Stakeholders in general were supportive of  
17 both of those, recognizing that there were some  
18 training issues and various things, but most everyone  
19 believed that it was appropriate to move to using the  
20 new scientific information calculations and other  
21 activities.

22 MEMBER SCHULTZ: Donald, what is the level  
23 of effort associated with those first two bullets?

24 DR. COOL: The level of effort, it's in  
25 Enclosure 5. I won't dig into the details. That's

**NEAL R. GROSS**

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

1 still several FTEs worth of effort and resources that  
2 we will use at Oakridge National Laboratory leveraged  
3 also with resources by EPA and DOE, which is where all  
4 that calculation work is being done for ICRP.

5 What we are in a position of doing is we  
6 are funding Dr. Keith Eckerman who is leading that  
7 effort. He's developing all of those for ICRP. We will  
8 at the same time have the information that would  
9 enable us to do Part 50, Appendix I. It will enable  
10 EPA to do revisions of Federal Guidance Reports 11 and  
11 13, and for DOE to move to update theirs by whatever  
12 process that they might wish to do so. So, we are  
13 working as a federal family on this actually.

14 There's still a fair bit of effort there.  
15 These numbers don't come cheap because they are all  
16 now Monte Carlo calculations. The models are no longer  
17 the MERG model of a cylinder and a couple of cones.  
18 They are now, in fact, voxel phantoms, voxel being a  
19 pixel in 3D, developed from countless MRIs and CTs  
20 with very wonderfully detailed ability to calculate  
21 radiation exposures in one organ from another organ,  
22 transport the materials. That's takes a lot of  
23 computer time.

24 MEMBER SCHULTZ: That's important. You're  
25 working to integrate a broader family of practices

**NEAL R. GROSS**

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

1 throughout NRC, DOE and other federal agencies.

2 DR. COOL: That's correct. One of our  
3 wishes, because I have precious little control over  
4 it, is that we could have the whole federal family  
5 realigned again.

6 MEMBER SIEBER: That would be good.

7 MEMBER RYAN: That's an admirable role.  
8 Don, there's one other element on the annual dose  
9 limits that there's been some discussion about, and  
10 that is that we currently have a way to have exposures  
11 in one year different from exposures in another year  
12 based on the fact that work forces move, and outage  
13 management, and other issues. How are we going to deal  
14 with that? Is there going to be a fixed annual limit  
15 or is there a way to have flexibility and year to year  
16 management, that kind of thing?

17 DR. COOL: Okay. This actually gets to, I  
18 believe, your question now, and now is the time.

19 MEMBER REMPE: Okay.

20 DR. COOL: We have several pieces of  
21 information, of course. The ICRP's recommendation had  
22 flexibility built into it with an average and a  
23 maximum. In our discussions with stakeholders the last  
24 three years they were very adamant that they did not  
25 wish to return to the old days of five and minus 18

**NEAL R. GROSS**

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

1 where they had to have dose histories over multiple  
2 years in order to demonstrate compliance. Right now  
3 under a single fixed limit, what they need to have is  
4 the occupational dose for that individual in this  
5 year. It's a much more straightforward system. There's  
6 a lot more recordkeeping that's associated with having  
7 values over multiple years.

8           During those discussions, while there was  
9 a recognition that yes, flexibility would be sort of  
10 nice, there was also input from all of the other  
11 countries. One of the things we did hear was  
12 flexibility was wonderful, hardly anybody ever used  
13 it.

14           MEMBER REMPE: But you would need a process  
15 for an exemption to go to a higher value.

16           DR. COOL: So, in fact, what the staff has  
17 recommended to the Commission is a straight two rem  
18 number, and the development of a specific process  
19 listed in the regulation which would provide that a  
20 licensee could apply for an additional amount up to  
21 perhaps five rem, 10 rem over five years, the same  
22 sorts of flexibilities are out there, which could be  
23 granted on the case by case basis so that it would be  
24 only those licensees who would have to have the  
25 additional burden of records and otherwise should they

**NEAL R. GROSS**

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

1 choose to use it.

2 I would fully expect that some of the  
3 industrial radiographers would want to do that for at  
4 least a period of time, some of the medicals, and  
5 otherwise. But that was the approach the Staff has  
6 recommended to avoid the uniform burden applied to  
7 everyone for something that most would never have to  
8 use.

9 I will also tell you that the nuclear  
10 power industry in talking to some of the folks --  
11 again, as I have said, I was at a conference just the  
12 last couple of days, are starting to go hmm, well,  
13 flexibility might be more important, and getting my  
14 chief nuclear officer to agree that we should apply to  
15 NRC to use a higher number, I don't know if we could  
16 ever get him to go there. Maybe we want to reconsider  
17 what we said which is we don't want any straight  
18 flexibility built into the rule. Okay.

19 Part of the reason for now the next step  
20 if the Commission agrees in exploring the issue in  
21 detail is if that's where it actually comes out, we  
22 still have the opportunity to build that into the  
23 system and adjust the recommendation. These are not  
24 fixed yet in stone.

25 MEMBER RYAN: So, the opportunity to have

1 a rule that allows year to year variability against a  
2 fixed single number limit is still on the table as a  
3 possibility.

4 DR. COOL: That could still be on the table  
5 as a possibility.

6 MEMBER RYAN: Could be or is on the table?  
7 I mean it's something you can consider, you're going  
8 to consider?

9 DR. COOL: It can be considered. Given that  
10 the stakeholders are already talking about it, I'm  
11 sure it will be.

12 MEMBER RYAN: Okay, good.

13 MEMBER CORRADINI: Can I ask a different  
14 question that goes along with the flexibility, which  
15 is the uncertainty of the number. We started off with  
16 5 percent chance of this average of effects if I have  
17 100 rem of exposure. So, is that 5 percent possibly  
18 10, possibly 1, or is it 5 percent, 5.5, and 4.5? I  
19 want to know the uncertainty in the number I'm  
20 regulating to.

21 CHAIRMAN ARMIJO: I just wanted to see how  
22 much benefit there is.

23 MEMBER CORRADINI: Because I'm sure this --  
24 - since you mentioned this a couple of times, and I  
25 remember this is the only number I can remember from

**NEAL R. GROSS**

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

1 all this stuff. I know the mushiness in that number.

2 DR. COOL: It's not 5 percent with 10 and  
3 1 being the boundaries, but it's not 5.5 either. I  
4 could get back to you with more specific numbers. I  
5 don't know if Tony Huff or Vince Holahan have the  
6 specifics.

7 MEMBER CORRADINI: I would like to know  
8 that.

9 DR. COOL: There is an error band around  
10 some of them which is at least a factor of two or  
11 three. Vince?

12 DR. HOLOHAN: Vince Holahan. I'm also with  
13 FSME. Well, first of all, that's an international  
14 number, it's not a U.S. number.

15 MEMBER CORRADINI: That's okay. Once you  
16 adopt it, it's your's.

17 DR. HOLAHAN: For the U.S. population, an  
18 average number is probably closer to seven to eight  
19 times 10 to the minus 4 program. Now, that is an age  
20 average, gender average number. And the  
21 recommendations of the United Nations Scientific  
22 Committee on the Effects of Atomic Radiation, UNSCEAR,  
23 would say that the range on that number is probably a  
24 factor of three higher, and a factor of three lower.

25 MEMBER CORRADINI: Okay, so let's just

**NEAL R. GROSS**

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

1 stick with five because you lost me. So, if it's five,  
2 it's five plus or minus what?

3 DR. HOLAHAN: That range would probably a  
4 range of one to 10.

5 MEMBER CORRADINI: Okay, so it's one to 10.  
6 So, now my next question is if I'm in the medical  
7 community and I have to do the dosimetry to actually  
8 track at least in a year, forget about multiple years  
9 of flexibility, is there uncertainty in their  
10 dosimetry for their personnel precise enough that --  
11 what I'm worried about is that -- I mean, I'm in the  
12 world of peak clad temperature, and we're doing 95-95,  
13 and I'm worried about 2,200 F versus 2,150. This  
14 strikes me as another total world on this, and it  
15 strikes me as a very large uncertainty, so I'm kind of  
16 with the Chairman over here about --

17 CHAIRMAN ARMIJO: What are we getting for  
18 all this effort?

19 MEMBER CORRADINI: What are the benefits  
20 we're getting for this reduction? So, that's -- it's  
21 not a question, it's just more of a -- if it's one to  
22 10 that really kind of makes me wonder, I guess.

23 CHAIRMAN ARMIJO: Well, I clearly think I  
24 need more education on that. I'm going to ask Mike if  
25 maybe we could have a technical --

**NEAL R. GROSS**

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

1 MEMBER CORRADINI: But I think --

2 (Simultaneous speech.)

3 MEMBER CORRADINI: - he answered the  
4 question. I don't want to hold him up any more.

5 CHAIRMAN ARMIJO: This is part of  
6 administrative organizational, but some of the  
7 technical basis for these recommendations, I think we  
8 need to talk about that.

9 MEMBER SIEBER: Actually, in the  
10 application stage out of the Health Physics manual  
11 uncertainty is not a factor. I mean, you try to  
12 calibrate all your instrumentation as best you can and  
13 you apply it, and whatever the answer is --

14 MEMBER RYAN: You know, I would say in  
15 practice people take a reading based on where the  
16 meter lays, but they're making a big mistake if they  
17 don't understand what the uncertainties are in that  
18 reading. And I think the health physics practitioners  
19 do understand that. That would be my observation.

20 MEMBER CORRADINI: So, the reason I asked  
21 the question is kind of back to Joy's flexibility  
22 issue, which is it strikes me that if you're going  
23 forward with this and you want to take five to two,  
24 and I can understand why. I can understand why, the  
25 public wants to see less risk in all areas. That I get

**NEAL R. GROSS**

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

1 it.

2 It strikes me you've got to build in some  
3 sort of flexibility into the regulation; otherwise,  
4 you're giving the impression of high certainty where  
5 I don't sense there is high certainty.

6 MEMBER RYAN: I think there's two ways to  
7 address the flexibility question, at least from my own  
8 experience. One is, if -- let's say there's a  
9 reduction in your occupational limit to 50  
10 millisieverts or 20 millisieverts. The question of  
11 flexibility comes around of is it easy to meet that or  
12 not? Does my equipment and my technique allow me to  
13 say I'm not really going to approach the limit. Let's  
14 just pick a number, the limit of 50 because I've got  
15 good equipment and good technique, so my --

16 MEMBER CORRADINI: And good procedures.

17 MEMBER RYAN: And good procedures, so I'm  
18 very unlikely to even approach that limit. So, I think  
19 you can get at it two ways. One is by technique being  
20 approved, which is typically -- correct me if you  
21 disagree, but my experience is when regulations have  
22 changed in this area people have figured out how to  
23 create the margin by technique, and by measurement and  
24 by lots of other things that can be considered.

25 If you look at how diagnostic x-rays have

**NEAL R. GROSS**

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

1 evolved over time, we now have all sorts of different  
2 techniques that minimize exposure with CT scans. When  
3 CT scans first came out they were high-dose  
4 procedures. They're not so much high any more because  
5 people have recognized that and dealt with it. So, I  
6 think it certainly can be addressed so that you're not  
7 against a statistical limit. You know, I'm close to  
8 the limit, I'm going to go over today. I'll be under  
9 tomorrow, I'll be over on Wednesday, that kind of  
10 thing. It's a manageable circumstance, I guess, is my  
11 view. Any thoughts?

12 DR. COOL: I agree. I think I would make  
13 one other distinction. We know that there's always  
14 uncertainty in the way that we measure exposure.  
15 That's different from the uncertainty that's  
16 associated with radiation risk, although all of them  
17 combined together in an uncertainty calculation.

18 For the dosimetry systems for effective  
19 dose, they are actually a lot less uncertain than your  
20 underlying risk question would be. It's not that they  
21 are certain, but --

22 MEMBER CORRADINI: But they're less --

23 DR. COOL: We have systems which are very  
24 good measuring to very low quantities of occupational  
25 exposure. More difficult is the lens of the eye,

**NEAL R. GROSS**

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

1 because up until now most of the exposures to the lens  
2 of the eye have been calculated on the basis of the  
3 whole body badge with an appropriate window to  
4 calculate the dose, the different levels to the lens  
5 of the eye. That was perfectly acceptable in a time  
6 frame where the effective dose limit was five, the  
7 lens dose limit was 15, because you just didn't get  
8 there hardly ever.

9 As has been raised, and as you have noted,  
10 if you lower the lens dose number as ICRP did to  
11 numerically the same value as the effective dose,  
12 recognizing it's applying to lens dose, but  
13 numerically it's saying two rem average, five rem  
14 maximum in any one year for the lens dose equivalent.  
15 It becomes much more important because at that moment  
16 you have placed the lens dose as potentially the  
17 controlling exposure. If you have shielding to the  
18 body as is in the typical case in the medical  
19 interventional cardiology suite where they've got the  
20 lead apron and things. If they do not have the leaded  
21 goggles, that lens dose would become the controlling  
22 dose, or if you're in very asymmetric exposure  
23 conditions and other situations. That is an issue  
24 which everyone is now struggling, I will say,  
25 examining it, because those recommendations from ICRP

**NEAL R. GROSS**

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

1 only came out one year ago. So, there is a lot of  
2 questions.

3           There are questions not only about that,  
4 there are questions about whether the endpoint of  
5 concern, the induction of a cataract, should be  
6 considered at the same level of concern and protection  
7 as the endpoints of concern for effective dose which  
8 are morbidity, mortality, and cancer, and others. Many  
9 people have pointed out in comments not just to us,  
10 but in the International Radiation Protection  
11 Association's Congress in Glasgow, United Kingdom a  
12 couple of weeks ago, cataracts are things that if we  
13 stick around long enough we're all going to have. And  
14 it now takes them about seven or eight minutes to do  
15 a cataract replacement. You go home the same day.  
16 You've got a patch over your eyes a couple of days.  
17 And, by the way, in the process they've converted what  
18 would be my very bad eyes to something that would see  
19 perfectly fine but I might need some reading glasses.  
20 So, there is a lot of debate around what's the right  
21 thing to do for lens of the eye, and the relationship  
22 of that limit with the effective dose limit. Which is  
23 why you will see that the staff is at this point  
24 recommending that we look at a reduction, but that we  
25 have not yet picked what the right reduction is. In

**NEAL R. GROSS**

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

1 fact, it's not at all clear to us that using the same  
2 number is the appropriate approach to take --

3 MEMBER RYAN: When you say the same number  
4 you mean the same number as --

5 (Simultaneous speech.)

6 DR. COOL: As recommendation.

7 MEMBER RYAN: The same number we have now.

8 DR. COOL: Correct.

9 MEMBER RYAN: Okay.

10 DR. COOL: What I'm saying is, and the  
11 slide states it explicitly, there are at least two  
12 options, and those are not meant to be the only two,  
13 necessarily, but the two logical ones of the two rem,  
14 because the ICRP recommendation is now a two rem  
15 average, five year maximum.

16 MEMBER RYAN: Just to calibrate the  
17 Committee a little bit, and I think to address the  
18 Chairman's question a little bit. What do you see as  
19 the time frame where you're going to be making some  
20 decisions about the numbers and all that sort of  
21 stuff? It's not today or tomorrow, it sounds like it's  
22 some number of years away.

23 DR. COOL: That's correct. A brief outline  
24 of the time line that we would be looking at if the  
25 Commission agreed with the Staff's recommendations,

**NEAL R. GROSS**

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

1 continue the technical basis development, draft rule  
2 text, draft guidance, development of the information  
3 necessary to do all the calculations through the end  
4 of 2015. Because, in fact, we won't have the numeric  
5 information available before that time under ICRP's  
6 current schedules. That would suggest that we could  
7 have a proposed rule end of 2016.

8           You're in public comment. Standard  
9 rulemaking process would assume you could have a final  
10 rule in 2017. The previous revision of Part 20 would  
11 suggest that it's going to be later than that because  
12 last time we did the revision we had it open for  
13 public comment for 300 days. There was a lot of  
14 interest. If you then assume you have a final rule and  
15 then if you assume an implementation period of three  
16 years, which is what we did last time, you are looking  
17 at an effective date after 2020.

18           MEMBER CORRADINI: The three years is a  
19 transition time?

20           DR. COOL: Is a transition time --

21           MEMBER CORRADINI: Okay.

22                           (Simultaneous speech.)

23           DR. COOL: -- after the final rule is  
24 published.

25           DR. NOURBAKSH: Some a little bit on the

**NEAL R. GROSS**

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

1 Chairman's side, as well. The bold limits in place now  
2 have been around for decades, such is my  
3 understanding, I remember them from my previous  
4 occupations. And I haven't heard or I didn't see any  
5 specific quantitative basis for saying hey, we have a  
6 real problem that we have to solve relative to those  
7 numbers that we've been using, and that the basis for  
8 trying to reduce these is really just to bring them  
9 into conformance with an international standard that  
10 other folks are going to band, that their basis -- and  
11 my statement now is what you said earlier, is that if  
12 you ask for a quantitative basis for why they have  
13 wanted to there, it's tenuous. It's almost like less  
14 is better and, therefore, they want to reduce the  
15 limits with some statistical hand waving. So, I tend  
16 to -- that really bothers me that people particularly  
17 in the medical community, those in yards, or shipyards  
18 or industrial folks and other type people who are  
19 doing radiography, there is a lot of controls, but the  
20 idea of forcing a cadre of people who may just leave  
21 their dosimeters aside because they feel that their  
22 mission in life is to make sure other people survive  
23 is -- you're making them break the law, effectively,  
24 to do their job.

25 When we don't have quantitative

**NEAL R. GROSS**

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

1 information the limits that are there today are  
2 creating a problem, and people are dying because we do  
3 not have low enough limits. I say that strongly  
4 worded, but it's just a high-level thought process.

5 CHAIRMAN ARMIJO: Charlie, the way I see  
6 it, if you have a good technical basis, it's an easy  
7 sell.

8 DR. NOURBAKHS: I agree with that.

9 (Simultaneous speech.)

10 CHAIRMAN ARMIJO: It looks like it's just  
11 conformance with ICRP, or what Europeans are doing.  
12 And that's not a sales tool, as far as I'm concerned.  
13 It's what does the United States Nuclear Regulatory  
14 Commission and its out bodies take a look at it and  
15 say here's the quantitative benefits, this is the  
16 basis for the benefits. For guys like me that don't  
17 understand this area, I'm going to need a little  
18 education, probably a lot of education. So, in the  
19 course of time I'm asking Mike to set us up with those  
20 kind of things.

21 And the other thing, there probably are  
22 professionals, respected professionals and maybe  
23 organizations that don't agree with this direction.  
24 And I'd like to hear from them and see where we come  
25 out on these numbers, because I worry even in the

**NEAL R. GROSS**

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

1 industrial, in the nuclear industry, we keep pushing  
2 these limits down. Harold has made a point, well, it's  
3 just money, cost, people, but I worry that people will  
4 say gee, our criteria are -- there's things that we  
5 could do or should do as far as maintenance and things  
6 like that that we'll find a way around it in order to  
7 meet these limits. And they'll do it knowingly, not  
8 cheating, but just say okay, we'll do this and that.  
9 When, in fact, maybe we want more inspection, maybe we  
10 want more -- the safety tradeoff might be compromised  
11 by pushing these limits down unless there's a really  
12 strong technical basis. And that's where I'm trying to  
13 put my whole story together. That's what's got me  
14 worried.

15 MEMBER RAY: My point was it wasn't just a  
16 matter of resetting limits and the alarm set points.

17 CHAIRMAN ARMIJO: Yes, that is --

18 MEMBER RAY: That isn't the point.

19 CHAIRMAN ARMIJO: No, I understood what you  
20 said, and I agree that -- so, you could have an  
21 unintended consequence of trying to do better on  
22 occupational exposure, but in fact you provide an  
23 incentive not to do things that would be good to do  
24 from the standpoint of maintenance and inspection of  
25 equipment --

**NEAL R. GROSS**

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

1                   MEMBER RAY: So, Davis-Besse over again.  
2                   Right?

3                   CHAIRMAN ARMIJO: Well, maybe something  
4                   like that, yes. That was -- I'm talking about guys who  
5                   tweak their system to meet their numbers. They don't  
6                   cheat, but they just tilt, and that's something we  
7                   shouldn't encourage.

8                   MEMBER SIEBER: Well, you know, under ALARA  
9                   there's all kinds of ways to attack the problem of I  
10                  don't want to get to dose but I've got to get the work  
11                  done. For example, in the old days steam generator  
12                  jumpers were a high-dose occupation, and as far as  
13                  ALARA is concerned when the pressure was on for ALARA  
14                  in came the robots.

15                  CHAIRMAN ARMIJO: Sure, as long as it gets  
16                  done.

17                  MEMBER SIEBER: The generator inspection,  
18                  man rem expenditure now is pretty low.

19                  MEMBER SHACK: But, I mean, if your  
20                  radiation risk is increased from 1.25 to 5, changing  
21                  your limit from five to two seems like a very modest  
22                  response.

23                  MEMBER SIEBER: Right.

24                  DR. COOL: That is correct. And, in fact,  
25                  the change in the limit is not of the same magnitude

**NEAL R. GROSS**

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

1 as the change in the risk because in parallel with  
2 that was a whole series of other factors and  
3 considerations about what was appropriate in  
4 individual protection.

5 And the Chairman is quite right, if you  
6 look at this in the typical cost benefit man rem up,  
7 man rem down, this is not going to pass, because most  
8 of the individuals because of ALARA, because of good  
9 radiation protection programs are getting exposures  
10 which are well below the limits. I would wish that we  
11 could happily then say that everyone is receiving  
12 proper protection, and the unfortunate thing is that  
13 there are individuals who are receiving higher  
14 exposures, who on the record have said they're getting  
15 higher exposures every single year, or we don't even  
16 know what their exposures are because they are already  
17 in non-compliance, although we did not receive  
18 something which I actually needed to send to our  
19 Office of Investigations as an allegation.

20 So, the technical basis is related to the  
21 appropriate individual protection. The recommendation  
22 is aimed at finding a mechanism to insure the level of  
23 protection for those individuals who would be  
24 approaching the limits.

25 MEMBER BLEY: Don, from what you just said,

**NEAL R. GROSS**

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

1 if I understand correctly, the effect of changing the  
2 limit would essentially be nil if we could bring the  
3 people, the small number of people who are out of  
4 compliance into compliance, it could be a very big  
5 effect. Is that what I heard you say? That's what I  
6 heard you say. Is that what you intended to say?

7 DR. COOL: If there was another mechanism  
8 for reducing the exposure of the high-dose  
9 individuals, you would achieve the same --

10 MEMBER BLEY: Approaching the limit won't  
11 affect that near as I can tell. They're already  
12 exceeding the current limit.

13 MEMBER RYAN: Well, there is a very small  
14 percentage of --

15 MEMBER BLEY: Yes, but it sounds like  
16 that's who we're after.

17 MEMBER RYAN: I think it's very hard to  
18 characterize it in that way, because it really is a  
19 very, very small number of folks that are out of  
20 conformance.

21 MEMBER BLEY: But there's a large number of  
22 people who are already below the new limit.

23 MEMBER CORRADINI: Dennis is asking -- what  
24 I heard Dennis ask was -- if he understood your  
25 explanation, is there another way to attack this

**NEAL R. GROSS**

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

1       rather than moving down the whole bar.

2                   MEMBER BLEY: Yes.

3                   MEMBER CORRADINI: That's what I thought  
4       you just --

5                   MEMBER SCHULTZ: Because moving down the  
6       whole bar could have dramatic impact on the cost of  
7       implementation.

8                   DR. COOL: The staff, in fact, looked very  
9       carefully at was there another mechanism to reduce  
10      that small set of individuals who were getting the  
11      higher exposures. In fact, I'll be very frank with  
12      you. As I started off this effort, I was thinking we  
13      would leave the limit alone and we would find some  
14      mechanisms to increase the strength of the ALARA  
15      program and the mission could be done.

16                   One of the things that you do when you go  
17      through these things is, occasionally, you have to  
18      realize that there's some other information coming  
19      into play. And what came into play was that the set of  
20      things that would be necessary to add strength to the  
21      ALARA program, which is essentially that which the  
22      reactor community does today, perfectly well and good  
23      in the reactor community, virtually no impact, job  
24      gets done. It does not translate to the 22,000  
25      licensees that we have on our side of the house. We do

**NEAL R. GROSS**

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

1 not have those kinds of programs to not have those  
2 kinds of resources.

3 MEMBER BLEY: Let me ask it another way.  
4 So, given that, changing the limit seems to make sense  
5 to you, but my question is how will changing the limit  
6 help to bring the small number of people who are out  
7 of compliance now lower?

8 MEMBER CORRADINI: If they behave like you  
9 suggested --

10 MEMBER STETKAR: Or if they were to just  
11 increase the number of people --

12 (Simultaneous speech.)

13 MEMBER STETKAR: -- out of compliance with  
14 the new limit for the same reasons.

15 MEMBER CORRADINI: Or, I guess, if I might  
16 just interject, what you said you heard in Europe,  
17 that they just put it in the drawer and do the job  
18 anyway, since they're not being watched as you would  
19 in a nuclear power plant.

20 CHAIRMAN ARMIJO: But those people would  
21 comply if they were convinced that they were putting  
22 themselves in harm's way by ignoring these limits.

23 MEMBER BLEY: I think they think they're  
24 doing more good than the harm they're doing to  
25 themselves.

**NEAL R. GROSS**

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

1 CHAIRMAN ARMIJO: I don't think they're  
2 that altruistic. I just think they believe there's a  
3 lot of margin in the current --

4 (Simultaneous speech.)

5 MEMBER CORRADINI: We're inferring what  
6 they believe. We don't know --

7 CHAIRMAN ARMIJO: There's got to be a  
8 reason.

9 MEMBER RYAN: Folks and their motivations  
10 in this context. I just -- I think we need to -- quite  
11 frankly, I don't know how we deal with that of  
12 thinking. I mean, we can't judge well, these people  
13 think this way, these people think that way, and  
14 they'll comply for these reasons, and they'll not  
15 comply for these reasons.

16 MEMBER BLEY: Well, back to my question,  
17 though.

18 CHAIRMAN ARMIJO: Why are they not  
19 complying with --

20 MEMBER BLEY: Why would lowering the limit  
21 affect that group we were trying to get at?

22 MEMBER RYAN: Well, the history lesson that  
23 I'd offer you is that every time limits have changed,  
24 the vast majority of the regulated community has come  
25 into conformance with them, some willingly and some

**NEAL R. GROSS**

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

1 quickly, and some maybe not so willingly, had to make  
2 some adjustments over time to get there, but it's been  
3 done. I don't see where the --

4 MEMBER BLEY: What I've heard is the vast  
5 majority is already well below what --

6 CHAIRMAN ARMIJO: You can always force  
7 people to --

8 MEMBER SHACK: Just on the 100 rem, you  
9 don't have 100 rem limit. These people are getting the  
10 100 rem because they're picking up five rem a year.  
11 So, when you change that you will -- they're in  
12 compliance now. They're still approaching the 100 rem  
13 limit because the limit -- the five rem lets you do  
14 that.

15 DR. COOL: The selection of the limit, if  
16 I make the assumption, which I believe we have to make  
17 the assumption that you will have compliance, will  
18 result in eliminating those over-exposures. There will  
19 be issues of non-compliance which we and the states  
20 will have to deal with. We also recognize that there  
21 will be some issues where there is flexibility needed  
22 for at least some period of time, maybe forever. And  
23 the Staff is asking the Commission to allow us to  
24 develop the basis that would provide an opportunity  
25 for that group of licensees and needs to be able to

**NEAL R. GROSS**

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

1 have the flexibility to do the job right without being  
2 in non-compliance.

3 Dr. Ryan I think mentioned that in 1991  
4 with that rule, the dose limit went from a maximum of  
5 12 rem in a year, because it was three rem per quarter  
6 up to N minus 18, to five. And there was enormous  
7 uproar during that period of development about how --

8 (Operator interruption.)

9 DR. COOL: At that time, there was a lot of  
10 expressions that is impossible, people couldn't do it,  
11 couldn't be done, you were going to impact medical  
12 care and otherwise. Not one peep, everyone complied  
13 very nicely. There were some bumps in the road with  
14 the implementation, as there always is, related to  
15 what's the guidance and answering a lot of questions.  
16 It all happened very smoothly.

17 The experience in other countries suggests  
18 that they moved to the new ICRP recommendations or  
19 some variation thereof --

20 (Operator interruption.)

21 DR. COOL: And, in fact, most of those  
22 countries never saw anyone utilize the flexibility.  
23 And, in fact, at least some of those countries, such  
24 as France, have already moved to a single limit  
25 because their view was the flexibility was not

**NEAL R. GROSS**

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

1 necessary. So, it's not a nice quantitative  
2 mathematical number for you, but the experience over  
3 time has indicated that it can be done, it has been  
4 done, but we believe that it's still appropriate to  
5 provide mechanisms for flexibility so that, in fact,  
6 if it is the doctor who needs to do that particular  
7 very difficult patient, and he gets a larger exposure  
8 because it is very difficult and it takes more time,  
9 and he has to have a longer period with his foot on  
10 the interventional cardiology pedal, et cetera, that  
11 he does that job.

12 We are not looking to put people out of  
13 business, but we are looking to provide a mechanism  
14 that insures a consistent level of individual  
15 protection within that framework. And we felt that the  
16 change in the limit was the way to go about doing that  
17 so that licensees could use whatever mechanisms they  
18 chose to use rather than us prescribing some very  
19 detailed set of processes that simply wouldn't be the  
20 right thing for many of them.

21 MEMBER RYAN: Don, we've got a few more  
22 slides to go.

23 DR. COOL: Yes.

24 MEMBER RYAN: I think we've hit this point  
25 enough. We need to move on and hear the rest of your

**NEAL R. GROSS**

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

1 package.

2 DR. COOL: I will touch the rest of these  
3 fairly quickly. We've already touched on the lens dose  
4 number where we believe there's considerable more that  
5 needs to be looked at. The answer is not much  
6 different with the bottom number on that slide for the  
7 occupational embryo/fetus limit. The current limit is  
8 500 millirem over the gestation period.

9 The underlining basis of protection has  
10 always been stated in the qualitative terms of  
11 protection equivalent to that provided to a member of  
12 the public, as in the public dose limit, 100 millirem,  
13 one millisievert. The Staff is recommending that we  
14 look at making that change.

15 In the discussions with stakeholders, most  
16 of them did not see a great deal of difference. Many  
17 organizations are able to simply remove the  
18 individuals when they have determined to declare so  
19 they don't get a great deal of additional exposure.  
20 There are some things that have to be carefully looked  
21 at, because again this one, if applied over the entire  
22 gestation period begins to challenge the dosimetry  
23 system's ability to demonstrate compliance.

24 We also know that there are some groups of  
25 licensees, nuclear medicine laboratory techs preparing

**NEAL R. GROSS**

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

1 the doses to go up who never get more than 500  
2 millirem. Their total annual exposure may be a couple  
3 of hundred millirem, so the embryo/fetus issue was  
4 never an issue for them. But if you change it to 100  
5 millirem, then perhaps it is. Those sorts of things  
6 continue to need to be explored.

7 The ICRP recommendation applied it only  
8 after declaration. The current NRC limit is over the  
9 entire gestation period. That is another question. I  
10 think you can immediately tell those would be very  
11 different levels of protection, because the right to  
12 declare, fundamental legal right established in the  
13 court system well outside of radiation space which we  
14 are not attempting to challenge. That's, in fact, a  
15 worldwide norm these days.

16 MEMBER SKILLMAN: Don, is TEDE still the  
17 sum of CEDE plus TOD, CED plus TOD over dose change  
18 also?

19 DR. COOL: The specific acronyms would  
20 change. Effective dose would still be the sum of the  
21 effective dose from external components, and the  
22 committed effective dose from internal components. So,  
23 the logic is all the same. Each of the terms will  
24 change because of the differences in the factors that  
25 have now been applied in doing the calculation.

**NEAL R. GROSS**

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

1 MEMBER SKILLMAN: Okay, thank you.

2 DR. COOL: There are a couple of other  
3 things that I mentioned that we wanted to look at. One  
4 of them is the increased use of the SI units. As I  
5 said, we're the only folks around who still talk in  
6 rems and microcuries, not millisieverts and  
7 becquerels.

8 The Commission's metrication policy, in  
9 fact, now is to use the SI first. Part 20 was in place  
10 before that policy was established. The Health Physics  
11 Society now has a position statement which says just  
12 do it. It doesn't exactly use the best words, but just  
13 do it, move to SI and be done with it. But that  
14 requires a great deal of careful exploration, but we  
15 believe that it's something that is warranted to  
16 continue the exploration because of some very strong  
17 inputs from the professional societies.

18 As I mentioned a little bit earlier, we  
19 are exploring additional categories of licensees. None  
20 of those doctors have to report their dose to anybody.  
21 They're in the dose records of the licensee. They do  
22 not have to be reported. They do not have to be  
23 reported to us. They do not have to be reported to an  
24 Agreement State.

25 We sort of marvel at that at times because

1 we're all used to the reactors always providing  
2 individual dose each year, in the fuel cycle  
3 facilities each year. They do not. Not only is that a  
4 difficulty from the standpoint of doing things like  
5 this, what do they actually get, but it also raises  
6 some interesting questions that the states readily  
7 agreed with the number of cases, because I can imagine  
8 any number of doctors here in the DC Metropolitan area  
9 who have practice privileges over at Fairfax INOVA,  
10 that would be a Virginia licensee, at Georgetown which  
11 would be an NRC licensing in the District of Columbia,  
12 and perhaps at Suburban or University of Maryland or  
13 something which would be a Maryland licensee. And they  
14 could do all of those in one week, three different  
15 jurisdictions, not a clue what the total net would be  
16 because there's nothing that would allow an  
17 independent organization, regulatory organization to  
18 go look and see what the individual's total is other  
19 than the presumption that the individual is doing the  
20 right thing and providing information on his exposure  
21 to the other licensees. It requires exploration.

22 MEMBER RYAN: As opposed to somebody that  
23 goes to a power plant to work, they better have their  
24 current Form 4 or they don't go in.

25 DR. COOL: And for most of them, in fact,

1 the PAD system, they know. And, lastly, to align Part  
2 50, Appendix I with the scientific information to move  
3 forward, and eventually to look at trying to do the  
4 same thing for other portions of the regulations. The  
5 Commission already is expressing interest in that in  
6 the waste disposal area.

7 Policy options, I will do this very  
8 quickly. There's always the don't bother doing  
9 anything. The limit is doing the job, let's just stick  
10 with it. The second option, a limited revision, just  
11 do the scientific updates, update Part 50, Appendix I  
12 using -- so at least we've reset the calculational  
13 approach, but don't do the limits and other things. We  
14 have recommended against that because that is -- I  
15 will say it this way, that is almost being two-faced.  
16 On the one hand, the new science is important so we  
17 should update the way we do the calculation, but on  
18 the other hand the new science, exactly same  
19 underlying science calculation of dose and risk isn't  
20 necessary because we don't need to worry about the  
21 risk to the individuals that might be exposed at  
22 levels approaching the limits.

23 Staff has recommended the third option to  
24 continue to move forward to develop the basis and  
25 information necessary to make a proposal, 2015-2016

**NEAL R. GROSS**

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

1 once we have the technical basis --

2 MEMBER RYAN: I peeked ahead. That's the  
3 option you're recommending.

4 DR. COOL: Right.

5 MEMBER RYAN: And I think it's important  
6 for the Committee to understand that you're making a  
7 decision to add a process rather than a decision to  
8 change the regulations quickly, so it's years of  
9 development to get from where we are today to some new  
10 construct that could be a regulation at some point.

11 DR. COOL: That is correct. We are asking  
12 permission to continue the engagement process now with  
13 the specifics because that's only how you can get to  
14 the detailed analyses over the next three years or so  
15 that could lead to a proposed rule, but we are not, in  
16 fact, asking the Commission or you to say yes, verily  
17 this is exactly the right answer, because I'm not  
18 smart enough to sit here today and tell you exactly  
19 what the right answer is in all of these details.

20 MEMBER BLEY: And in response to our  
21 Chairman's points earlier, part of this process is to  
22 develop that basis.

23 DR. COOL: To continue to develop that  
24 basis.

25 MEMBER RYAN: I share Dr. Leo's comments in

**NEAL R. GROSS**

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

1 wanting to have basis and an understanding but that's  
2 something that you -- again, I just want to make sure  
3 I understand it clearly, you have built into the  
4 process for the next few years if you're authorized to  
5 go forward today with the exploration of those issues  
6 and many others.

7 DR. COOL: That is correct.

8 MEMBER RYAN: Okay.

9 DR. COOL: Not just myself but a variety of  
10 other people with their specialties.

11 MEMBER RYAN: One thing, I tried to add it  
12 a little earlier but it seems to me that there's one  
13 limitation of having a single number for an individual  
14 per year. The rule of having flexibility on an annual  
15 exposure to vary, I think as my -- I'll ask my reactor  
16 colleagues if you have an outage going on, having  
17 flexibility on the annual limit but some larger period  
18 of time limit over five years or whatever it might be  
19 seems to be a practical --

20 DR. COOL: Benefit.

21 MEMBER RYAN: -- and useful tool to have  
22 for that environment. I guess at some point in the  
23 future the Committee might offer input on that, but I  
24 think that's a question that needs some more detailed  
25 exploration as to have we eliminated a requirement

**NEAL R. GROSS**

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

1 that's useful or not.

2 DR. COOL: The Staff's recommendation, in  
3 fact, includes discussion of a way to build in  
4 flexibility.

5 MEMBER RYAN: Okay.

6 DR. COOL: We are not locked in on that  
7 particular approach. Our desires, in fact, would be to  
8 be able to provide flexibility but to do in the  
9 mechanism that does not burden what we suspect is the  
10 vast majority of licensees who wouldn't ever need the  
11 flexibility.

12 MEMBER RYAN: Okay.

13 MEMBER SCHULTZ: And I think it could be  
14 more beneficial in other industries or companies.

15 MEMBER RYAN: Sure, yes.

16 MEMBER CORRADINI: Are we behind kind of -

17 MEMBER RYAN: We have a few minutes.

18 MEMBER CORRADINI: I guess I want to  
19 understand the EPA's connection to this. Are you going  
20 to specify --

21 MEMBER RYAN: We don't have an hour.

22 MEMBER CORRADINI: I'm sorry, can I go  
23 ahead?

24 MEMBER RYAN: Yes.

25 MEMBER CORRADINI: Okay. So, are you --

**NEAL R. GROSS**

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

1 let's say Option -- well, you go forward with Option  
2 3. We're okay with Option 3. The wheels start turning  
3 and in 2016 everything you suggest that connects to  
4 Option 3, five to two, 103, all this stuff happens.  
5 Does EPA just say yea verily?

6 DR. COOL: No.

7 MEMBER CORRADINI: Or they now have to thin  
8 about it?

9 DR. COOL: Well, in fact, in parallel with  
10 this EPA is already in discussions with us about  
11 making a revision and update of the federal guidance  
12 for occupational exposure which was last signed by  
13 President Reagan in '87 using these same sorts of  
14 issues to look at it. So, we would, in fact, hope that  
15 in moving forward we could have revised federal  
16 guidance that would go along with this, that there  
17 would be continued discussions with our friends in the  
18 Occupational Safety and Health Administration whose  
19 radiation protection rule is the 1966 version of Part  
20 20 copied in verbatim, has never been changed.

21 EPA is also in parallel already and about  
22 to publish an Advanced Notice for Proposed Rulemaking  
23 related to 40 CFR 190, their generally applicable  
24 environmental standard for the fuel cycle facilities.  
25 This is a public exposure area, and the questions they

**NEAL R. GROSS**

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

1 are asking are exactly these same questions about  
2 updating the number, updating the risk, moving to  
3 effective dose.

4 MEMBER CORRADINI: Okay. And the reason I  
5 asked that question partly is, you had this long-term  
6 vision that you expressed early in the conversation.  
7 I assume this is where it connects, because at least  
8 for licensees what you eventually may turn out to do  
9 affects the licensees, end of story. All this would  
10 then roll out to other potentially affected individual  
11 -- other groups.

12 DR. COOL: Yes.

13 MEMBER CORRADINI: Okay. Let me ask -- I'll  
14 just stop there. We're running out of time.

15 MEMBER RYAN: Okay. Than you, Mike. Let's  
16 see, we're kind of --

17 DR. COOL: That's the last slide. I'm done.  
18 Thank you.

19 MEMBER RYAN: -- at the end of our time.  
20 Are there any other questions from members? Anything  
21 else? I'd like to see if there's any members in the  
22 audience that might like to make a comment or two  
23 briefly. Yes, Ralph Andersen.

24 MR. ANDERSEN: Yes, Ralph Andersen with the  
25 Nuclear Energy Institute. This was a very enlightening

**NEAL R. GROSS**

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

1 discussion, and actually it raised a few questions in  
2 my mind different than the comment that I thought I  
3 might make. It seems to me that the NRC needs to  
4 define a problem statement or a series of problem  
5 statements that they're trying to address with this  
6 effort.

7 Up to now, I think our problem statement  
8 has been should we align our NRC regulations more  
9 closely with international standards, and yet I've  
10 heard at least two problems that have not been clearly  
11 articulated and dealt with. One is, it seems to me  
12 there's a lot of data that the NRC should be acquiring  
13 to do it's job that it's not currently getting.

14 You refer to the majority of licensees. In  
15 effect, you're saying you don't really know how much  
16 dose they're getting. And that seems to confuse your  
17 decision making at the Commission level. So, one  
18 problem I think you need to evaluate is are you  
19 getting all the information you need to do your job.

20 A second problem I heard is that there's  
21 a question of whether there is some subset, albeit a  
22 small subset of workers at licensees that are not  
23 currently being adequately protected by the existing  
24 regulatory framework, and the solution to that problem  
25 as we heard from some of the members might be quite

**NEAL R. GROSS**

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

1 different than a massive rulemaking.

2 I'll comment that within the context of  
3 nuclear power plants, we actually specifically went at  
4 worker exposure in regard to the regulatory oversight  
5 process which provided a lot of flexibility for  
6 emphasizing ALARA that one could argue supplements the  
7 regulation but isn't directly required by the  
8 regulation. For instance, we have performance  
9 indicators that we're using in the ALARA area that  
10 have had a positive effect for continuing to reinforce  
11 our efforts to reduce worker dose. So, there's other  
12 tools in the box than rulemaking, I'll just comment.

13 And then, finally, I just want to make a  
14 remark to the Committee. There actually is an annual  
15 report of occupational dose that compiles the  
16 information that NRC does have available. It's NUREG-  
17 0713, actually the most recent annual version just was  
18 published in the last few days. And I commend that to  
19 the Committee to look at so at least you have an up-  
20 to-date factual understanding of what the real dose is  
21 people are getting such as the NRC knows to date.  
22 Thank you.

23 MEMBER RYAN: Thank you. Any other  
24 comments? Mr. Chairman, I'll turn it back to you.

25 CHAIRMAN ARMIJO: Okay. Well, thank you

**NEAL R. GROSS**

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

1 very much. Thank you, Don, for a good presentation.  
2 Let's reconvene at 10:20.

3 (Whereupon, the proceedings went off the  
4 record at 10:02:01 a.m., and went back on the record  
5 at 10:23:03 a.m.)

6 CHAIRMAN ARMIJO: Okay, I'm sorry I was  
7 late. The next topic is disposition of Near-Term Task  
8 Force, Tier 3 recommendations. Dr. Schultz will lead  
9 us through this presentation. Steve.

10 MEMBER SCHULTZ: Thank you, Chairman. This  
11 morning we're going to have a presentation related to  
12 the disposition of Near-Term Task Force  
13 recommendations, guidance documents associated with  
14 the NTTF recommendations 2.3, and other topics that  
15 were discussed at our Fukushima Subcommittee meeting  
16 on May 22<sup>nd</sup> and 23<sup>rd</sup>. We are going to have a  
17 presentation first by John Monninger, and then we have  
18 other topics associated with recommendation 2.3. Chris  
19 Cook and Annie Kammerer will be presenting that.

20 Now, we do have one request from a member  
21 of the public to make a short presentation, a comment  
22 at the end of the discussions here, so we want to  
23 allow time for that. With that I want to introduce  
24 you, John, and have you take over the presentation.  
25 Thank you.

**NEAL R. GROSS**

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

1 MR. MONNINGER: Thank you, Dr. Schultz, and  
2 good morning. My name is John Monninger. I'm the  
3 Associate Director for the Japan Lessons Learned  
4 Project Director within the Office of Nuclear Reactor  
5 Regulation. I'm pleased to be here today to address  
6 the Full Committee following our hopefully successful  
7 day and a half Subcommittee meeting we had last month.

8 To a certain extent I hopefully have the  
9 easy part in providing the presentation today, but I  
10 do have to recognize that this is really an agency  
11 effort. For all of these various recommendations out  
12 there, there's teams in place, there's teams on staff  
13 from NRR, NRO, Research, NSER, and NMSS, so the plans  
14 that are in front of you are not necessarily the  
15 product of the Japan Lessons Learned Directorate. It's  
16 an agency effort. And a lot of those staff have also  
17 been very active and busy with the Tier 1 activities  
18 out there.

19 So, there was a word that was mentioned,  
20 the disposition of the Tier 3 items. I guess what I  
21 would characterize potentially as we're sort of as  
22 opposed to dispositioning, to me we're sort of in the  
23 informative stages. We're starting to -- basically  
24 starting our plans rolling out. So, I think that  
25 should be some of our focus, is the staff at the right

**NEAL R. GROSS**

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

1 -- at the correct starting point? Have we identified  
2 the potential correct technical issues to begin  
3 dialoguing on, recognizing that as we pursue these  
4 plans, the plans are subject to change, and there  
5 could be potential additions to the plans.

6 Did we potentially identify the  
7 dependencies between the Tier 3 issues and the Tier 1  
8 issues? And, also, along that thought process, I  
9 believe that this begins a series of interactions, a  
10 series of interactions on each one of these issues  
11 with the ACRS and with our stakeholders out there. So,  
12 this is just the first opportunity to begin that  
13 dialogue.

14 MEMBER SCHULTZ: And we agree with that  
15 characterization, and thank you for it.

16 MR. MONNINGER: Okay, public meetings. We  
17 did have three very good public meetings that last  
18 approximately two and a half days. We have a paper due  
19 to the Commission in early July, and the Tier 3 plans  
20 will be one part of that Commission paper.

21 With that said, even though we're going to  
22 talk Tier 3 today, the Agency's focus continues to be  
23 on the Tier 1 activities, so to the extent that the  
24 staff is pulled between Tier 3 and Tier 1, the Tier 1  
25 activities will continue to take precedent.

**NEAL R. GROSS**

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

1 I think it's important to have the slide  
2 here but we won't necessarily cover it. There's been  
3 a lot of Agency actions since the accident in March  
4 2011. And really how Tier 3 came about was from the  
5 Near-Term Task Force that was established in March  
6 2011.

7 The Task Force concluded with regard to  
8 the particular event that a similar sequence of events  
9 was unlikely within the U.S., that U.S. nuclear power  
10 plants have robust structure in terms of systems and  
11 preventative measures to mitigate the likelihood of  
12 core damage or radiological release. So, with that,  
13 they recommended to the Commission essentially  
14 continued operations and the Commission agreed with  
15 that.

16 Nevertheless, they did identify multiple  
17 potential enhancements to safety, and that's where  
18 some of the Tier 3 issues come in. The report was  
19 issued July of last year. The Agency took action first  
20 from the Tier 1 activities and we issued those orders  
21 and requests for information in March. So, that sort  
22 of leads us to where we are today.

23 There is a definition of what a Tier 3  
24 recommendation is. I'm on slide 5 here. And it was  
25 deliberate by the staff, and the Commission ultimately

**NEAL R. GROSS**

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

1 approved of it. And they were those recommendations  
2 that required further staff study to support a  
3 regulatory action. Should we issue rules, orders, or  
4 is this particular issue that has been identified  
5 sufficiently already covered within our regulatory  
6 structure? So, up front it does not necessarily mean  
7 that all these Tier 3 issues would result in changes  
8 to the NRC's regulatory posture, or set up  
9 requirements.

10 Other items that were identified as Tier  
11 3 would have an associated shorter term action that  
12 needs to be complete in order to inform the longer  
13 term action. There were others that were dependent  
14 upon the availability of critical skill sets or on the  
15 resolution of another recommendation.

16 What we've tried to do on this slide here,  
17 it's a little bit busy, but if you look at  
18 recommendation 3 there, at the end there's a  
19 parenthetical for the ACRS, so that's ACRS  
20 Recommendation 1-G and 2-D. Further along you'll see  
21 ACRS-C, which was ACRS conclusions from a previous  
22 letter, so we tried to do a little bit of mapping in  
23 that regard. So, as we go through we'll talk in more  
24 detail on these particular recommendations.

25 So, we're on Slide 7 and this is

**NEAL R. GROSS**

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

1 recommendation 2.2 which was the periodic reassessment  
2 of the external hazards. And the Near-Term Task Force  
3 had recommended rulemaking to require licensees to re-  
4 evaluate external hazards and bring their licensing  
5 basis up-to-date to the extent needed.

6 This recommendation is also very much  
7 related for overlaps with language within the  
8 consolidated Appropriations Act of 2012. That  
9 essentially requires the NRC to do the same thing, but  
10 it didn't specify a 10-year window.

11 With regard to this, the period  
12 reassessment, to a very, very large extent it's  
13 dependent upon recommendations 2.1 and 2.3. 2.3 is the  
14 walk downs for seismic and flooding to confirm that  
15 you meet your current licensing basis, and  
16 recommendation 2.1 is to do a reassessment against the  
17 existing guidance and standards out there. So, this  
18 10-year potential rulemaking would essentially have  
19 you do 2.1 every 10 years. So, we believe that while  
20 rulemaking is potentially needed, there will be  
21 sufficient lessons to be learned from the  
22 implementation and the execution of recommendation  
23 2.1. So, with that said it doesn't make sense today to  
24 proceed with a rulemaking because you're not quite  
25 sure what that rulemaking will look like. We really

**NEAL R. GROSS**

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

1 believe the experience from 2.1 is needed.

2           Nevertheless, there are some what we have  
3 characterized as pre-rulemaking activities that we  
4 believe we could undertake. The Europeans do a  
5 periodic assessment. We'll look to see what the  
6 Europeans do. There are certain issues out there with  
7 terminology in terms of what is new and significant  
8 information. There's two different things, what is new  
9 information and if it is new information, is it  
10 significant. And then how do you determine if your  
11 licensing basis has to be updated to reflect that?

12           CHAIRMAN ARMIJO: But the Japanese did  
13 periodic updates of their seismic and tsunami stuff.  
14 The problem was they just missed it on the tsunami.  
15 It's really how you evaluate the hazard as opposed to  
16 the frequency of evaluating. That, I think, is the  
17 issue.

18           MR. MONNINGER: I think that's true with  
19 the additional understanding within the U.S. that some  
20 of the plants that were designed and licensed back in  
21 the '60s or '70s, they would be tied to that  
22 methodology back then. So, we would be looking --

23           CHAIRMAN ARMIJO: Update them to the  
24 newest--

25           MR. MONNINGER: Newest methodology and then

**NEAL R. GROSS**

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

1 insure that they do it correctly.

2 MEMBER RAY: I think the point you make,  
3 though, about exploring what is meant by new and  
4 significant is the greater more important thing,  
5 because it's very hard for licensees to know is this  
6 new or just new to me? Is it significant, is it not  
7 significant? I don't know. And the inspectors don't  
8 now, and it's just a very unstructured situation as it  
9 is now.

10 You know that at some point you need to  
11 take some action to reassess, but you don't have any  
12 clue as to what that point is. And I think getting  
13 clarity around that would be a big step forward, more  
14 important than the every 10 years part, in my opinion.

15 MR. MONNINGER: And the staff agrees.

16 MEMBER RAY: Yes, because I mean you may  
17 have people come in and say I've got a new piece of  
18 information. Well, is it or is it not new? Very hard  
19 to assess.

20 MR. MONNINGER: And we would hope through  
21 work and through recommendation 2.1 it would inform  
22 our judgment.

23 MEMBER RAY: I don't know that that will  
24 fall out of 2.1, or whether it's part of what you're  
25 talking about pre-rulemaking here, which is what I

**NEAL R. GROSS**

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

1 encourage you to say. But either way, I think it  
2 should be emphasized that that's an important thing to  
3 give thought to, what do we mean when we say evaluate  
4 to new or important, or significant information. And  
5 it's just very hard to know today.

6 MR. MONNINGER: Moving to Slide 8,  
7 seismically induced fires and floods. The Task Force  
8 had recommended potential enhancements to mitigate or  
9 prevent potential seismically induced fires and  
10 floods. And they have the potential to cause multiple  
11 things. You could have multiple failures of safety-  
12 related systems, structures, and components. You could  
13 have separate or ongoing fire and flooding events in  
14 response to the event, or it could degrade your  
15 existing capability to mitigate these type events,  
16 degrade your existing fire protection systems.

17 There are some significant challenges  
18 associated with that, and what the staff is proposing  
19 is to work with the PRA Standards Committee who  
20 developed the PRA standards for the Level 1 and the  
21 limited Level 2 PRA standards for internal events. And  
22 is also working on standards for shutdown events, et  
23 cetera.

24 This issue is also tied to other Tier 1  
25 activities, so to a certain extent the staff is

**NEAL R. GROSS**

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

1 looking to learn from those other Tier 1 activities.  
2 Say, for example, if a plant was to update in response  
3 to Recommendation 2.1, if they were to update their  
4 design basis or their licensing basis to more current  
5 seismic criteria, the staff -- it would make sense to  
6 make sure that that occurs first prior to doing some  
7 type of PRA looking for seismically induced fires and  
8 floods. So, there should be some type of sequencing to  
9 these various issues.

10 In addition to that, the potential changes  
11 to the plant for mitigating or preventing station  
12 blackout should be also incorporated into some of the  
13 baseline PRAs prior to proceeding with this work.

14 So, with that said, the Staff is going to  
15 undertake some activities in this area, but we believe  
16 it's strongly dependent upon other Tier 1 activities,  
17 and the need for them to progress first.

18 MEMBER STETKAR: John, does that mean that  
19 you're not even going to get Research started on doing  
20 some of the fundamental work behind this until --

21 MR. MONNINGER: Research has the lead for  
22 this particular task. And, yes, they were going to  
23 work with the standards organization. They were going  
24 to look at existing PRA tools out there. And either  
25 recently or within the next week or so they're

**NEAL R. GROSS**

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

1 releasing publicly a program plan as to that.

2 MEMBER STETKAR: I was just thinking, you  
3 know, some of the things you mentioned are pragmatic  
4 reasons why implementation of some of this might lag,  
5 but some of the other Tier 1 issues, but some of this,  
6 in particular, requires development of methods that  
7 tend to -- you need some pre-lead time for that type  
8 of activity that you don't want to necessarily wait  
9 for another three or four years to start.

10 MR. MONNINGER: And that's actually a very  
11 good discussion because to a certain extent the  
12 Commission tiered or broke apart NTTF Recommendation  
13 3. They placed methods development as a Tier 1-type  
14 activity, and then the potential application of that  
15 as Tier 3. So, the methods development is proceeding.

16 MEMBER STETKAR: Okay, good. Thanks.

17 MEMBER SCHULTZ: Another way we could -- I  
18 think the Committee would want to discuss this is we  
19 get very nervous when we hear that we're waiting for  
20 the Tier 1 activity to provide us information to move  
21 forward with Tier 3. We really feel that there is an  
22 opportunity for Tier 3 activities if they can start to  
23 influence the Tier 1 activities. Develop information  
24 through Research, or through other means.

25 MR. MONNINGER: Right.

1           MEMBER SCHULTZ: Or just discussion and  
2 feedback information from that to Tier 1 activities.  
3 So, we don't want the staff to miss that opportunity.

4           MEMBER RAY: Steve, there's one thing that  
5 continues to trouble me, and that is to the extent  
6 that a flood is a tsunami, they aren't only induced by  
7 seismic events. The governing ones often are  
8 landslide, and having just gone through an application  
9 in this regard, is any of the research going to  
10 address other than seismically induced floods?

11           MR. MONNINGER: And I would look to the  
12 audience to support me, but I would say recommendation  
13 2.1 looking at external hazards should bring in - no  
14 matter how the tsunami is induced, that should be  
15 covered within the most recent and applicable guidance  
16 we have out there, and would or should be addressed  
17 under recommendation 2.1.

18           MEMBER RAY: Well, to the extent is has  
19 already, the observation is we're not ready to go to  
20 the step of -- it's not clear how to proceed. I'll put  
21 it that way. It is what has been said so far. But, in  
22 any event, it's over the horizon. I'm talking about  
23 now, something other than seismically induced tsunami.

24           And I guess I haven't seen that ball being  
25 picked up at all in anything I've seen so far. I'll

**NEAL R. GROSS**

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

1 continue to look and see, but -- I'm talking about 2.1  
2 now, and it seems to sort of push it off and say well,  
3 we'll have to stick with current methodologies for the  
4 time being.

5 MR. MONNINGER: I believe in June the Staff  
6 is scheduled to come to the Subcommittee to address  
7 the guidance documents --

8 MEMBER RAY: Oh, good. That's good.

9 MR. MONNINGER: -- for Tier 1. And I would  
10 think that's a fair discussion.

11 MEMBER RAY: Yes, because we've -- this  
12 isn't the first time that comment has been made.  
13 Because of the headline up there, "seismically  
14 induced," I wanted to say that we have had the  
15 experience of dealing with other than seismically  
16 induced floods, and found that the state of the  
17 methodology development is embryonic, to say the  
18 least.

19 MR. MONNINGER: Reliable hardened vents for  
20 other containment designs. There were significant  
21 issues or problems encountered in Japan with actuating  
22 the hardened vent system, so the Near-Term Task Force,  
23 they had two recommendations. One was to evaluate and  
24 look at and improve venting within the U.S. for Mark  
25 I and II plants. That the Tier 1 issue, Recommendation

**NEAL R. GROSS**

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

1 5.1. And then they also said the staff should  
2 reevaluate the need for hardened vents for other  
3 containment designs, Mark III's ice condensers or  
4 large drives.

5 In March of this year the Staff issued the  
6 order to Mark I and IIs only that required them to  
7 install reliable hardened vent for prevention of  
8 severe accidents only. There's a second piece of that,  
9 and that's the need to consider filter vents for Mark  
10 I and IIS, or the need to consider the reliable  
11 hardened vents for severe accident conditions. And  
12 that's, basically, where the staff's focus and  
13 resources have been devoted in working on it at this  
14 time.

15 So, what we -- we believe 5.2, the  
16 assessment of venting for other containment designs is  
17 very important, but we believe it's more important now  
18 to fully resolve the issue for Mark I and IIS, and to  
19 provide a recommendation to the Commission this summer  
20 on the Mark Is and IIs with regard to filter venting,  
21 or with regard to beefing up the already required vent  
22 such that it could withstand severe accident  
23 conditions.

24 MEMBER CORRADINI: So, just to clarify, so  
25 I understand the action, but the order is a hardened

**NEAL R. GROSS**

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

1 vent, not filtered, nor severe accident robust in  
2 operation. Am I correct? The order is strictly a  
3 hardened vent?

4 MR. MONNINGER: Yes. The March order, a  
5 hardened vent from the suppression pool out to the  
6 side.

7 MEMBER CORRADINI: Okay.

8 MR. MONNINGER: Or an elevated release  
9 point.

10 MEMBER CORRADINI: Okay, thank you. I  
11 thought that's what it -- I just wanted to make sure  
12 I hadn't forgotten.

13 MR. MONNINGER: Yes. But we have an IOU to  
14 the Commission to address the other two aspects, the  
15 filter vent and the severe accident design  
16 considerations for the reliable hardened vent.

17 Hydrogen control and mitigation. There  
18 were significant threats and impact from both hydrogen  
19 generation and combustion at the Fukushima Dai-ichi  
20 site, was very evident from what happened to the  
21 Reactors 1, 3 and 4 reactor building.

22 The staff has a significant knowledge base  
23 with regard to hydrogen generation and control, and we  
24 currently have a set of regulatory requirements out  
25 there on that. So, what we want to do is basically

**NEAL R. GROSS**

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

1 take a step back and say what have we learned new from  
2 the accident? What have we learned new with regard to  
3 hydrogen generation, the timing of hydrogen generation  
4 from various severe accidents, the quantities  
5 potentially generated. Where does it migrate to,  
6 what's the potential for combustion, and what is the  
7 impact be it in the container building or another  
8 building that it may migrate to? And, as a result of  
9 that, reassess the staff's existing technical basis  
10 for 50.44 which is out there. That's what our plans  
11 are for hydrogen generation.

12 MEMBER REMPE: For implementing that plan  
13 it says through further study of the accident. And one  
14 can study it, but doesn't one need data from the  
15 plant? You've heard this before. And what is your plan  
16 forward to get that data?

17 MR. MONNINGER: I think there's two issues  
18 there, so one is what are we going to do? And then the  
19 other is the data.

20 With regard to -- within the plant we've  
21 said we expect to rely upon existing results that are  
22 out there, be it reports from INPO, reports from IAEA,  
23 reports for TEPCO, et cetera. We would also look at  
24 existing analysis out there to the extent that the  
25 forensic study being done by DOE, NRC, EPRI out there

**NEAL R. GROSS**

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

1 sheds light on that. We would also do any additional  
2 calculations that we deem necessary.

3 I think we've tried to establish bounds  
4 with regards to what we can do within the next three  
5 to four years. With regard to data, the Office of  
6 Research has been, or is working with the  
7 international community to try to see what can be done  
8 for gaining additional information, gaining additional  
9 data on exactly how the accident progressed, and using  
10 that to update or validate our models, et cetera.

11 I think the notion is given TMI and the  
12 timing it took to get a lot of information out there,  
13 it probably won't be within the window for doing some  
14 of these current assessments. If you're realistic  
15 about trying to tackle some of these recommendations  
16 from the Near-Term Task Force in the next three to  
17 four years, there will be limitations.

18 MEMBER REMPE: Yesterday I saw a table that  
19 a person had prepared summarizing results from  
20 different calculations from different organizations  
21 that had been trying to analyze Units 1 and 2, et  
22 cetera, and the results differ considerably. So, when  
23 you try and say well, I'm going to do something in the  
24 next three or four years, I think that you might want  
25 to consider acknowledging some of the uncertainties

**NEAL R. GROSS**

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

1 and data that are needed. And if the Office of  
2 Research is planning this international effort, it  
3 sure would be nice to hear a report back from them on  
4 what concrete things that they're going to be doing.

5 MEMBER SCHULTZ: Go ahead, Mike.

6 MEMBER CORRADINI: I guess I'm -- you go.

7 MEMBER SCHULTZ: Is Research considering  
8 any experimental studies associated with particularly  
9 the migration and transport of hydrogen in systems  
10 like reactor systems? It seems as if based on what  
11 happened and what engineering understanding was at the  
12 time of Fukushima, it was missed, a fundamental piece  
13 was missed, so one would think you'd want to go to  
14 some even bench type experience to try to figure what  
15 happened.

16 MR. MONNINGER: Right now we have the four  
17 items within the plan. We haven't taken it to the next  
18 step as to exactly whether it would be relying upon  
19 existing data, whether it would be analysis, or  
20 whether it would be some type of experimental-type  
21 program. I'm knowledgeable of the resources we have  
22 benchmarked or placed against these, and it would be  
23 difficult to do any type of experimental programs.

24 MEMBER CORRADINI: But you have ongoing --  
25 I guess this question is kind of where I was going.

**NEAL R. GROSS**

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

1 You guys have ongoing international collaborations  
2 such that data is being generated in some of these, or  
3 at least analyses of past data is being generated, so  
4 I assume Research will use that information in some of  
5 your examine, evaluate, assess activities.

6 MR. MONNINGER: I'm not fully versed on all  
7 the activities of Research. I see Alan walking up to  
8 the microphone now.

9 MR. DI FRANCESCO: Alan Di Francesco,  
10 Office of Research. The assertion that this was  
11 overlooked is actually captured in the Peach Bottom  
12 historical work. Okay? What Fukushima exposed was  
13 potentially the weakness of a Mark I containment to  
14 accommodate hydrogen. Okay? So, basically, if you're  
15 not burning the hydrogen, it's going to build up  
16 slowly and pressurize the containment enough to leak.  
17 And if it leaks in a place that's enclosed, there's a  
18 potential for a combustion event, and that's what  
19 happened.

20 So, the essence of this is that it's not  
21 new. I mean, we've been doing hydrogen research for  
22 almost 30 years and looking at transport combustion,  
23 behavior, doing different types of assessments with  
24 generation. So, we're on top of the situation. The  
25 variation of the different hydrogen generations of the

**NEAL R. GROSS**

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

1 different codes is clearly something we look at, and  
2 we recognize that, too. So, we intend to envelope the  
3 situation.

4 MEMBER CORRADINI: But still there are some  
5 things. I look back at the work that was done on  
6 containment seals in the '90s and how they would hold  
7 up in severe accidents. And they looked at them in  
8 steam, they looked at them in nitrogen, they looked at  
9 them in air. They didn't look to see when leakage of  
10 hydrogen would start.

11 MR. Di FRANCESCO: Well, those are  
12 environmentals due to post severe accident conditions.  
13 Obviously, if these seals degrade there's a potential  
14 for leakage, and that's --

15 MEMBER SHACK: But, I mean, we don't seem  
16 to have data on when degradation for hydrogen leakage  
17 starts. I mean, we have knowledge of what they can  
18 stand. If you're worried about the leakage of steam,  
19 nitrogen, or air, but --

20 MR. Di FRANCESCO: Well, I think one could  
21 look at the plant data for the Fukushima I and II, and  
22 the best guess, the leakage is dominated by the  
23 drywell head bolts. And even we do the Peach Bottom  
24 SOARCA work, we get a similar signature. And we did  
25 capture that weakness.

**NEAL R. GROSS**

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

1           The point is if the plant was reliably  
2 vented at a pressure around the design, it would take  
3 load off of the drywell heads. Okay? And it's not  
4 designed for two times the design pressures of these  
5 containments, and that's what happens.

6           MEMBER CORRADINI: But, Alan, since you're  
7 up there, so what sorts of things will Research assist  
8 in in examine, evaluate and assess?

9           MR. Di FRANCESCO: Well, right now we're  
10 active in the Fukushima forensics.

11          MEMBER CORRADINI: Okay.

12          MR. Di FRANCESCO: We use MELCOR to try to  
13 simulate three units, and right now we've done a pass  
14 already and it's going to be refined. We looked at  
15 TEPCO work in which they've postulated different  
16 breaks in the drywell for example as a potential, so  
17 we're going to follow-up on that.

18          MEMBER REMPE: But it sure would be nice to  
19 have data to see if any of those postulated breaks did  
20 occur.

21          MR. Di FRANCESCO: Well, the data is -- we  
22 have drywell data.

23          MEMBER REMPE: But, I mean, real plant data  
24 is what I'm getting at.

25          MEMBER RAY: Plant data? It is plant data

**NEAL R. GROSS**

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

1 from Fukushima.

2 MEMBER REMPE: But Fukushima data is what  
3 I'm --

4 MEMBER RAY: Yes, we have data. It was --

5 MEMBER REMPE: Of failure locations?

6 MEMBER RAY: Well, not failure locations.

7 MEMBER REMPE: That's what I'm pointing at,  
8 is --

9 MEMBER RAY: Well, until somebody visually  
10 looks at some of the area, but the data of water  
11 level, pressure in the drywell, we have that.

12 MEMBER REMPE: And some of that data is  
13 suspect, too.

14 MEMBER RAY: Well, true. I mean, we're  
15 going to make the best effort we can with what we've  
16 got. But the bottom line is there's nothing new or  
17 unique. I mean, this is a BWR. It has a lot of  
18 zirconium. Okay? And that really drives it, the  
19 drywell of -- well, one containment is relatively  
20 small. And then you put a lot of zirc and a lot of  
21 steaming, put some MCCI core concrete interaction  
22 which could also create a lot of gases, you've got a  
23 problem.

24 MEMBER CORRADINI: I guess, not to belabor  
25 the point, but what I'm hearing is that Research is

**NEAL R. GROSS**

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

1 assisting the office as appropriate to try to do  
2 analyses. But the one thing you said, I guess, maybe  
3 I'm missing something, you can correct me, but it's  
4 not zirconium, any sort of metallic. Zirconium maybe  
5 releases more heat during the thing, but in terms of  
6 oxidation kinetics --

7 MR. Di FRANCESCO: We're looking at --

8 MEMBER CORRADINI: -- any sort of metallic  
9 is going to create hydrogen.

10 MR. Di FRANCESCO: We're looking at  
11 stainless steel and B4C also.

12 MEMBER CORRADINI: All right. That's what  
13 I guess I was -- okay, fine.

14 MR. Di FRANCESCO: Yes.

15 CHAIRMAN ARMIJO: Yes, but given what you  
16 know now and assuming that it's a containment head  
17 that the bolt stretched, and it leaked, and it was a  
18 main source of hydrogen release, the question I have  
19 is would the staff say okay, had they had recombiners  
20 or igniters on these particular locations would it  
21 have helped? Would it have prevented the hydrogen  
22 explosion? And the question, is the staff looking at  
23 this problem that way, or some other way?

24 MR. Di FRANCESCO: Well, the hydrogen  
25 control regulations related to Mark Is is basically

**NEAL R. GROSS**

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

1 driven by an inerted containment.

2 CHAIRMAN ARMIJO: Yes, I know that.

3 MR. Di FRANCESCO: The trouble was that the  
4 hydrogen issue is also a pressure consideration which  
5 let's say is less obvious, so the hydrogen movement in  
6 the reactor building which was problematic, obviously.  
7 But notice Unit 2 did not explode because when Unit 1  
8 exploded, it opened the blow out panel in Unit 2 so  
9 the hydrogen was able to be vented out. So, that seems  
10 to be a simple mitigation, is to open up the blow out  
11 panel to remove the hydrogen.

12 The issue about putting igniters in a  
13 reactor building is probably unwarranted and probably  
14 igniters will also induce a combustion event and the  
15 reactor building is not a containment. It's a weak  
16 structure, so you'll probably fail it at a lower  
17 pressure.

18 MR. RULAN: Bill Rulan from the Division of  
19 Safety Systems. When I first started leading AITs when  
20 I was an inspector, one of the things they always told  
21 because the second day they stuck a microphone in your  
22 face and said well, what was the problem? And one of  
23 the things they always train us to say was it's too  
24 soon to tell. It's too soon to tell. So, I -- these  
25 are great questions. And, frankly, it's too soon to

**NEAL R. GROSS**

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

1 tell what exactly staff is going to have to do.

2 We've got really great technical folks and  
3 that's going to help us work through this problem.  
4 This really is -- you know, this is a Tier 3 item.  
5 We're going to be working on it. And what we tried to  
6 describe here was kind of our approach to the problem,  
7 and that's really -- we'll have a copy of the  
8 transcripts and we'll be able to take these questions  
9 and try to decide gee, what should we do about these  
10 things?

11 So, if you have any other questions you  
12 think we ought to factor into our deliberations, feel  
13 free to send me an email. Talk to the staff, we'll  
14 come over and meet with you, whatever.

15 MEMBER CORRADINI: If I might just to  
16 follow-up with your offer, so my -- I think where  
17 we're going with this is -- it kind of goes back to  
18 what Steve said maybe two slides ago, which is to the  
19 extent that you don't have to do analyses, but to the  
20 extent that you start thinking through your Tier 3  
21 issues that make you turn back to Tier 1, or even the  
22 international effort to try to -- as they deconstruct  
23 the units to look for things so that gives us clues.  
24 I think that's kind of where Joy was getting, is that  
25 we all think it's coming out of this place in the

**NEAL R. GROSS**

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

1 thing, but what sorts of visual or inspectible clues  
2 can be gotten from the deconstruction since as they're  
3 going to go through and decontaminate, clean up, to  
4 look for things so that we can be -- so we can learn  
5 from essentially that effort. So, in some sense it's  
6 kind of, Steve was saying feeding back through all the  
7 concerns that are happening under Tier 1. So, I'm not  
8 looking for more analysis. I'm perfectly clear that  
9 Research is going to help you folks. It's just a  
10 matter of trying to go back and forth about the things  
11 that you might want to look for that give you some  
12 clue that you thought it was X, but lo and behold it  
13 was Y.

14 MR. RULAN: I can't imagine us not, you  
15 know, after our five-year -- providing our  
16 recommendations to the Commission, us not having a  
17 continuing program to observe and provide feedback  
18 essentially long-term O P E to decide gee, do we need  
19 to do something different? And I'm fairly confident  
20 that that's what the staff is going to do. It will be  
21 no doubt long past my retirement, so I'm fairly  
22 confident. I can't assure you because I will not be  
23 here then. Anyway, thank you.

24 MEMBER SCHULTZ: Bill, thanks for your  
25 comments. Your offer for dialogue will certainly be

**NEAL R. GROSS**

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

1 accepted. John, you've got a challenge now, we need to  
2 move through the slides as you can to the next topic.  
3 Thank you.

4 MR. MONNINGER: The next topic is emergency  
5 preparedness. There were various Tier 3, or there was  
6 actually some Tier 1 items also, but various Tier 3  
7 items on EP, and then there were also some additional  
8 issues that came up after the Near-Term Task Force  
9 report that are also EP-related.

10 The staff has looked at the various issues  
11 and they have reconfirmed that they believe that the  
12 existing framework continues to provide reasonable  
13 assurance of adequate protection of public health and  
14 safety. Nevertheless, what they want to do with all  
15 these various issues out there is coalesce them  
16 together and start engaging our stakeholders out there  
17 to determine is there a basis for an additional  
18 rulemaking on emergency preparedness.

19 There's issues out there on multi-unit  
20 events, how do you work the personnel and staffing?  
21 How do you do the dose assessment for multi-units? The  
22 training and exercises typically at the sites now are  
23 just one unit at a time. There's also issues out there  
24 with the equipment and facilities, and how do you get  
25 additional equipment on site?

**NEAL R. GROSS**

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

1           So, when you look at the various issues  
2 out there, the staff thinks the best approach is to  
3 try to pool them all together and do what's called an  
4 advanced notice of proposed rulemaking to solicit  
5 further engagement with our various stakeholders out  
6 there to see if we can come up with a solid basis to  
7 proceed with some type of rulemaking.

8           MEMBER RAY: I'll just make the observation  
9 that the inclusion of what I'll call command and  
10 control issues within the heading EP, I can't fault  
11 how you tend to group things, but it is distinctly  
12 different than protective action recommendations, that  
13 sort of thing in my mind.

14           MR. MONNINGER: And I can take that back.

15           MEMBER RAY: Well, I mean, it's just more  
16 a matter of categorizing than it is anything else, but  
17 emergency preparedness typically you think  
18 traditionally about protective action, offsite things  
19 that are done, and so on and so forth, as opposed to  
20 who's making which decisions about severe accident  
21 management, which is the thing I'm totally --

22           MR. MONNINGER: And I think they want to  
23 look at it globally. They want to look at the staffing  
24 and the decision making, and the responsibilities in  
25 addition to the actions within the field. So, they're

**NEAL R. GROSS**

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

1 trying to pool all the various issues together,  
2 including the training that's available out there.

3 MEMBER RAY: Right.

4 MR. MONNINGER: The next topic,  
5 Recommendation 12.1, enhancements to the reactor  
6 oversight process. What's important about this  
7 recommendation is to look at the Near-Term Task Force  
8 report, and they really pegged these changes to the  
9 ROP to Recommendation 1. Recommendation 1 is the  
10 global development of a new regulatory framework  
11 putting additional reliance and consideration on  
12 defense-in-depth. So, to a very large extent that's  
13 what Recommendation 12.1 is.

14 If Recommendation 1 evolves into something  
15 some day, the Agency should then go back or while  
16 Recommendation 1 is being worked, the Agency should  
17 also rework the reactor oversight process. However,  
18 with that said the ROP is continuously assessed by the  
19 staff, and we have multiple engagement with our  
20 stakeholders out there. Once a year the staff provides  
21 a paper up to the Commission discussing needed  
22 changes. Those needed changes could be based on  
23 observations within the field. Other needed changes  
24 that would come about would be a reflection upon  
25 what's going on with Tier 1, the Tier 1 activities.

**NEAL R. GROSS**

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

1           Ultimately, these inspections and new  
2 orders and all that, that has to become part of our  
3 routine process, so those activities to update the ROP  
4 would be within the staff's, what we would say our  
5 current process. We continuously do that. When any  
6 new rules or requirements come out, we update the ROP  
7 and we also update the ROP based on lessons learned  
8 throughout the year.

9           So, back to 12.1, it's really pegged to  
10 Recommendation 1, and the staff is set to deliver a  
11 paper to the Commission in February on a plan to  
12 proceed to assess Recommendation 1.

13           The next two slides, Slides 13 and 14 are  
14 staff training, to enhance staff training within  
15 headquarters and within the fields, including the  
16 residents on severe accidents and severe accident  
17 management guidelines.

18           Initially, when we looked at this there  
19 was some initial thinking that this was heavily tied  
20 to Recommendation 8.4 which will result in a revision  
21 of the SAMGs by industry and Owners groups, and sites,  
22 et cetera. But when the staff delved into this issue  
23 more they said hey, there are things that we currently  
24 do, or there are things we should currently be doing  
25 and we don't necessarily have to wait for 8.4 out

**NEAL R. GROSS**

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

1 there, for Recommendation 8.4 out there.

2           There is a current need to expand the  
3 knowledge base of Agency staff on severe accident  
4 phenomenology on core melt, on releases, on source  
5 terms, et cetera, and with that there's a current need  
6 out there to train additional staff on the severe  
7 accident management guidelines that currently do  
8 exist. So, the staff has tried to break this into two  
9 pieces, near-term actions and maybe some longer term  
10 actions out there. So, this is a summary of some of  
11 the near-term activities, to update the current  
12 courses we have, and to expand the staff that would --  
13 the set of staff that would receive that training.

14           In the longer term it is dependent upon  
15 Recommendation 8. You don't want to train your set of  
16 staff and call that quits with the current set of  
17 severe accident management guidelines if industry is  
18 in the process of updating the severe accident  
19 management guidelines. So, there will be an evolution  
20 to this process. And the staff would also look to  
21 studies of the SORC report that Research has done to  
22 incorporate some of that knowledge and insights in our  
23 classes, and also insights from the accident at  
24 Fukushima that occurred.

25           MEMBER SCHULTZ: In the Subcommittee

1 meeting we had quite a bit of discussion related to  
2 the expansion of the training program to the regions  
3 and to the site inspectors, staff, and is that still  
4 part of what is here?

5 MR. MONNINGER: So, staff is looking at, we  
6 call them qualifications programs, and the  
7 qualification programs has mandatory courses. They  
8 have readings, they have on-the-job training, et  
9 cetera. The staff is going through the qualification  
10 programs for our residents, for our regional base  
11 inspectors, for our reviewers within headquarters, our  
12 operator licensing examiners, and they will be  
13 enhanced dependent upon the particular job that each  
14 individual feels fits.

15 MEMBER SCHULTZ: Thank you.

16 MEMBER REMPE: We also discussed briefly  
17 that, you know, you take a course and you put the book  
18 on the shelf --

19 MR. MONNINGER: Right, on the shelf.

20 MEMBER REMPE: -- and perhaps that the  
21 current expertise needs to be enlarged with younger  
22 staff because of the need to make sure people actually  
23 are actively doing severe accident work which is part  
24 of the obvious, but --

25 MR. MONNINGER: I think that's a very --

**NEAL R. GROSS**

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

1       yes, I think that's a very legitimate or concern,  
2       because it is true, when you take a course, you know,  
3       a week, or two, or a month after if you don't exercise  
4       it you will eventually lose it. And that's some of the  
5       requirements for proficiency, the same for the staff  
6       that are assigned to the Op Center. You go to the OP  
7       Center once a year, you go through your exercise, your  
8       drill, and as time goes on you -- so, there is the  
9       need for that type of refresher training.

10               But one of my thoughts is severe  
11       accidents. The notion is SAMGs will become a  
12       requirement. That's part of the rulemaking, and then  
13       there will be this integration between the EOPs,  
14       Emergency Operating Procedures, the EDMGs, and the  
15       SAMGs. And that will all be within a regulatory  
16       structure. Once you have that within your regulatory  
17       structure, there will be staff assigned some place, be  
18       it at headquarters, be it within the regions, wherever  
19       to know and to exercise it. Whether there's amendments  
20       that come in relating to it, whether licensees propose  
21       some type of changes, or whether it's the inspections,  
22       the staff will have to be knowledgeable and proficient  
23       to make sure it's covered.

24               Currently, that's a voluntary industry  
25       initiative so the staff doesn't work in that area

**NEAL R. GROSS**

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

1 daily, weekly, monthly, but once it becomes a  
2 regulatory requirement, the notion is you would have  
3 a core set of staff that is very conversant.

4 MEMBER CORRADINI: And the offices, I guess  
5 in terms of these longer term actions, these are --  
6 this is mainly NRR and NRO?

7 MR. MONNINGER: Well, it would --

8 MEMBER CORRADINI: Or does -- I guess --  
9 I'm sorry, I didn't mean to interrupt. Go ahead.

10 MR. MONNINGER: Working on this, you know,  
11 the level 3 PRA is being led by Research, Kevin Coin's  
12 group, you know, the SORCA study is Kathleen Gibson's  
13 division. The particular Recommendation 12.2 is owned  
14 by NRR, but they would get information from the other  
15 organizations.

16 MEMBER CORRADINI: So, in some sense, I'm  
17 just trying to understand, you might run scenarios to  
18 try to inform a training course, or to try to inform  
19 lesson -- you know what I'm trying to get at. In some  
20 sense, you could use the tools from Research to --

21 MR. MONNINGER: To drive.

22 MEMBER CORRADINI: -- drive at least some  
23 thinking process, assuming that we have the data, that  
24 what we were training on was appropriate. But that  
25 would be the connection.

**NEAL R. GROSS**

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

1 MR. MONNINGER: Hopefully. One of the  
2 things that Research did, Research had worked with  
3 NSER approximately two, three years ago, and I'm not  
4 sure exactly how it works but I was on the receiving  
5 end to have MELCOR or some of the severe accident  
6 codes drive ERDs data, or to drive the OP Center. So  
7 the profiles for maybe a station blackout in the  
8 source term, and the core melt progression, et cetera,  
9 they were trying to use those codes to enhance the  
10 training within the --

11 MEMBER CORRADINI: And just to ask one last  
12 question, so that, for example, in this -- this is  
13 what you were saying where it's going to go from --  
14 where you see it going from voluntary to --

15 MR. MONNINGER: A requirement.

16 MEMBER CORRADINI: -- a requirement and  
17 audited. Then in some sense you want to kind of drive  
18 the underlying thinking with maybe some scenarios to  
19 try to connect up the appropriate, or you hand off  
20 your piece to the SAMGs, and what sort of symptoms you  
21 look at.

22 MR. MONNINGER: The next topic, expedited  
23 transfer of spent fuel to dry cask. We don't have a  
24 number in front of that. That's because it was an  
25 additional topic identified post-Near-Term Task Force.

**NEAL R. GROSS**

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

1 Staff had proposed to adopt it, the Commission agreed,  
2 and it is a Tier 3 issue.

3 There's been considerable interest  
4 predominantly post-9/11 in this topic. The notion of  
5 accelerating the transfer of spent fuel from the spent  
6 fuel pools to dry cask storage. Over the past couple,  
7 or probably for the last nine months or so, the Office  
8 of Research undertook the spent fuel pool scoping  
9 study, and I know within the past three months the  
10 ACRS has been briefed on the study, and they recently  
11 issued a letter on the spent fuel pool scoping study.

12 So, the intent is for the staff to  
13 continue working on the spent fuel pool scoping study,  
14 use that body of information in addition to previous  
15 assessments that have been done. Back in the '80s  
16 there was Generic Issue 82 out there. The staff had  
17 looked at what the concerns were, what analysis was  
18 done, and the conclusions. In a similar manner, in the  
19 late 1990s or the early 2000s there was an assessment  
20 done out there to look at spent fuel pool accident  
21 risk at decommissioning plants. So, the staff is  
22 trying to look at the existing set of information,  
23 plus the new information coming from the Office of  
24 Research from the spent fuel pool scoping study to  
25 determine whether there is -- if there's significant

**NEAL R. GROSS**

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

1 safety benefits, or if there are significant risk  
2 reductions associated with the movement of spent fuel  
3 from the pools to dry cask. And they would synthesize  
4 all that information, engage with stakeholders and  
5 eventually re-engage the Commission with a  
6 recommendation.

7 MEMBER RAY: Yesterday, we were reviewing  
8 the potential for the higher temperatures that arise  
9 from earlier transfer to dry cask to effect the long-  
10 term storage, very long-term storage integrity of dry  
11 cask storage. I know that's not part of this  
12 consideration, but it would be, I think, when it came  
13 back to us.

14 MR. MONNINGER: Within, and I can't speak  
15 to the specifics, but this particular working group,  
16 the Office of Nuclear Material Safety and Safeguards,  
17 the spent fuel -- Division of Spent Fuel Storage and  
18 Transportation is involved within this activity.

19 MEMBER RAY: That's a tradeoff anyway that  
20 hasn't been mentioned previously, and I just wanted to  
21 note it here.

22 MR. MONNINGER: The next topic, Emergency  
23 Planning Zone. This was another additional topic that  
24 was identified post-Near-Term Task Force report. And  
25 it was to evaluate, or to re-look at the basis for EPZ

**NEAL R. GROSS**

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

1 zone sizes. The staff has done some work in the past  
2 and they believe that they do have assurance that the  
3 existing EPZ size is sufficient. Nevertheless, with  
4 the considerable interest out there on this topic they  
5 will relook at this issue, and they expect to, as much  
6 as possible, use insights from the planned current  
7 Level 3 PRA that's going to be conducted by the Office  
8 of Research.

9           The next topic, Potassium Iodide, KI, was  
10 to look at the pre-staging of KI beyond the 10-mile  
11 EPZ zone. IN a similar manner, the staff has looked at  
12 this issue in the past and believes that the existing  
13 policy is sufficient. But with that, they would like  
14 to continue to look at and assess any information that  
15 comes out of the accident in Japan to see whether the  
16 current policy should be revised or reopened.

17           The fourth additional topic that was added  
18 was reactor and containment instrumentation. There was  
19 a lot of interest from the ACRS on this particular  
20 issue, and the staff is actively working it. And one  
21 of the things they are very focused on now is engaging  
22 with the actual Tier 1 recommendations and insuring  
23 that there's very close cooperation between the staff  
24 working on this issue and the staff that are working  
25 the particular Tier 1 issues.

**NEAL R. GROSS**

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

1           For example, the issue with flex, in  
2 addition to providing equipment and supplies to the  
3 site, you would need sufficient information to know  
4 when to use that equipment, and whether that equipment  
5 and procedures were effective. So, the staff is trying  
6 to engage with stakeholders working on the Tier 1  
7 activities to identify the need for instrumentation  
8 and information up front, as opposed to waiting three,  
9 four years down the road. And we believe we have  
10 potentially solved some of the various issues out  
11 there.

12           The staff is also going to work with  
13 various domestic and international organizations to  
14 see where are the gaps out there in the information  
15 needs for responding to severe accidents. And also to  
16 look at the instrumentation, the various ranges of the  
17 instrumentation and whether the normal instrumentation  
18 within a plant would potentially respond or survive  
19 severe accident conditions.

20           Based on that body of information, they  
21 would come back with a recommendation to the  
22 Commission, and I'm sure engage the ACRS on the needs  
23 to potentially enhance that equipment, or come back  
24 with a basis that says for the following reasons we  
25 believe the existing equipment is sufficient.

**NEAL R. GROSS**

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

1                   MEMBER CORRADINI: So, can I ask about that  
2                   again? I'm kind of -- so this, again, is -- how do I  
3                   want to say it? I guess I have no problem -- knowing  
4                   more is always good, but I'm trying to understand the  
5                   criteria that I decide to use to decide what knowing  
6                   more is nice but not necessary. So, who is developing  
7                   the criteria -- I mean, I see insure, review, gather,  
8                   determine, and somewhere is there a discussion of the  
9                   criteria I'm going to say this falls within the oh,  
10                  this is good to do, and this is just too much  
11                  information, not necessary? Do you understand what I'm  
12                  saying? Is NRO -- I'm sorry, is NRR the source of  
13                  trying to develop this criteria?

14                 MR. MONNINGER: Well, it's a joint effort  
15                 led by Research, but with also NRR and NRO staff.

16                 MEMBER CORRADINI: Okay.

17                 MR. MONNINGER: And the notion is if you're  
18                 in one of these accidents, or one of these events,  
19                 what is the information you need to make in order to  
20                 make an informed decision.

21                 MEMBER CORRADINI: Okay.

22                 MR. MONNINGER: How do you know whether  
23                 what you are doing is successful, or not? What it  
24                 takes me back to is some of the work we did on the new  
25                 reactors back in the '90s and the early 2000s. There

**NEAL R. GROSS**

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

1 was a topic there called "Equipment Survivability,"  
2 and we looked at the existing information, or the  
3 existing instrumentation proposed within the plant  
4 designs, and we looked at the severe accident  
5 analysis, the severe accident analysis done by the NRC  
6 and done by the applicant.

7 We also looked at the PRAs, you know. If  
8 the PRAs are taking credit for initiation of a  
9 particular piece of equipment at this time period,  
10 what are the potential profiles within the  
11 containment? And it was -- the instrumentation needs  
12 were divided into various categories, whether it was  
13 an in-vessel severe accident or whether it was ex-  
14 vessel severe accident. If you're -- this is just some  
15 for advanced reactors, but back then the thinking was  
16 well, you know, it makes sense to have reactor  
17 pressure temperature level indications and  
18 measurements. But once you go ex-vessel, it's probably  
19 not needed to measure reactor vessel pressure any  
20 more. So, based on the -- where the equipment is  
21 located, the environmental parameters that that  
22 equipment may be exposed to would potentially be  
23 different, whether it's an in-vessel accident or a ex-  
24 vessel.

25 MEMBER CORRADINI: I'll stop because I know

**NEAL R. GROSS**

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

1 Steve -- but I guess I'm still focused on the criteria  
2 so that one can make the decision that this is good  
3 but not necessary, and this is necessary. And the  
4 design basis for what is necessary, because it worries  
5 me -- it was just -- we're all -- more information is  
6 always good, but it's not necessary. And the basis by  
7 which we get to me is important, so if Research is  
8 participating in that, at least I understand. Thank  
9 you.

10 MR. MONNINGER: Yes.

11 DR. NOURBAKSHSH: I can't help -- I can't  
12 restrain myself, Mike. This can be over-complicated by  
13 what's necessary. I mean, fundamentally if you don't  
14 walk away knowing is there water in there or not, is  
15 the water I'm putting in cooling anything or not?  
16 There's a few simple things -- we don't need this  
17 giant reservoir -- I'm arguing with you a little bit  
18 right now.

19 MEMBER CORRADINI: No, but I think --

20 DR. NOURBAKSHSH: Reservoir criteria, I  
21 mean, there was no information at Fukushima, no  
22 information. It was all wrong. They had no idea what  
23 was -- they were just throwing water in, doing this  
24 and hoping the water was going somewhere. Fine, you  
25 want me to say it the way I would want to, this is the

**NEAL R. GROSS**

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

1       circumstance. I mean, that's what it seemed like if  
2       you read all the stuff. So, I mean, this is not  
3       complicated. You either want water, is it where it's  
4       supposed to go, and are the temperatures too high?  
5       Okay? Even if you've got a vessel that is now leaking  
6       and it's going somewhere, in BWRs you've got a smaller  
7       containment. You want to -- where is the water in  
8       there? Is it building up so it can actually cover  
9       stuff? Is it going to go in, or not? This is not  
10      complicated, so I think we can over-think what is  
11      necessary to put in because we're linking it to  
12      temperature, pressure, levels, or flow, whatever --  
13      we're putting water in, we want to know it's getting  
14      in there. So, I just --

15                   MR. MONNINGER: I think also tied to your  
16      EOPs and your SAMGs. I mean, if your SAMGs out there,  
17      if you're taking credit or reliance upon these for  
18      taking certain action in this event, you want to make  
19      sure you can do that. And you want to make sure it's  
20      successful, so I think it will be --

21                   MEMBER SCHULTZ: Other questions for John?  
22      This finishes his set of slides. Hearing none now,  
23      we're going to start the next presentation. Chris,  
24      Annie, if you could come forward and set up quickly.  
25      Chris, I understand that you're going to start?

**NEAL R. GROSS**

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

1 DR. COOK: Yes, there's no particular  
2 reason for that.

3 MEMBER SCHULTZ: That's fine.

4 DR. COOK: It was more just to go through  
5 -- the reason for us coming before you today is really  
6 as a follow-up to when we were here on May the 22<sup>nd</sup>.  
7 I'm going to be presenting the flooding question, or  
8 follow-up that was there, and then Annie -- Dr.  
9 Kammerer is going to be following up talking about the  
10 seismic portion of that.

11 Just for some background so that we're on  
12 the same page, on May 21<sup>st</sup> industry via NEI submitted  
13 the Flooding Walkdown Guidance. This is document NEI  
14 12-07. On May 22<sup>nd</sup>, we had our meeting before you to  
15 discuss and go through the flooding walkdowns. On the  
16 31<sup>st</sup>, the NRC staff sent out the endorsement of the  
17 walkdown guidance.

18 In that there were two enclosures, one was  
19 dealing with necessary changes, and those incorporated  
20 changes that we thought were necessary following the  
21 ACRS meeting that we had with you to put those in. An  
22 that's going to be the primary point of my discussion.  
23 There's one slide on that.

24 The other thing were suggested corrections  
25 we had put in there. Those are really minor errors. If

**NEAL R. GROSS**

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

1 you will, they have referenced -- you know, just in  
2 putting this together they would say see Part D. Well,  
3 really it was Part C and D, and they just left that  
4 other part out, or a bullet was missing, so they're  
5 really minor errors that were in there, so we call  
6 those suggested corrections.

7 On June the 10<sup>th</sup>, coming up here very  
8 quickly, each licensee is going to need to confirm  
9 the guidance that they're going to be using, we  
10 anticipate that to be the NEI guidance as endorsed by  
11 the NRC. And the other thing I just wanted to mention  
12 was that when we issued our endorsement on May the  
13 31<sup>st</sup>, that set the 180-day clock for them to complete  
14 the walkdowns and to submit the walkdown reports to  
15 us.

16 I believe the endorsement letter has been  
17 sent to you all so that you've been able to see that.  
18 The necessary changes -- one of the comments that we  
19 got during our meeting was a suggestion, very good  
20 suggestion to add extreme air temperature to the list  
21 of examples for the adverse weather conditions. Those  
22 were mainly mentioned in several statements where we  
23 had talked about other extreme weather conditions. We  
24 had talked about high winds and so forth, so we added  
25 extreme air temperature just to help clarify.

**NEAL R. GROSS**

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

1           The other thing that we did was we asked  
2           that a citation reference to NUREG 1852, which is look  
3           at demonstrating the feasibility and reliability of  
4           manual actions, response to fire be added as a useful,  
5           additional information source that licensees may  
6           consider when evaluating the reliability and  
7           feasibility of manual actions. So, those are the two  
8           things we put in our endorsement letter, and just  
9           wanted to come before you to give you that update.

10           MEMBER SCHULTZ: I think you've captured  
11           both of those very well, thank you.

12           DR. COOK: Thank you.

13           MEMBER SCHULTZ: Dr. Kammerer.

14           DR. KAMMERER: Okay, thanks for having us  
15           again. Similar to the flooding guidance, the seismic  
16           guidance was also issued on May 31<sup>st</sup>. We did not have  
17           -- because we had the opportunity to come to you a  
18           couple of days before we finalized that with industry,  
19           we were able to incorporate everything. We did not  
20           have any changes to the endorsement letter, so -- and  
21           I believe that you have both the guidance and the  
22           cover letter available to you.

23           So, what I was going to do -- oh, similar  
24           to the flooding then, that started the 180-day clock,  
25           so we have the same deadline. Industry has an

**NEAL R. GROSS**

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

1 additional 30 days to respond which guidance that  
2 they're going to be using. We anticipate, of course,  
3 for most of them that they'll be using the EPRI  
4 guidance that you provided. So, I wanted to go through  
5 just really quickly and show where we incorporated the  
6 recommendations from ACRS.

7           The first thing that we incorporated was  
8 the discussion of the risk-informed -- of a risk-  
9 informed approach to development of the SWEL. We were  
10 actually provided some language by you, and we put it  
11 in directly and we ended up after the discussions with  
12 industry with it being very similar to what you  
13 provided. So, this you'll find on page 3-5. So, it's  
14 not a requirement, but we ask as they go through and  
15 develop their sampling and their sample to turn the  
16 complete SSEL into the SWEL that they consider the  
17 risk important factors.

18           We also incorporated to the extent  
19 possible, if Operations personnel, we were not able to  
20 get agreement in the guidance that Operations  
21 personnel would be a part of the team because industry  
22 felt that they needed a little bit more flexibility,  
23 but we incorporated a lot of additional language  
24 throughout the document, so on page 2-2 we discuss  
25 their participation and describe two important

**NEAL R. GROSS**

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

1 responsibilities we'd like to see in development of  
2 the SWEL, in develop -- in consideration of changes,  
3 including those in response to the IPEEE program. This  
4 is a continuation of what's on 2-2, and then a  
5 discussion of how they should be brought in to support  
6 the seismic walkdown engineers throughout that  
7 process.

8 We repeated all of this language again in  
9 Section 4 which was the section that discussed  
10 specifically how the walkdowns and the walkbys were to  
11 be conducted. So, again, you'll have the pages and you  
12 can read through this. We incorporated directly as  
13 well in page 3-1 in that we have an explicit strong  
14 recommendation, and the plant operation personnel sign  
15 off on the SWEL, so that was something that industry  
16 accepted, so we put it into the process.

17 Again, we've added a discussion of how  
18 they are incorporated in on page 3-6, and on 3-7. You  
19 can see that we tried to incorporate quite a bit of  
20 it. And, again, on page 4-5, which is discuss having  
21 guidance on how -- and I'm going through this quickly  
22 because we only have 15 minutes, otherwise, I'd be  
23 reading it. I think you all can read it yourselves.

24 So, those were the two key elements that  
25 you wanted to see from us. In addition, we also took

**NEAL R. GROSS**

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

1 away a number of other items that I wanted to go ahead  
2 and touch base on. We've completely removed the word  
3 "credible" from the document, and we -- it turned out  
4 there was no place that we felt we couldn't do without  
5 it, or use a different word. We used the word "likely"  
6 a few times, but that was used with care. We reviewed  
7 every time that was used in the document.

8 We added boil off in the discussion of the  
9 analysis of drain down of the spent fuel pools. We  
10 clarified that the status of items from the CAP should  
11 be updated in the revised submission report. Remember,  
12 this is the report which will be resubmitted at the  
13 time that they are able to fully complete the  
14 walkdowns, including the equipment which is  
15 inaccessible during the six-month period. So, we would  
16 anticipate this is for some plants going to be quite  
17 a while after, so that will really give us an idea in  
18 that report what's happened with the items that are  
19 put into the CAP.

20 Additionally, we are developing plans to  
21 - so that we follow every single item that's put into  
22 the CAP, how it was dealt with, when it was dealt  
23 with. I think that some of the discussions we had in  
24 terms of the use of the CAP, I think that will be very  
25 insightful for us just in terms of how that process

**NEAL R. GROSS**

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

1 and that program works.

2 We included stronger description of the  
3 structure elements, why they are and aren't included.

4 MEMBER STETKAR: On that last one there --

5 DR. KAMMERER: Yes.

6 MEMBER STETKAR: I did, actually, dutifully  
7 go through the whole thing. The discussion about the  
8 spent fuel pool now, the structural part of the spent  
9 fuel pool, we had some discussion in the Subcommittee  
10 meeting about the expectation that it was a seismic  
11 category one.

12 DR. KAMMERER: Right.

13 MEMBER STETKAR: Et cetera. Those words  
14 have been removed, as you're well aware, and -- but  
15 the concept has been sort of relocated. And let me for  
16 the benefit of the record read something from Section  
17 3 now in the current guidance.

18 "Extreme core rapid drain down identifies  
19 items that could allow the spent fuel pool to drain  
20 rapidly based on typical designs of spent fuel pools  
21 at nuclear power plants. This scope of items would  
22 typically be limited to hydraulic lines connected with  
23 spent fuel pool and the equipment connected to those  
24 lines. The adequacy of the spent fuel pool structure  
25 is typically assessed by an analysis as a seismic

**NEAL R. GROSS**

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

1 Category 1 structure; therefore, the spent fuel pool  
2 structure is assumed to be seismically adequate for  
3 the purposes of this program."

4 That's used as justification for not  
5 needing to look at the spent fuel pool structure. It  
6 sounds like a lot of typical, typical, typical,  
7 assume, assume, assume. Why doesn't the guidance  
8 simply require each licensee to show that their  
9 structure was seismically --

10 DR. KAMMERER: Within the course -- within  
11 the framework of 2.3, we don't have -- it's not  
12 something that you would do as a walkdown. It would be  
13 an analysis, so we anticipate that happening in 2.1.

14 MEMBER STETKAR: Okay.

15 DR. KAMMERER: Yes, because you can't  
16 really look at it. Right? Because what we're doing is  
17 we're doing visual inspections here. But we do -- and  
18 we did actually look, and we -- I found that -- I  
19 believe at this point we've identified two which are  
20 not seismic Category 1 spent fuel pool, so they are  
21 not all. So, that's something that we're looking at  
22 incorporating into 2.1 and how we would do that,  
23 because it will require structural analysis similar to  
24 how we'll be doing the broader structural analysis of  
25 the -- for the PRAs and the SMAs.

**NEAL R. GROSS**

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

1 MEMBER STETKAR: Okay, thank you.

2 DR. KAMMERER: Thank you for dutifully  
3 reading the report. Okay.

4 MEMBER STETKAR: Have no fear.

5 DR. KAMMERER: It's nice when you do work  
6 and someone reads it, you know. So, again, the  
7 intention is that all of the items that are entered in  
8 the CAP will be followed and the outcomes are going to  
9 be part of the lessons learned report. And I know that  
10 flooding, they have the same approach, that we've  
11 decided we're going to do everything very  
12 consistently. And we've identified two approaches in  
13 terms of just the way that our regulatory offices work  
14 that we can use longer term.

15 One is an additional TI. It was, of  
16 course, the -- we discussed it with the resident  
17 inspectors, and they wanted to complete the current TI  
18 as quickly as possible, so we're discussing a future  
19 TI which will then look specifically at the items in  
20 the CAP and close that out.

21 A second potential approach which is  
22 identified is for working through the PMs, giving them  
23 basically the list periodically of outstanding items  
24 and asking them to follow-up with the plants. I think  
25 where we end up is going to be to some extent a

**NEAL R. GROSS**

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

1 function of how many items are still remaining when we  
2 get the second report, the complete report. And it's  
3 just going to be a discussion that we'll need to have  
4 with the various groups. Okay, so that's all I've got.

5 MEMBER SCHULTZ: Are there other questions  
6 for Chris Cook or Annie Kammerer from the Committee?  
7 Thank you very much for the presentation.

8 DR. KAMMERER: Thank you.

9 DR. COOK: Thank you.

10 MEMBER SCHULTZ: We do have a member of the  
11 public who like to make a statement for the benefit of  
12 the Committee and the staff. Mark Leyse has indicated  
13 he'd like five minutes of our time for that statement.  
14 He has provided some slides for his presentation, and  
15 we have hard copies for the Committee. Make sure the  
16 phone line is open for his comments.

17 MR. LEYSE: Mark Leyse, can you hear me?

18 MEMBER SCHULTZ: Yes. Can you hear --

19 MR. LEYSE: Okay. Yes, I can -- because I  
20 know you keep things on mute, and then take them off.  
21 Okay.

22 MEMBER SCHULTZ: You are now -- we are now  
23 hearing you, and we're ready for your statement, Mark.  
24 Thank you.

25 MR. LEYSE: Okay, thank you so much. Yes,

1 my name is Mark Leyse, and first I want to thank the  
2 ACRS for giving me the opportunity to make a quick  
3 presentation today. And may I have the first slide,  
4 please.

5 MEMBER SCHULTZ: We have it here both on  
6 the screen and in front of the Committee.

7 MR. LEYSE: Okay, thank you. Nuclear power  
8 plants need to operate within core thermocouples at  
9 different elevations and radial positions throughout  
10 the reactor core. On this slide is a quote from the  
11 President's Commission on the Three Mile Island  
12 accident. They recommended that nuclear power plants  
13 have the ability to measure the full range of  
14 temperatures within the reactor vessel under normal  
15 and abnormal conditions. However, in the last three  
16 decades the NRC has not made a regulation that would  
17 help fulfill what the President's Commission  
18 recommended.

19 On February 28<sup>th</sup>, 2012 I submitted a  
20 Petition for Rulemaking to the NRC, PRM 50-105,  
21 requesting that nuclear power plants operate within  
22 core thermocouples at different elevations and radial  
23 positions throughout the reactor core to provide  
24 operators with the ability to accurately measure a  
25 large range of in core temperatures in steady state

**NEAL R. GROSS**

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

1 and transient conditions."

2 In the event of a severe accident, in core  
3 thermocouples would enable operators to accurately  
4 measure in core temperatures providing crucial  
5 information to help them manage the accident. For  
6 example, signaling the time to transition from  
7 emergency operating procedures to implementing severe  
8 accident management guidelines.

9 In core thermocouples would also provide  
10 crucial information for tracking the progression of  
11 core damage during a severe accident. May I have th  
12 second slide, please.

13 MEMBER SCHULTZ: You have it.

14 MR. LEYSE: Thank you. On the second slide  
15 is information about an oversight over Westinghouse's  
16 PRA for the AP1000. Westinghouse's PRA states that in  
17 the event of a severe accident, the AP1000  
18 containment, "Hydrogen igniters are actuated by manual  
19 action when the core exit temperature exceeds a  
20 predetermined temperature as directed by the emergency  
21 response guidelines."

22 The predetermined temperature is 1,200  
23 degrees Fahrenheit. Westinghouse does not consider  
24 that experimental data, which has been available for  
25 decades shows that core exit temperature measurements

**NEAL R. GROSS**

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

1 would not provide an adequate signal for when to  
2 either correctly or safely actuate hydrogen igniters  
3 in a severe accident. If the hydrogen igniters were  
4 actuated after a detonable concentration of hydrogen  
5 developed in the containment, it could directly  
6 initiate a detonation, which could in turn compromise  
7 the containment.

8 Experimental data from tests simulating  
9 design basis accidents conducted at four facilities  
10 show that core exit temperature measurements would not  
11 provide an adequate signal for when to transition from  
12 EOPs to implementing SAMGs. Two of the main  
13 conclusions from such tests are the core exit  
14 temperature measurements display in all cases a  
15 significant delay up to several hundred seconds, and  
16 that core exit temperature measurements are always  
17 significantly lower, up to several hundred degrees  
18 Celsius than the actual maximum fuel cladding  
19 temperature.

20 In LOFT LP-FP-2, a severe accident  
21 experiment that was an actual reactor meltdown in the  
22 time period when maximum core temperatures exceeded  
23 3,300 degrees Fahrenheit, core exit temperatures were  
24 typically measured at 800 degrees Fahrenheit, more  
25 than 2,500 degrees Fahrenheit lower than maximum core

**NEAL R. GROSS**

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

1 temperatures.

2 In quoting an OECD Nuclear Energy Agency  
3 report from 2010 in LOFT LP-FP-2, "During a rapid  
4 oxidation phase the core exit temperature appeared  
5 essentially to be disconnected from core  
6 temperatures."

7 So, I'm going to conclude just by saying  
8 I know today you've spoken quite a bit about SAMGs and  
9 EOPS, and transitioning from them, and I really think  
10 that having in core thermocouples would be a very  
11 valuable tool to help plant operators. And as I -- on  
12 the first slide there's the quote from the President's  
13 Commission. This is something that has been kicking  
14 around for decades, the concept of having in core  
15 measurements which are accurate, and I think that's  
16 something that ACRS should consider and speak about,  
17 and research. And thank you very much for your time.

18 MEMBER SCHULTZ: Thank you, Mark. I  
19 appreciate your statement, and appreciate the detail  
20 that you provided for us. I did want to mention, as  
21 well, that the documentation that you provided to the  
22 NRC, the Petition for Rulemaking has also been  
23 distributed to the Committee for our review.

24 MR. LEYSE: Thank you so much.

25 MEMBER SCHULTZ: And I thank you for this

**NEAL R. GROSS**

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

1 level of detail, and will also assure that the OECD  
2 documentation that you've referenced here is provided  
3 for the Committee. So, again, thank you.

4 Are there other comments from the audience  
5 here in the room, anyone would like to make, members  
6 of the public? Anyone else on the phone line who would  
7 like to make a comment, please identify yourself at  
8 this time.

9 (No response.)

10 MEMBER SCHULTZ: Hearing none, I'll turn  
11 the meeting back over to you, Mr. Chairman.

12 CHAIRMAN ARMIJO: Okay. Thanks, Steve.  
13 We're very close to schedule, so we'll take our lunch  
14 break and reconvene at 12:45.

15 (Whereupon, the proceedings went off the  
16 record at 11:47:19 a.m., and went back on the record  
17 at 12:46:01 p.m.)

18 CHAIRMAN ARMIJO: All right, we're  
19 reconvening. The next subject is the proposed revision  
20 to Regulatory Guide RG 1.192, Operation,  
21 Maintainability Code Case, Acceptability. Dr. Shack  
22 will lead us through the presentation. Bill.

23 MEMBER SHACK: Okay. The basic part of this  
24 Reg Guide is essentially to accept with conditions the  
25 code cases that the ASME code is set up for motor

**NEAL R. GROSS**

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

1 operated valve testing and such. And we've -- the code  
2 itself and the code cases really arose out of some  
3 generic letters that the staff sent out in the late  
4 '80s and '90s when they were concerned with  
5 operability of motor-operated valves to make sure that  
6 they would fulfill their design-basis functions.  
7 Again, testing before that had really gone on notions  
8 like stroke testing, which made sure that in fact they  
9 sort of worked, but the question is whether they'd  
10 really work under the design basis conditions we were  
11 really concerned with. So, testing programs were set  
12 up to do that.

13 Concern for this particular revision of  
14 the code we're looking at is it allows some extensions  
15 of the testing intervals, and this was sort of  
16 discussed in terms of the ABWR. And, again, when one  
17 is extending test intervals, one is always sort of  
18 concerned that, you know, what's the basis for  
19 extending the testing.

20 Well, the concern was that, you know, is  
21 there sort of a built-in notion of a constant failure  
22 rate, in which case it's fairly easy to justify the  
23 extension of a rate based on previous experience, or  
24 is there a possibility that you're somehow developing  
25 new failure modes, in which case it's not so clear

**NEAL R. GROSS**

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

1 that you can do the extension based on the previous  
2 experience. So, the question arose what were the  
3 safeguards within the program to prevent that sort of  
4 new failure modes coming up. And, again, that's where  
5 the questioning rose up, and that's why we're looking  
6 at this particular set of code cases to address that  
7 kind of issue. I think Tony McMurtray wants to start  
8 off the presentation.

9 MR. McMURTRAY: Thank you very much, Dr.  
10 Shack. My name is, as Dr. Shack mentioned, Tony  
11 McMurtray. I'm the Branch Chief of the Component  
12 Performance and Testing Branch over in NRR in the  
13 Division of Engineering. And we see that there's three  
14 things that we want for the purpose of this meeting.  
15 One, we want to provide a history of Reg Guide 1.192.  
16 This is Revision 1. There was an earlier revision that  
17 was written in 2003 and put into 50.55(a) in 2004. We  
18 also want to talk a little bit about a long history in  
19 the ASME OM code of allowance of frequency extensions  
20 for in-service testing of components.

21 The next point is Tom Scarbrough from NRO  
22 is going to talk about the intent and purpose of the  
23 ASME OM-1, and then lastly we're going to go through  
24 and look to obtain ACRS endorsement of the proposed  
25 Rev. 1 to 192 for the rulemaking in 50.55(a).

**NEAL R. GROSS**

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

1           And with that, Bob Wolfgang on my staff is  
2 going to give some background on Reg Guide 1.192. John  
3 Huang also from my staff is going to talk about IST  
4 frequency extensions, both allowed in the code and  
5 that we've allowed through alternatives and relief  
6 request. As I mentioned, Tom Scarbrough will talk  
7 about OMN-1, and then Mike Farnan from my staff is  
8 going to provide some feedback of actual data that we  
9 have regarding OMN-1 usage out there in the industry  
10 at present. So, with that we'll go to Slide 4 and  
11 we're ready for Reg Guide 1.192 background with Bob  
12 Wolfgang.

13           MR. WOLFGANG: Yes. Back in 1990, the ASME  
14 issued or published their code for operation and  
15 maintenance of nuclear power plants which we're  
16 calling ASME OM Code. Since that time, they  
17 periodically issued code cases for the OM code.  
18 Because of that, we wanted to be like Section 11 and  
19 Section 3, would have Reg Guides that have Reg Guides  
20 that list in tables acceptable code cases to the NRC,  
21 and acceptable with condition code cases, so we did  
22 the same thing in Reg Guide 1.192.

23           We first issued, as Tony said, Rev. 0 of  
24 this Reg Guide in June 2003. That contained code cases  
25 OMN-1 through OMN-13, and it included up to the 2001

**NEAL R. GROSS**

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

1 edition of the ASME OM Code. We endorsed in 10 CFR  
2 50.55(a) in 2004 Rev. 0 of Reg Guide 1.192.

3 Rev. 1, the proposed Rev. 1 that you have  
4 seen has the same six code cases that are  
5 conditionally acceptable to the NRC as Rev. 0 has. And  
6 Rev. 1 of Reg Guide 1.192 contains code cases through  
7 the 2006 edition of the code. And it goes -- has code  
8 cases OMN-1 through OMN-16 in it.

9 The conditions on those six code cases in  
10 Rev. 1 are -- the Rev. 1 that you've seen are  
11 identical to the conditions on the code cases that are  
12 in Rev. 0. We are considering new proposed conditions  
13 for OMN-1 and OMN-3. Tom Scarbrough will talk about  
14 that when he gives his presentation.

15 Code case OMN-1 in Rev. 0 was acceptable  
16 with three conditions that we imposed. And with that,  
17 licensees can use code case OMN-1 with the conditions  
18 without obtaining prior NRC approval.

19 OMN-1 in proposed Revision 1 has some  
20 minor changes from the OMN-1 in Rev. 0. In addition to  
21 that, it's incorporated code case OMN-11 and its  
22 conditions into OMN-1. And Tom is also going to talk  
23 -- there's -- in the proposed Revision 1 there are no  
24 changes to the three conditions that were in OMN-1 in  
25 Rev. 0. So, now we'll go on to John Huang.

**NEAL R. GROSS**

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

1 MR. HUANG: Okay. I will go over some  
2 history of testing of pump and valve, especially the  
3 frequency. And I think starting in 1971 ASME Code,  
4 Section 11 require testing of certain pumps and valves  
5 installed in the nuclear power plants. And first let's  
6 talk about pump testing.

7 Up to 1980, all pump test monthly, from  
8 1980 to '95 all pump test quarterly, since 1995 Group  
9 A or Group B pump test performed quarterly and a  
10 comprehensive test for all pump biennially.

11 For valve testing up to '90 full stroke  
12 test quarterly on POVs and MOVs. If test not practical  
13 during plant operation, allow extension to cold  
14 shutdown. Since 1990, if full stroke test not  
15 practical during plant operation and cold shutdown,  
16 code allows test frequency -- test extension to  
17 refueling outage. After 1999, check valve required to  
18 be exercised quarterly, since 1990 this assembly  
19 inspection, reassembly is allowed as an acceptable  
20 alternative for testing check valve by the refueling  
21 outage frequency.

22 Previous extension allows for POV, MOV and  
23 the check valves. First for POV and MOVs, in 1996,  
24 1998, 1999 and 2001 ASME issued cold case OMN-1, 3,  
25 11, and 12 which provide guidance for determine test

**NEAL R. GROSS**

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

1 interval up to maximum 10 years for a qualified group  
2 of similar valves.

3 The process described in the OM code cases  
4 require MOV test every two refuel outage or three  
5 years until sufficient data from said history is  
6 available. To increase test frequency --

7 MEMBER STETKAR: John, in the context of  
8 the code cases what is sufficient data?

9 MR. HUANG: Okay, that's what I just about  
10 mention. The next two presenters --

11 MEMBER STETKAR: Okay, I'll let you go.

12 MR. HUANG: -- will address in more  
13 details about MOV testing, and test frequency.

14 MEMBER STETKAR: Okay, I'll wait.

15 MR. HUANG: I just give you overview and  
16 summary. To increase testing of adequate margin must  
17 be demonstrated before test activity. You see there  
18 will tell you how the staff set adequate margin. The  
19 check valve testing since '99 grouping assembly of  
20 check valves allowed, and the test interval extended  
21 to eight years for a qualified group of four valves or  
22 more. Since 1998, ASME OM Code Appendix 2 check valve  
23 condition monitoring program collects testing for up  
24 to 16 years.

25 MEMBER BLEY: Do we know how many people

**NEAL R. GROSS**

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

1 have taken these extensions?

2 MR. HUANG: It depends. You can see the  
3 exchange applies to MOVs and the check valves. I think  
4 for check valve, I don't know exact number how many  
5 people take advantage of Appendix 2, but for this  
6 grouping, and sampling of check valve, up to four  
7 valve, unless they can demonstrate -- unless they can  
8 do the test during operation, exercise test, they all  
9 take advantage of disassembly, and inspection  
10 approach.

11 MR. McMURTRAY: Dr. Bley, the other thing  
12 is, too, Mike Farnan is going to talk about it at  
13 least with MOVs. We do have some data for MOVs for one  
14 utility group out there as far as who -- a group  
15 that's taking advantage of some of these extensions.  
16 So, we do -- it's limited information but we do have  
17 some information. And when Mike gets to his point in  
18 the presentation he will give that information.

19 MEMBER BLEY: I'll wait for that, thank  
20 you.

21 MR. HUANG: Yes, that's for MOVs. I'm only  
22 talking about check valve.

23 MEMBER SHACK: Here, though, do you have to  
24 take a sample from the group at each more frequently  
25 than the -- or within the 16 years, how do you do the

**NEAL R. GROSS**

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

1 sampling --

2 MR. HUANG: Oh, that's the next point. So,  
3 if we can -- first, you require for extension that  
4 check valve testing using the Appendix 2. And test  
5 frequency extension is only limited to one refuel  
6 cycle per extension. You start with -- every valve  
7 has to be tested starting each refueling outage. You  
8 can only extend when refuel outage, when refueling  
9 extension. So, if you start with two years before the  
10 outage, next time you come and extend it to four  
11 years. If you want to extend it to six years, you'll  
12 need more data to justify that. So, if you want to  
13 take advantage of the 16 years, I figure you'll take  
14 30 years, maybe 40 years to get there.

15 MR. McMURTRAY: And, Dr. Shack, with that  
16 everything -- all the check valves in that group have  
17 to be tested within that interval before you can step  
18 out to the next extended interval. In other words, as  
19 John is saying here, you need to test all of them  
20 within one refueling outage for that group. And then  
21 if the data looks good, you can go out to two  
22 refueling outages, so you do theoretically 50 percent  
23 in that period and then the 50 percent in the next  
24 refueling outage. And then if they all pass, you could  
25 go out to three refueling outages. But all check

**NEAL R. GROSS**

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

1 valves within that group would need to be --

2 MEMBER SHACK: Yes, but you can't wait  
3 until the end of the period and check all four. You  
4 have to do a sample within the -- at the intermediate  
5 step.

6 MR. McMURTRAY: I believe that's correct.  
7 Is that correct, Mike?

8 MR. FARNAN: That's correct. It's broken  
9 down in check valve -- I'm just talking check valves  
10 now, the way the check valve condition monitoring  
11 appendix is written is that it's all based on valve  
12 groupings. If you have a valve group of one, you can  
13 only go out to 10 years. Okay? But you have to step  
14 out to that 10 years, like John was explaining. If you  
15 have a valve group of two, you can go out to 12 years.  
16 But, again, one valve has to be tested at six years,  
17 the other valve has to be tested the other six years.  
18 Okay? And then if you have a valve group of four, and  
19 then you could go out to 16 years, but four valves  
20 have to be tested at four years, another four valves  
21 at eight years, another four at twelve, so they're  
22 always sampling the group within four, four and a half  
23 years time frame over that 16-year period, but all  
24 four will be tested within that 16 years. And should  
25 there be any adverse trend on any one of the group,

**NEAL R. GROSS**

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

1 then they must pull it back and reset the interval to  
2 a lesser time.

3 MEMBER SKILLMAN: How is sufficiency of  
4 data identified?

5 MR. FARNAN: In the code, the MOVs, the  
6 test data is at least two points, most likely three  
7 points verified, and that was all a baby step from  
8 89.10 because 89.10 required --

9 MEMBER STETKAR: Excuse me. Be careful with  
10 the microphone.

11 MR. HUANG: Oh, sorry.

12 MEMBER STETKAR: Drives our recorder crazy.  
13 Baby step from 89.10.

14 MR. FARNAN: 89.10. Yes, basically we're  
15 limited to five years, four and a half to five years  
16 time collecting static diagnostic test data to verify  
17 that it's set and still remains to be able to perform  
18 its safety function. And I'm going to talk about it  
19 later about how we extended out further, the data has  
20 extended out. And when I talk about my -- if you can  
21 hold on --

22 MEMBER STETKAR: Sure, okay. Thank you.

23 MR. FARNAN: And we have a condition on  
24 that in Reg Guide 192 which we'll talk about that.

25 MEMBER STETKAR: Okay, thank you.

**NEAL R. GROSS**

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

1 MR. HUANG: Okay. Next we talk about  
2 frequency extension for safety relief valves. Up to  
3 2009, code specified a certain minimum number of  
4 valves shall be tested each refuel cycle, and all  
5 valves shall be tested every five years for Class 1  
6 valve, and 10 year for Class 2 and Class 3 valves.

7 In 2009, ASME issued code case OMN-17  
8 which extended test interval for Class 1 pressure  
9 relief valve from five years to six years plus six  
10 months. However, in addition to the extension the  
11 owner shall disassemble and inspect each valve to  
12 verify parts are free of defects. OMN-17 has not --

13 MEMBER STETKAR: Just out of curiosity,  
14 because I don't believe I've read OMN-17, or if I have  
15 it's been a while. Five years is a nice round number.  
16 I don't want to know where that came from. Six years  
17 and six months strikes me as a very precise value  
18 that's not a lot more than five years.

19 MR. HUANG: If you --

20 MEMBER STETKAR: How was that derived?

21 MR. HUANG: Okay. If you ask me, I don't  
22 know the real basis for it. My own --

23 MEMBER STETKAR: I hope somebody in front  
24 knows.

25 MR. FARNAN: Well, the six years, basically

**NEAL R. GROSS**

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

1 when the code was -- when it first came out it was  
2 five years. A lot of the plants went to two-year  
3 refuel cycles, so when they went to two years they go  
4 we're kind of handcuffed at four -- so, they basically  
5 said okay, we'd like to go to six years, which is what  
6 this code case was about.

7 Now, the six months comes into play with  
8 outage scheduling. That allows you to slide --

9 MEMBER STETKAR: So, it's basically five  
10 years with pragmatism thrown in.

11 MR. FARNAN: Right.

12 MEMBER STETKAR: Okay.

13 MEMBER SKILLMAN: But let's look at that  
14 middle bullet for a minute, please. "In addition to  
15 the extension, the owner shall disassemble and inspect  
16 each valve to verify parts are free of defects." When  
17 that valve is reassembled, have you not reset the  
18 infant mortality curve? You basically have the  
19 potential for maintenance induced failures that you  
20 may not have had before you disassembled that valve,  
21 so you may have introduced a failure mode or mechanism  
22 that may not have been active before you took it  
23 apart.

24 MR. HUANG: Well, all safety-related valve  
25 after -- you know, bench test, they have to do some --

**NEAL R. GROSS**

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

1 - if they have to do anything subsequent to that test,  
2 they have to retest it for that valve.

3 MR. FARNAN: I guess one word that we're  
4 missing from that is they also rework the valve to  
5 bring it back to as-new condition. They -- part of the  
6 added bonus of the -- the assurance that we're going  
7 to be using is by taking them apart you're looking for  
8 -- see if there's any degradation that we've  
9 introduced adding that extra year into the valves. But  
10 they also rebuild them and bring them back to as-new,  
11 basically bring them back to ground zero and set them,  
12 so their set points are set and they're ready to go.

13 MEMBER BLEY: And then you have to do a  
14 post maintenance test.

15 MR. FARNAN: Right.

16 MEMBER SIEBER: Following the maintenance,  
17 there is post maintenance testing that goes on, which  
18 establishes new -- assures operability and resets the  
19 time interval.

20 MR. HUANG: Yes. Usually, you do see some  
21 degradations, you know, like set point pressure.  
22 Because we are allowed plus three minus five to date,  
23 so every valve we retest after the -- for the testing,  
24 there is some changes. We have to rebuild that valve  
25 to bring back to plus minus one, so most likely all

**NEAL R. GROSS**

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

1 the valves will be rebuilt and retested.

2 MEMBER SKILLMAN: Does this testing test  
3 the blowdown percentage?

4 MR. HUANG: Will do the blowdown test, you  
5 know, for Nickagee test, we do each test, as well.

6 MEMBER SKILLMAN: I'm talking about in the  
7 safety and relief valves you've got two sets of rings.  
8 You've got a pressure ring and you've got a huddle  
9 chamber with a reaction ring. And if you don't get  
10 those set precisely correctly, then if the huddle  
11 chamber is set incorrectly, that valve will take you  
12 the whole way down. If the huddle chamber is set too  
13 close, it's too wide, the valve won't blow down  
14 enough, so the industry learned years ago that when  
15 you're into the safety valves, there is more than just  
16 a pop test to see at what pressure it relieves, there  
17 is the added function of the degree to which it blows  
18 down. Plants have blown the whole way down because the  
19 rings were set improperly.

20 So, my question is when you go through  
21 that activity, are you really resetting the valve so  
22 it performs the way it is intended to for your safety  
23 analysis?

24 MR. BILLERBECK: Hi, I'm John Billerbeck.  
25 I can answer your question. You're right that ring

**NEAL R. GROSS**

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

1 adjustment defines the performance of these valves.  
2 And, basically, the ring adjustment is determined when  
3 the valve is capacity certified, when it's designed  
4 and built new for the first time. And then a record of  
5 that adjustment stays with the valve, and it's  
6 basically -- you've seen the rings. It's a tooth ring,  
7 and you can count the number of teeth, and you can  
8 spin the thing up and down the nozzle to get the rate.  
9 So, the owner is obliged to know that, and to return  
10 the valve after service to the correct ring  
11 adjustment.

12 And, in fact, during hot testing you're  
13 actually allowed to change the ring setting to get a  
14 crisp hot provided they put the ring back to where it  
15 should have been in the first place. And what that  
16 tries to recognize, particularly in these Class 1s  
17 that are large valves protecting the reactor coolant  
18 system, is that on a common test bench you can't get  
19 nearly the flow that you would need to fully lift that  
20 valve in its design capacity.

21 MEMBER SKILLMAN: So, I hear you say hey,  
22 they set it so it will pop clean, then they return the  
23 reaction ring to its original setting so that it will  
24 then produce the blowdown that it should.

25 MR. BILLERBECK: Yes. And the same would be

**NEAL R. GROSS**

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

1 true if under the new code where you can go out six  
2 years provided that as part of the six year test you  
3 fully disassemble, inspect, and refurbish the valve.  
4 Same deal there. Obviously, when you put it back  
5 together you need to put the rings back to where they  
6 ought to be.

7 MEMBER SKILLMAN: John, thank you.

8 MR. HUANG: Okay. Let's see where I am now.  
9 Okay. OMN-17 has not been added to Reg Guide 1.192. By  
10 relief request in accordance with 10 CFR 50.55(a), NRC  
11 has authorized the use of this alternative described  
12 in the code case to a number of plant already.

13 Next one. If a valve in the spaces for the  
14 safety relief valve, if a valve in the sample group  
15 fails to meet acceptance criteria, two additional  
16 valves shall be tested. If any of the additional valve  
17 fail the test, all remaining valve in the group shall  
18 be tested.

19 Okay. Here I'm addressing the acceptance  
20 criteria, correct NRC regulations. And I'd like to  
21 note that the primary goal of IST program is really to  
22 monitor components for degradation. And the trending  
23 of the degradation can determine if a component needs  
24 rework prior to next test. The ASME OM code specify  
25 also alert and required action range for permanent

**NEAL R. GROSS**

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

1 valve testing, require action range usually more  
2 libertine than text, but limits for FSAR design basis  
3 conditions. Usually, there's quite a bit more.

4 ASME OM code require test frequency  
5 increase when data alert range for prompt increased  
6 test, end of frequency from three months to month and  
7 a half. For valve, where you increase -- test interval  
8 from three months to one month. ASME code also require  
9 component declare inoperable until correct action is  
10 taken from data that's in the required action range.  
11 So, if you -- in this view the component has really  
12 not failed yet. They already -- they are in the  
13 required action but may not be failed.

14 ASME code allow test frequency increase to  
15 16 years, but only for assembly and grouping of  
16 similar valve. A minimum number of valve in group  
17 must be tested each refuel cycle, so always test some  
18 valve, some number of valve during outage. And Code of  
19 Federal Regulation 10 CFR 50.65 provides regulatory  
20 requirement for monitoring effectiveness of methods  
21 including IST program.

22 Also, NRC Inspection Manual Part 9900  
23 provides guidance on operability determination and a  
24 functionality assessment for resolution of degraded,  
25 including failure, or non-conforming condition adverse

**NEAL R. GROSS**

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

1 to quality or safety. So, all this above acceptance  
2 criteria, code and NRC regulatory requirements be sure  
3 effectiveness of IST program. In effect, IST program  
4 will offer the best potential for early identification  
5 of degraded components so that timely action can be  
6 taken to correct this degraded condition and prevent  
7 degrade of components from failure. That's the end of  
8 my presentation.

9 MR. McMURTRAY: Okay, Tom.

10 MR. SCARBROUGH: Okay. I'm Tom Scarbrough,  
11 and I'm going to take you through a little bit of the  
12 MOV OMN-1 background. I was assigned to valves back in  
13 1989 and I coordinated that program for 20 years until  
14 I moved over to Office of New Reactors. And now I'm  
15 doing the same thing with new reactors.

16 Basically, starting out in the 1980s there  
17 was --

18 MEMBER REMPE: Excuse me. Everyone be real  
19 careful about those mics. It really bothers the guy's  
20 ears, and we'll have to pay to have his ears repaired.

21 MR. SCARBROUGH: In the 1980s, there was  
22 operating experience that revealed that the quarterly  
23 stroke time testing required by the ASME Code was  
24 inadequate to demonstrate MOV operation or readiness.  
25 And we had a number of high visibility failures.

**NEAL R. GROSS**

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

1 Davis-Besse had a loss of all feedwater when the  
2 valves did not open properly. Catawba had a whole  
3 series of issues where their auxiliary feedwater, the  
4 storage valves wouldn't close properly and they ran a  
5 bunch of tests and found out that they worked fine  
6 under static conditions, but under flow conditions  
7 they would not close.

8 So, we started that process. And the  
9 bullet in 8503 was the first phase of that. And it  
10 just focused on the high pressure valves, the ones in  
11 the high systems, and there was a program that was  
12 done for that. And the results led us to decide that  
13 the whole program needed to be expanded to all safety-  
14 related motor-operated valves. And that started that  
15 process. And that was developed as a compliance  
16 backfit, and we went through that whole process for  
17 review.

18 The net result was the licensees ended up  
19 testing a large number of their motor-operated valves.  
20 There was a large EPRI program to test valves to see  
21 what the requirements were for opening and closing the  
22 valves. NRC had a research program that dealt with  
23 that. But in the end, there was -- each power plant  
24 spent several million dollars to modify, upgrade,  
25 replace their motor-operated valves, and retest them.

**NEAL R. GROSS**

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

1 And we worked with the Owners groups for that.

2 And as we were going through that process,  
3 we realized there needed to be a longer term. Once we  
4 demonstrated design base capability, we didn't want to  
5 lose it after we achieved it. So, we developed Generic  
6 Letter 96-05, which requested licensees to develop  
7 programs to periodically verify design base capability  
8 of those safety-related MOVs.

9 And we worked with the Owners groups. They  
10 put together a joint Owners group which did a testing  
11 of valves at power plants where they were looking for  
12 valve degradation. They didn't really deal with  
13 output, but they looked to see if over time the  
14 stellite friction really increased over time, or did  
15 you sort of reach a plateau and sort of stayed there.  
16 And the net result was that for the most part they  
17 found that the stellite once it reached a plateau, it  
18 stayed there over time. There are a few outlier  
19 valves, but for the most part they found that they  
20 stayed there. And we accepted that program, a JOG  
21 program through some safety evaluations that we  
22 prepared as a way to satisfy the Generic Letter 96-05  
23 recommendation. So, that's a very high-level look at  
24 the MOV history.

25 About that same time that we were doing

**NEAL R. GROSS**

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

1 that whole process, ASME recognized that the quarterly  
2 stroke time testing was inadequate, so they went  
3 through the process of looking at first phase of  
4 making a code change as a code case. So, they  
5 developed code case OMN-1, which allowed the  
6 replacement of the quarterly stroke time testing to  
7 exercising every outage with periodic diagnostic  
8 testing that ran from two years up to 10 years.

9 And part of that was the process where we  
10 worked with Limator, and made sure that they were  
11 comfortable with changing an exercise frequency from  
12 every quarter, to make sure that the grease was  
13 properly stirred up over time. And they said two years  
14 was the maximum they would go for their actuators.

15 The way OMN-1 is set up is to start you  
16 have to verify your design base capability. And that  
17 was like a Generic Letter 89-10 program, so you have  
18 to first have your design basis verified. And then it  
19 allows -- it talks about high-risk valves, and it says  
20 okay, if you have high-risk valves, you might want to  
21 think about do you really want to go to every outage,  
22 so it was sort of a yield sign. So, be careful --  
23 before you throw these things out to every outage,  
24 look at your high-risk valves. Make sure you're  
25 comfortable with doing that.

**NEAL R. GROSS**

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

1 CHAIRMAN ARMIJO: How do you define a high-  
2 risk valve?

3 MR. SCARBROUGH: Well, that's through their  
4 PRA process that they would do that. So, what -- and  
5 this is what got us into the conditions, because it  
6 was put in there as a consideration. So, we wanted to  
7 have some basis for how they were grouping their  
8 valves high-risk, low-risk, and that sort of thing.  
9 So, we ended up putting some conditions on OMN-1 for  
10 that.

11 MEMBER STETKAR: Tom, can I interrupt you  
12 just for a second?

13 MR. SCARBROUGH: Sure.

14 MEMBER STETKAR: And tell me to hold it if  
15 it's more pertinent later. As I read the code cases  
16 and the Reg Guide, it says if you observe failures you  
17 need to test more frequently until you have confidence  
18 that the stuff is good. I don't find anything -- the  
19 only reason I ask it now is because you brought up the  
20 notion of high-risk, high safety-significance I think  
21 it's called, components. There's nothing in there that  
22 I read that says gee, if I have a failure I need to go  
23 reassess the safety significance.

24 In most cases, that safety significance is  
25 based on a numerical ranking, also vessel importance

**NEAL R. GROSS**

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

1 or risk achievement worth, which in turn depends on  
2 the failure rate that's used for that particular  
3 component in the PRA models, such that if it had a  
4 failure rate of 10 to the minus 90<sup>th</sup> it might not be  
5 all that safety-significant because it doesn't have a  
6 lot of importance. On the other hand, if it had a  
7 failure rate of .1, it might show up as a high safety-  
8 significance component.

9 Have you thought about that? There doesn't  
10 seem to be anything in the guidance that says go back  
11 and reevaluate the safety significance of your valves  
12 if you start to discover failures.

13 MR. SCARBROUGH: Yes. In terms of the  
14 ranking, there was discussions about way back when  
15 this was being prepared, how do we establish what the  
16 risk-significance of these valves are? Part of the  
17 problem is that the quarterly stroke time testing  
18 really wasn't demonstrating design base capability, so  
19 in terms of going out to every outage, which ones do  
20 you consider to be high-risk. So, this was back in  
21 like the 1999 time frame, so our knowledge of use of  
22 PRA was just beginning. Actually, this was like one of  
23 the first things where we actually used -- there were  
24 some risk considerations that we were using. So, we  
25 were really sort of like this was new for us in terms

**NEAL R. GROSS**

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

1 of that.

2 And I think now, and I think the PRA group  
3 has seen the conditions that we have on OMN-3, which  
4 is the PRA, and they have some suggestions on how to  
5 bring that up to sort of today's standards in terms of  
6 how to evaluate the quality of the PRA, make sure  
7 you're actually ranking things properly and that sort  
8 of thing.

9 MEMBER STETKAR: That's one issue, and I  
10 don't want to get too much into the PRA end of things  
11 because of the time considerations, but I was asking  
12 more in terms of the ranking. Let's say you had a  
13 perfect PRA and you had people who knew how to use it  
14 perfectly, there's still nothing in the guidance that  
15 I can read, either in the code case or as conditions  
16 in the guidance that says hey, if indeed you do  
17 observe degraded performance for a class of -- a set  
18 of your valves, you need to go back and reevaluate  
19 could that degraded performance place those valves  
20 into a high safety-significance category where they  
21 might have previously not been categorized as high  
22 safety-significance. Because the safety-significance  
23 actually depends on the valve failure rate, but the  
24 valve function, I mean what system it's in and what  
25 function it performs. But within that context, the

**NEAL R. GROSS**

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

1 valve failure.

2 MR. SCARBROUGH: Right. We have -- you're  
3 exactly right.

4 MEMBER STETKAR: Okay.

5 MR. SCARBROUGH: We have guidance that  
6 talks about -- in OMN-1 that specifies that if you  
7 have performance issues, if you see abnormal behavior,  
8 you have to go back and reassess your entire process  
9 that you're applying to that valve, what the frequency  
10 of testing is and that sort of thing. But we didn't go  
11 back and tell them to reassess the risk ranking. I  
12 think it's because we just -- we're just deterministic  
13 guys, and we don't really think in terms of PRA, and  
14 how that will reflect, but that's a --

15 MEMBER STETKAR: Thank you for putting that  
16 on the record.

17 MR. SCARBROUGH: That would be good to  
18 evaluate. One of the PRA guys is going to defend you  
19 now.

20 MR. DINSMORE: My name is Steve Dinsmore.  
21 I work in the PRA License Branch of NRR. As it's set  
22 up right now, there is no periodic reevaluation.  
23 However, again, if the raw is greater than two, it's  
24 going to be high. The raw is not going to change if  
25 the failure rate goes up. The Fussell-Vesely --

**NEAL R. GROSS**

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

1                   MEMBER STETKAR: Fussell-Vesely will change  
2 on you, the raw won't.

3                   MR. DINSMORE: But there's the Maintenance  
4 Rule which kind of keeps track of increasing failure  
5 rates, as Tom said, if the thing starts to fail. I  
6 think one thing about this whole thing that confused  
7 me for a long time is these gentlemen are very  
8 interested in those tests. They think those tests and  
9 the diagnostics that they get are just the best thing  
10 in the world. And that's what they're relying on to  
11 make sure that this whole thing works. So, there's no  
12 specific hardwired feedback.

13                   MEMBER STETKAR: But, you know, you  
14 understand my concern.

15                   MR. DINSMORE: Yes.

16                   MEMBER STETKAR: The raw isn't going to  
17 change. Suppose the raw was 1.95, and the Fussell-  
18 Vesely importance was .0049. You know, and now I  
19 experience a couple of failures within a group, and  
20 the raw ain't going to change. I'm sorry, I'll be --  
21 the raw is not going to change, but the Fussell-  
22 Vesely importance now pops up above your magic .005,  
23 because that is affected by the failure.

24                   MR. DINSMORE: That is possible, and even  
25 with the 50.69 guidance it's somewhat fuzzy. I guess

**NEAL R. GROSS**

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

1 we did -- there's not a big expectation that this  
2 stuff is going to move around quite that much.

3 MEMBER STETKAR: That's fine. I've taken  
4 enough time. Thanks.

5 MR. SCARBROUGH: In terms of the -- it does  
6 allow some grouping. There's some grouping that was  
7 provided, and OMN-1 originally just had some sort of  
8 general language about risk, but we really didn't  
9 accept it. There was an OMN-11 code case that was  
10 written which provided more information, and we ended  
11 up adding conditions on that because we just were not  
12 comfortable getting too much down the risk path with  
13 grouping and things of that nature.

14 But the one thing that we did specify in  
15 OMN-1 is that no matter whether it's high or low risk,  
16 the functional margin has to support the data until  
17 the next test. You cannot say well, it's low-risk so,  
18 therefore, we're going to run it in the failure. I  
19 mean, it has to -- we have to have a basis for it.  
20 Now, how you group things, you might things in a  
21 little more relaxed manner for your low-risk valves,  
22 but you still have to have a basis for the next test.

23 And then, as I said, if you have some  
24 performance problems, you're required to take  
25 corrective action for that. And that's the same as

**NEAL R. GROSS**

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

1 Appendix B.

2 But part of this, also, was driven by the  
3 fact that through the lessons learned from Generic  
4 Letter 89-10 is that these valves, the torque switches  
5 were set up much higher than they were in the past.  
6 The amount of output capability was much greater in  
7 terms of where the torque switch was tripping, so  
8 every time you stroke the valve for a quarterly stroke  
9 time test, you actually were tripping that torque  
10 switch at sometimes twice the thrust that it was there  
11 before. And there was a concern that if you keep doing  
12 that every quarter, you're going to end up having some  
13 problems with the performance of the valves, like the  
14 stem nuts are very soft material and they wear.

15 So, part of this logic that ASME was  
16 working on was saying okay, we're going to do -- we  
17 set these valves up with much higher torque switches,  
18 and is that going to cause a degradation problem over  
19 time by stroking them every quarter? And is there a  
20 way to do this in another way not to have that happen?  
21 So, that's part of what was coming out of OMN-1.

22 MEMBER STETKAR: Tom, before you go to the  
23 next slide and, again, tell me to be quiet if you're  
24 going to address this later. The earlier version of  
25 OMN-1 had some figures in it that showed that basic

**NEAL R. GROSS**

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

1 concept of what you were just discussing in terms of  
2 projecting failure rates and calculating margins, and  
3 things like that. Those all presume a constant failure  
4 rate as a function of time such that all of the groups  
5 were linear.

6 Those curves have been removed from the  
7 latest version and replaced with rather vague words.  
8 How do people now with the current revision of the  
9 code case, the new code case, how do they determine  
10 those projections? Is it still -- I mean, will they  
11 still follow the same linear failure rate?

12 MR. SCARBROUGH: Yes, the curve --

13 MEMBER STETKAR: Oh, because I couldn't  
14 find that -- those words in there. The only guidance  
15 were the pictures in the former version of the code  
16 case.

17 MR. SCARBROUGH: Yes. When OMN-1 was first  
18 written, these -- since it's such a new area to go  
19 from stroke time testing to diagnostics, it was --

20 ASME considered that this would provide some  
21 clarification of what you were looking for, that the  
22 margin is going to reduce over time, and by the time  
23 it reaches down to zero, you need to be able to have  
24 your frequency of your test satisfied, so you don't  
25 have a problem.

**NEAL R. GROSS**

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

1                   MEMBER STETKAR: But it reduces linearly  
2 over time, because we know that.

3                   MR. SCARBROUGH: Yes. Well, that was the  
4 assumption here in the amount in the drawings. Over  
5 time as they used OMN-1, as licensees started to use  
6 OMN-1 and there was more information, the way the  
7 slides were written they focused on stem torque. And  
8 so many licensees were using direct stem thrust  
9 measurements, directly measured off the stem. So, they  
10 were seeing -- there were a lot of questions that came  
11 through ASME, it was like is this sort of like tying  
12 my hands, and I have to use torque sensors, and such  
13 as that.

14                   So, once this was used for a while, the  
15 industry decided that the figures were maybe giving  
16 the impression that you had to use torque sensors, and  
17 whereas thrust sensors would be equally acceptable.  
18 So, they decided they didn't need to have the figures.  
19 But the concept was still the same.

20                   MEMBER STETKAR: The concept is still a  
21 linear.

22                   MR. SCARBROUGH: Yes.

23                   MEMBER STETKAR: Do we have any actual --  
24 you know, we run a lot of power plants with a lot of  
25 valves for a lot of years. Do we have any actual

**NEAL R. GROSS**

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

1 experience that supports this notion of a linear  
2 failure rate, or that refutes it to say that the  
3 failure rate might be non-linear, as a function of  
4 time?

5 MR. SCARBROUGH: The Joint Owners Group  
6 program was intended to look at that. But what they  
7 did, they tested a number of valves over like a five-  
8 year period multiple times at the various power  
9 plants, and they had like 90 something of the reactor  
10 units participating. And what they were looking for  
11 was what would happen to valve factors over time.  
12 Could the valve factor increase over time? So, you'd  
13 end up having failure rates that would increase over  
14 time.

15 And what they found was that for stellite,  
16 once it reached its sort of plateau value, it  
17 basically stayed the same over time. It really didn't  
18 degrade, so what they were finding for most valves,  
19 for most valve types --

20 MEMBER STETKAR: Sometimes decreased.

21 MR. SCARBROUGH: Yes. So, what they found  
22 was that, bsaically, they could make an assumption  
23 that the valve factor was not going to increase over  
24 time. So, therefore, they said okay, if you focus on  
25 your diagnostics for your output capability, you can

**NEAL R. GROSS**

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

1 monitor that. So, they looked at things, so licensees  
2 looked at things like stem friction coefficient in  
3 terms of lubricant. How often do you need to lubricate  
4 the valve to make sure you're not losing your output  
5 capability? So, the plants will have every outage  
6 lubrication for their valve stems and that sort of  
7 thing.

8           So, basically, what they found is that  
9 they can make an assumption that their valve factor is  
10 going to stay constant, and if they keep monitoring  
11 their output capability, they'll be able to control  
12 their integral that they need to be able to retest a  
13 valve, so that's where they -- but that's the data  
14 that they found over this five-year period where they  
15 tested a large number of valves in various places.

16           MEMBER STETKAR: Okay.

17           MR. SCARBROUGH: Okay, 50.55(a). Back in  
18 1999, whenever we were doing the Generic Letter 99-10  
19 program, and it was determined that the quarterly  
20 stroke time testing to be in the regulations was  
21 inadequate, so the Commission imposed a requirement  
22 that the plants establish programs to insure that MOVs  
23 continue to be capable of performing their design  
24 basis safety functions. And that was done when we went  
25 from OM. There was Section 11 which is the IST Code,

**NEAL R. GROSS**

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

1 and we went into OM. So, this was the first time we  
2 endorsed OM code in the regulation, so we added this  
3 condition for the use of the OM code.

4 The other thing we did was as the process  
5 we were working on developing this rule, the OMN-1 was  
6 issued by ASME, and we were working on plant-specific  
7 reviews of each of those. And when this went through  
8 the process, the NRC decided that we would actually  
9 accept OMN-1 in 50.55(a), so actually it was unusual  
10 that we actually put the code case right into the  
11 regulations, but there was no Reg Guide 1.192 at the  
12 time. So, there was no quick way to be able to  
13 indicate the staff's generic acceptance of OMN-1. So,  
14 what we did was we worked with the PRA group, and this  
15 gets to the question about the two years, or two  
16 outages or three years at the very beginning that says  
17 you have to have sufficient data.

18 So, when we looked at that sufficient data  
19 clause that was in OMN-1, we didn't feel comfortable  
20 with that because what is sufficient? So, what we told  
21 them was because OMN-1 allows you a 10-year maximum  
22 interval, we were concerned that maybe some valves  
23 might be put at 10 years and we wouldn't know about  
24 them until you test them two years later. So, what we  
25 said was -- and this was actually explained in the

**NEAL R. GROSS**

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

1 SOC, Statement of Consideration, for this rule, is  
2 that we wanted the licensees to evaluate data over the  
3 first five years from group valves or similar valves  
4 so that you didn't have valves that were set at 10,  
5 you wouldn't know anything about them until you  
6 stroked them at 10, and they wouldn't work. So, we  
7 explained this that they have to gather data over the  
8 first five years of group valves so that that would  
9 support the intervals that had those longer intervals,  
10 those longer time frames. So, that was our condition  
11 we placed on that, because we were concerned about  
12 that sufficient data clause, as well. And the other  
13 thing we did was --

14 MEMBER SKILLMAN: Did you describe what  
15 sufficient is in terms of stroke time torqued, that  
16 type of thing?

17 MR. SCARBROUGH: Well, what we indicated  
18 was that they have to actually have data -- actually,  
19 you have diagnostic data over the thrust output,  
20 thrust capability. They have to actually look at the  
21 data of group valves, similar valves that shows that  
22 the degradation was not occurring more quickly than  
23 they were predicting in their analysis, so actually  
24 the -- so the interval they set up for 10 years, if it  
25 was 10 years, was still supported by the actual data

**NEAL R. GROSS**

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

1 they were gathering over the first five years.

2 MEMBER SKILLMAN: Thank you, Tom.

3 MR. SCARBROUGH: And the other thing we did  
4 was, the same thing about this high-risk MOVs, about  
5 the quarterly. We saw that clause in OMN-1, and we  
6 discussed in the Statement of Consideration that you  
7 have to have a basis for going beyond the quarterly  
8 for these high-risk valves. We wanted them to evaluate  
9 the impact of extending those exercise intervals. And  
10 what would it mean from a risk perspective if you all  
11 of a sudden took all your high-risk MOVs and put them  
12 out to quarterly. So, that's where we came up with the  
13 language. And this was the language that the PRA staff  
14 came up with at the time, is that the impact has to be  
15 small from a PRA perspective and consistent with the  
16 Commission's safety goal policy standard. So, that was  
17 the language that we put in at the time.

18 MEMBER STETKAR: Tom, just out of  
19 curiosity, this is only a -- that section of the Reg  
20 Guide or the code case essentially reproduces Reg  
21 Guide 1.174. Are you going to have problems going  
22 forward if Reg Guide 1.174 changes, and this doesn't?  
23 In other words, why don't you just refer to Reg Guide  
24 1.174 for that guidance without having all of the  
25 stuff duplicated?

**NEAL R. GROSS**

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

1 MR. SCARBROUGH: I guess that's one thing  
2 we could do.

3 (Simultaneous speech.)

4 MR. DINSMORE: Well, I think the first  
5 place it's a code case so we can't -- all we can do to  
6 make changes to it is to put conditions into 1.192.

7 MEMBER BLEY: But you can do that.

8 MR. DINSMORE: But you can do that. But  
9 what we've have to do is put a condition in, don't  
10 follow these two pages, but follow what's on four. I  
11 don't think 174 is going to change a lot. And even if  
12 it did, these code cases, again, they roll around  
13 every 10 years which is a long time, but we still have  
14 an opportunity to make changes over a longer period.  
15 So, the ASME put the stuff in there. We didn't find it  
16 -- we didn't believe it was necessary in the end to  
17 strip it out and put what we wanted in there, we just  
18 left it in there. That might not be a real  
19 satisfactory answer, so your suggestion would be to?

20 MEMBER STETKAR: At least in the Reg Guide  
21 refer to either what's in the code case, or guidance  
22 in the current -- however you specify it, current  
23 version of 1.174 to avoid that possible creep into a  
24 divergent set of guidance that people might use.

25 MR. DINSMORE: Yes, it does link.

**NEAL R. GROSS**

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

1 MR. McMURTRAY: Over in OMN-3, though, not  
2 in 1, but in OMN-3. And 3 is sort of the catchall from  
3 a risk standpoint to a lot of these other code cases,  
4 like OMN-1, OMN-4, OMN-7 where it talks about using  
5 risk for pumps.

6 MR. DINSMORE: Actually, there is a  
7 condition 2 in OMN-3 that says the --

8 MEMBER STETKAR: Okay, thanks.

9 MEMBER SHACK: It doesn't mention 1.200 for  
10 quality.

11 MR. McMURTRAY: No, it doesn't.

12 (Simultaneous speech.)

13 MR. McMURTRAY: We're looking at that.

14 MEMBER STETKAR: Okay.

15 MR. SCARBROUGH: And then I'll just say  
16 that once Reg Guide 1.192 was issued we took this  
17 provision out of 55(a) on OMN-1 because now we had a  
18 place, a Reg Guide that could handle OMN-1. That's  
19 what we did.

20 MEMBER BLEY: Tom, I need clarity on  
21 something because I have never quite dealt with this.  
22 You went back to the Statements of Consideration and  
23 that had the kind of things that we had talked about  
24 at the Subcommittee that would seem important to make  
25 sure this is stepwise. Does that last forever? You

**NEAL R. GROSS**

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

1 know, as the Reg Guides change, as the code cases  
2 change does that idea of -- that was embedded in the  
3 Statements of Consideration stay with this process? I  
4 don't know.

5 MR. SCARBROUGH: It should. I mean, it's an  
6 explanation of the Commission's thoughts and  
7 expectations regarding implementing the Reg Guide or  
8 whatever. So, yes, it's --

9 MEMBER BLEY: It doesn't need to get poured  
10 into the Reg Guide to make sure we don't lose track of  
11 that?

12 MR. SCARBROUGH: Yes, and that's the  
13 question that we talked about, should we emphasize --  
14 is there places where we can make stronger emphasis  
15 on things. And that's really up for discussion.

16 MEMBER BLEY: Okay.

17 MR. McMURTRAY: We're looking at that and  
18 we're working through with Office of General Counsel  
19 to see where we should put this, and also CRGR because  
20 we want to -- as we're saying, I think going forward  
21 we can put some of these things on. Going back there's  
22 issues about backfit and whether we would be going  
23 into that later.

24 MEMBER BLEY: I think going forward is what  
25 we -- at least what I'm focused on.

**NEAL R. GROSS**

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

1 MR. McMURTRAY: Right, but I think for  
2 folks to appreciate here what you've got to realize  
3 with this, even if we get this Reg Guide and into  
4 50.55(a) in 2014, if a licensee has implemented OMN-1  
5 and they did it let's say in 2012, and their 10-year  
6 interval doesn't expire until 2020 something, they  
7 don't have to implement this until that time period.

8 MR. SCARBROUGH: Well, let me move on. In  
9 terms of Reg Guide 1.192, June 2003 we endorsed OMN-1  
10 and we've included these conditions. And then, also,  
11 since there was OMN-3 which is the risk ranking, we  
12 added another provision that indicated that if you had  
13 an NRC-accepted risk ranking methodology that you've  
14 already gone through the process, you could use that  
15 rather than forcing them to use OMN-3. So, it's sort  
16 of a permissive that was in there. And, also, we  
17 accepted the OMN-11 which was the risk ranking, but we  
18 put conditions that make sure they evaluate the test  
19 data and that sort of thing.

20 And then the OMN-1, 2006, where it is  
21 today, basically, the OMN-1006 is an update of the  
22 earlier OMN-1. It sort of makes some language more  
23 clear, it talked about -- it sort of removed the sort  
24 of focusing on torque, make sure it talked about  
25 operating requirements and that sort of thing. We

**NEAL R. GROSS**

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

1       tried to make sure that licensees knew that they could  
2       use it with different diagnostic techniques and  
3       methods, and clarified some other language that was in  
4       there.

5               We actually incorporated OMN-11 and added  
6       the conditions from Reg Guide 1.192 so we don't need  
7       to add any additional sort of risk conditions from  
8       OMN-11 in there. But it -- we went ahead and  
9       maintained the conditions in Reg Guide 1.192 just to  
10      emphasize the issue about sufficient data, evaluating  
11      the data, to make sure that they had evaluating of  
12      test data before you go beyond five years and that  
13      sort of thing. So, we kept those conditions.

14             And we have talked about adding additional  
15      clarification. We talked about that, and as Tony said,  
16      we're working with OGC to see how we can do that. But  
17      that's my presentation. Let me turn it over to Mike,  
18      so he can talk about our experience a little bit more.

19             MR. FARNAN: Okay. Yes, I wanted to provide  
20      you some feedback from the operating units, a little  
21      history on myself before I came to the NRC. I actually  
22      was the MOV engineer at Ginna Station for several  
23      years, so I felt Tom's pain for many years. But I want  
24      to give you some feedback on OMN-1.

25             And starting off, recapping with OMN-1, I

**NEAL R. GROSS**

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

1 mean, it has the following attributes. You have to do  
2 a design basis verification test. You have to test  
3 the valve at full pressure and flow, whether it be in  
4 situ or whether it be at a test facility, but it is  
5 required for the valve. And it's also -- part of the  
6 other attribute it has a pre-service test. That  
7 doesn't necessarily have to be at design basis  
8 pressures or flows, it's what pressures or flows  
9 you're going to be -- from this day forward what's our  
10 IST program is going to be checking for degradations.

11 The in service test is a mix of static and  
12 dynamic diagnostic testing basically to see if the  
13 valve and the actuator are set up properly. And the in  
14 service test interval is bsaically established after  
15 evaluation of test data. And there's also a separate  
16 test which is the MOV exercising, which basically  
17 checks the full integrity from the main control board  
18 down, and basically stirs up the grease, and that's  
19 the once every refuel cycle interval.

20 Today there's 29 plants that have adopted  
21 OMN-1 that are using OMN-1. There's 39 additional  
22 plants that are planning to implement OMN-1, and I  
23 also wanted to mention that there's 98 plants that are  
24 Joint Owners Group participants, and basically they're  
25 in the process of implementing the final stages of the

**NEAL R. GROSS**

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

1 Joint Owners Group program.

2 Now, the reason I talk about the Joint  
3 Owners Group program is that the JOG program, the  
4 final program has all the attributes of OMN-1, with  
5 the exception of the exercise testing, which plants  
6 still have to exercise per the IST program. But JOG  
7 was, like Tom said earlier, was a five-year study on  
8 valve degradation response to Generic Letter 96-05.  
9 And the test data from the JOG program must justify  
10 test interval extension. Test interval determination  
11 shall account for all potential performance-related  
12 degradations, maintenance activities and associated  
13 intervals are considered.

14 I think what came out of the 89-10 testing  
15 is that a lot of the actuators are all the same even  
16 though they're different sizes, but they're  
17 functionally pretty much the same. And the breakdown  
18 mechanisms, or the mechanisms that cause you problems  
19 are torque switch repeatability, your stem nut  
20 coefficient of frictions, what type of greases you're  
21 using on the stem, the stem nut, and that's pretty  
22 much -- if you can control all that and know your  
23 environment that the actuator and the valve are  
24 operating in, you have a pretty good feel as to how  
25 long it's going to last.

**NEAL R. GROSS**

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

1 Known parameters that affect margin are  
2 tracked and trended, and they're factored into the  
3 interval decision. Next slide. So, being in the MOV  
4 community for as many years as I have, I know a lot of  
5 my peers among the industry, so I sent out feelers,  
6 and I was able to get some -- a gentleman that I know  
7 that he's the MOV Corporate Engineer for Duke, and he  
8 was glad to -- I was happy that he provided me  
9 information representing seven of his units, and how  
10 he handles the program, and they are JOG participants,  
11 his plants.

12 He has approximately 1,015 valves across  
13 his seven units. Currently, as of today about 700 MOVs  
14 are on a 10-year or a six RFO interval. And on average  
15 there's 120 MOVs are tested per year. Now, this is  
16 kind of an important concept. It's not a per valve  
17 thing. I mean, an MOV program is a living program  
18 which stretches across everywhere, so he's looking at  
19 not just one, but he's looking at the whole stretch  
20 across Duke Energy.

21 Basically, he trends, has found test  
22 results that rarely have rendered an MOV inoperable.  
23 He said they've had less than one per year. Each test  
24 is evaluated and trended. Each MOV test interval is  
25 based on component margin, risk trending, performance

**NEAL R. GROSS**

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

1 review, and they also look at work quarter history  
2 review. Not only are they looking at the diagnostic  
3 testing, they're looking at the exercising. They're  
4 also looking at the stem grease and lube, and there's  
5 also actuator PMs that are also factored into there  
6 where they look at the actuators. And, in fact, that  
7 all comes back to the MOV engineer who basically sets  
8 -- it plays into his evaluation as to what interval is  
9 the proper interval for the MOV.

10 Preventive maintenance and preventive  
11 maintenance intervals, prevent and address potential  
12 degradation, and the testing, the diagnostic testing  
13 validates that adequately. Potential degradation and  
14 available thrust torque is assessed, and the static  
15 testing, NF static diagnostic testing. And measured  
16 against the JOG requirements. JOG is very explicit in  
17 how you attain your intervals, and how you gather the  
18 data, and how you get a qualifying basis should you  
19 lose your original design basis.

20 As general information, what this  
21 gentleman did at his seven units was in 2003 after  
22 they had been implemented 89.10, and they were in the  
23 process of doing the JOG program, in 2003 they did an  
24 extensive analysis of 500 as-found static test data to  
25 try and identify degradation and support longer test

**NEAL R. GROSS**

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

1 intervals. So, this was all the data that was gathered  
2 to support going out from the initial five years that  
3 was granted per the 89.10.

4 No adverse trends were identified;  
5 however, he did say that there was some considerable  
6 data scatter beyond what could be explained by  
7 measurement error and torque switch repeatability, so  
8 because of that minor -- that data scatter they've  
9 added a 10 percent degradation value and incorporated  
10 it into the design calculation when they're setting up  
11 the valves.

12 The interval between the as-left test, the  
13 as-found test from all the 500 they looked at ranged  
14 from MOVs were on anywhere on 12-month interval up to  
15 100-month intervals.

16 MEMBER BLEY: Just tell me, if you had a  
17 program like this and you started from today aimed at  
18 a 10-year program we'd be seeing a 10 -- essentially,  
19 a tenth of the valves being tested every year, so over  
20 that 10 years we would begin to see if something is  
21 starting occur that you can --

22 MR. FARNAN: Well, if you're starting from  
23 ground zero, you're gathering data every I think but  
24 two weeks during outages. I think every four years you  
25 have to gather data, and on each valve, so you're

**NEAL R. GROSS**

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

1 gathering data to build that case to where you can  
2 extend it out.

3 MR. McMURTRAY: And that's one of the key  
4 points we were trying to make here to the Committee,  
5 is we do think that there's a body of data over more  
6 than a decade that's been out there, really since  
7 89.10 was put in place, and certainly after 96.05 and  
8 the JOG program. And that's why we think that what's  
9 in OMN-1 is not different or substantially different  
10 from what the JOG program and other testing that has  
11 been going on in the industry based on deterministic  
12 criteria has been for years. And what's new sort of in  
13 this that wasn't in JOG before is using some of the  
14 risk information to further refine what you do with  
15 your testing program.

16 MEMBER SKILLMAN: Mike, I'd like to ask you  
17 an opinion question. This is one utility, these are  
18 all Ps, all pressurized water reactors, and this is a  
19 utility that's been very keen on 89.10. If you were to  
20 go over to other utilities that own a number of units,  
21 would you expect the data to be approximately the  
22 same?

23 MR. FARNAN: I would say yes, based on the  
24 fact that I've been doing -- I had the MOV program  
25 from '96 until I retired in 2008, so I've been

**NEAL R. GROSS**

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

1 attending the annual motor-operated valve users group  
2 conference that they have every year. And it's a -- I  
3 take a look and see how many people show up, and it's  
4 a very high industry output. It's on the order of 85-  
5 90 percent participation that show up at this, so a  
6 lot of the peers, MOV engineers out there. They are  
7 all living this living program, and are gathering all  
8 this type of data. And they're constantly feeding back  
9 every year at this annual meeting as to what potential  
10 problems are coming up, or what are we seeing? Let's  
11 head it off at the pass. And I would say yes, from my  
12 point of view, yes.

13 MEMBER SKILLMAN: Thank you, Tom. Excuse  
14 me. Mike, thank you.

15 MEMBER SCHULTZ: Mike, in that third bullet  
16 there is that experience typical of what you might  
17 expect based on your experience, the scatter that was  
18 seen in the data set? And then the application of 10  
19 percent, do you think that was an appropriate way to  
20 handle it?

21 MR. FARNAN: Yes. It's appropriate. I mean,  
22 you've got to remember you've got -- you think of a  
23 valve and an actuator, but they're put in all sorts of  
24 different configurations. I mean, they may be next to  
25 a system that has a lot of machinery around it and

**NEAL R. GROSS**

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

1 it's causing vibration, and it may cause problems. Or  
2 it may be in a real quiet area that it just sits there  
3 and it works perfect every time you look at it. So,  
4 beyond -- my guess when he's saying data scattering he  
5 adds 10 percent, and I know this gentleman very well,  
6 that he's probably saw the scatter was about 5 percent  
7 so he probably doubled it. He's very conservative. But  
8 yes, I would say that's a pretty good and accurate  
9 reflection of what you find in the field.

10 MEMBER SCHULTZ: Thank you.

11 MR. FARNAN: And the last feedback that  
12 I've got from the operator is just I want to give you  
13 an idea of what parameters that they were looking at  
14 when they did all this evaluation. And he looked at  
15 the effects of sensor combinations. There's all sorts  
16 of types of sensors out there that measure torque and  
17 thrust, and they look to see is there any discrepancy  
18 of the sensors that are being used. They also looked  
19 at multiple strokes and multiple tests. He looked at  
20 torque switch setting versus thrust measured. He  
21 looked at stem speed versus thrust measure. He looked  
22 at valve and actuator manufacturer, looked at Gates  
23 versus Globes. He looked at actuator spring  
24 compensation, actuator size, thread pressure, stem  
25 configuration, stem lubrication, the type of

**NEAL R. GROSS**

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

1 lubrication that they use, ambient room temperature.  
2 They looked at different systems and time between  
3 tests, whether that made an issue. And, also, he  
4 looked at stem nut replacement as to how often the  
5 stem nuts can be -- typically, a stem with a stem nut  
6 it's a matched set. When you replace it sometimes you  
7 have to send it back to the machinist to take off  
8 another thousandth to get that stem nut on there  
9 correctly.

10 So, this is what all went into the data.  
11 I'm not saying that this is what everyone looks at  
12 because this is pretty extensive, but I would say  
13 probably 80 percent are probably look at all that. And  
14 like I said, this information is shared on an annual  
15 basis, and there's several -- it's a two and a half  
16 day event, and several people come up with their  
17 successes and their failures, and show where they --  
18 to help everybody learn and go forward.

19 MEMBER SIEBER: Is there -- does anybody  
20 keep track of the difference between the actuator's  
21 thrust, in other words the horsepower, motor, and the  
22 actuator and the amount of thrust that a given valve  
23 needs, given valve type needs under certain  
24 differential pressure conditions? That was one of the  
25 early failures, because it would test a valve with no

**NEAL R. GROSS**

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

1 pressure on it, and it would look great, and as soon  
2 as they pressurized the system the actuator would  
3 trip. So, that's where all that came from.

4 MR. FARNAN: A lot of that answer was done  
5 in the 96-05, the JOG testing, industry test data. A  
6 lot of that was validated.

7 MR. SCARBROUGH: Right. And one of the  
8 things they -- with the new ASME QME-1 standard in  
9 terms of qualifying valves, you actually have to  
10 inspect the internals and have the qualification that  
11 deals with that issue of what happens when you  
12 pressurize it, and the amount of tilt and such, and  
13 clearances and stuff. So, that's part of ASME  
14 qualification, and that's done now when you qualify  
15 new valves.

16 MEMBER SIEBER: Well, in the early 1980s a  
17 number of plants had to go buy all new actuators  
18 because they didn't have enough torque to operate the  
19 valve when it was in the operating condition.

20 MEMBER BLEY: Tom, this goes back to what  
21 you were saying earlier. Some of this is why we ended  
22 up with those torque settings cranked up high enough  
23 that we worry about that now.

24 MR. SCARBROUGH: That's right, because they  
25 found that the friction coefficient really wasn't .3

**NEAL R. GROSS**

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

1 like everyone thought. It's .5, .6 is more typical for  
2 stellite once you get it up and get it worn in. So, it  
3 was a design issue that took a long time to resolve.

4 MEMBER SIEBER: It's the initial friction  
5 when the valve is closed that really makes the  
6 difference whether it's going to operate or not.

7 MR. SCARBROUGH: Right.

8 MEMBER SIEBER: Once it moves, you're sort  
9 of --

10 MR. SCARBROUGH: Yes.

11 MEMBER STETKAR: Tom or Mike, one or the  
12 other, one of the questions I had, and you've  
13 addressed it, is the notion of constant failure rate  
14 as a function of time, is that justified. The other  
15 issue that we discussed is can extended test intervals  
16 introduce other failure modes that you might not  
17 observe, or actually introduce a failure mode that  
18 more frequent testing will prevent? I guess I'm not  
19 guessing -- the last slide there you had the long list  
20 of things that people have looked at, which I can  
21 think of in the context of failure modes, if you will.  
22 Have there been surprises? The code case is set up,  
23 and it says hey, gee, you know, if you do discover a  
24 new failure mode, put it into your program. And that's  
25 kind of like, you know, when the plane crashes into

**NEAL R. GROSS**

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

1 the ground you ought to go back and figure out how to  
2 rework the control surfaces, that it isn't necessarily  
3 the way to do things.

4 Have there been surprises? I mean, there's  
5 obviously been a lot of testing. Are we fairly  
6 confident that we have a set of failure modes, or  
7 failure causes, if I can call them that, that we're  
8 examining now that we don't feel that we're going to  
9 find surprises?

10 MR. SCARBROUGH: Yes. Starting back when I  
11 started in this program like 1989, it seemed like  
12 every time we would go to the MOV user group meeting  
13 there was a new failure that we had not known about.  
14 I mean, there was rotors, there was stem friction  
15 coefficient, you know, there was rate of loading  
16 effects. I mean, it seemed like every time we went  
17 back there was a new issue, and plants end up having  
18 to replace valves sometimes and actuators multiple  
19 times. And then they have to pull more cable because  
20 the larger motor can't handle -- you know, was pulling  
21 voltage way down. So, over time, over those 10 years  
22 or so it seemed like constantly we were doing that.

23 Now, recently -- and Mike has been  
24 monitoring the meetings now, it seems that there's  
25 fewer of those things happening. We still have some

**NEAL R. GROSS**

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

1 issues pop up like we had at Susquehanna, we had some  
2 stem nut issues and we had to deal with that. Okay,  
3 what's causing that problem? Where did that come from?  
4 So, there was -- they looked at a lot of issues in  
5 terms of reviewing the lubricant they were using. It  
6 turned out to be a very abrasive type of lubricant  
7 they were using on the valve stem, so we still have  
8 some pop up that we have to monitor. And that's why  
9 this MOV group is such a great forum, but we don't see  
10 it like we did before. So, I think we're sort of  
11 plateauing in terms of finding the issues that we  
12 have.

13 MEMBER SIEBER: I have a comment on that.  
14 There is a bathtub effect; whereas, when you first  
15 build something and install it, you get a pretty high  
16 failure rate until you learn how to maintain it and  
17 operate it. And at the end of the trail it goes back  
18 up, so be prepared for that.

19 MR. SCARBROUGH: Yes. And I think that's  
20 what Susquehanna found with their stem nuts, because  
21 they had multiple stem nuts all of a sudden starting  
22 to be very degraded at one time. They worked great for  
23 several years and all of a sudden they had an issue,  
24 so the same sort of thing. I think they reached that  
25 so they had to go back and rethink the right type of

**NEAL R. GROSS**

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

1 lubricant --

2 MEMBER SIEBER: I think license renewal,  
3 now you're pushing the envelope.

4 MR. SCARBROUGH: Right.

5 MEMBER SIEBER: Springs do have a certain  
6 fragility associated with it, including check valves.  
7 You remember the Veelon check valve issue where the  
8 disk would come off?

9 MR. SCARBROUGH: Right.

10 MEMBER SIEBER: Yes.

11 MR. SCARBROUGH: Yes, so there's issues --  
12 exactly. And we -- and that's why there's this long-  
13 term program, Generic Letter 96-05, and it's being  
14 folded into the longer term programs, and the JOG  
15 program to monitor that over time. But 96-05 is an  
16 ongoing program that will basically last forever, I  
17 mean, until they fold it into their IST program. So,  
18 they're aware that they have to continue monitoring  
19 for different types of degradation.

20 MEMBER SIEBER: Right.

21 MR. FARNAN: The only issue I've seen  
22 through the years that creeps into this whole thing is  
23 not the valve and the actuator itself, but the  
24 turnover of the MOV engineer. You know, you're getting  
25 a lot --

**NEAL R. GROSS**

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

1 (Simultaneous speech.)

2 MR. FARNAN: A lot of young engineers that  
3 come in and they don't know all the thousands of  
4 things that we found in the last 25 years, but that's  
5 where this user's group comes in because it's a  
6 constant learning, we're teaching the young engineers  
7 to say hey, this is the issues. And they have a  
8 technical tag, they have the advisory group there  
9 where they talk about the old issues, and they're  
10 teaching the young engineers that are coming in.  
11 That's the biggest problem I've seen through the  
12 years.

13 MEMBER STETKAR: You talk a lot about MOVs  
14 and, obviously, there are a lot of MOVs in this world.  
15 The code cases also cover pneumatic, hydraulic,  
16 solenoid operated valves, other types of valves. Do we  
17 have the same experience, and knowledge, and let me  
18 call it confidence level about the performance of  
19 those because --

20 MR. SCARBROUGH: There is an AOV user's  
21 group that's taking lessons learned from that. And we  
22 wrote a RIS, Rectory Information Summary, which talked  
23 about transferring that knowledge over to the air  
24 operated valve programs, and other power operated  
25 valves. And I know --

**NEAL R. GROSS**

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

1 MEMBER BLEY: Is that new, or is that --

2 MR. SCARBROUGH: No, it was like 2000  
3 something. It was a RIS --

4 MR. McMURTRAY: It's been a while. Mike has  
5 been involved with that group now for the last couple  
6 of years, and even before that we've had that out  
7 there. And, of course, there's been these subgroups  
8 within ASME OM for years. There's a specific subgroup  
9 for AOVs, a specific subgroup for MOVs, a specific  
10 subgroup for relief valves, and we have  
11 representatives on each of those subgroups.

12 MEMBER STETKAR: The reason I was asking,  
13 you know, in terms of the knowledge base, obviously,  
14 there's been a lot of accumulated knowledge and  
15 experience on testing and failures, and whatnot of  
16 motor operated valves, and I was sort of probing to  
17 find out whether that same knowledge base exists for  
18 the other types of valves, such that you can have the  
19 same confidence when we're talking both in terms of  
20 surprise failure modes, if you want to call it that,  
21 and confidence that the failure rates remain  
22 relatively flat in terms of thinking about extending  
23 the testing intervals on those types of valves also.

24 MR. SCARBROUGH: One of the things that we  
25 did in an Information Notice 96-48, was we talked

**NEAL R. GROSS**

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

1 about lessons learned from loader operated valves in  
2 terms of the valve thrust requirements. It doesn't  
3 matter what type actuator you have on it, and we  
4 transferred that knowledge over to the other power  
5 operated valves, and over time the vendors have  
6 developed very much improved diagnostics for air  
7 operated valves to look in -- and a lot of them now  
8 use stem thrust and stem torque measurements to  
9 improve the diagnostics. So, there's been a lot of  
10 knowledge transfer, and some of the older MOV  
11 engineers that Mike was talking about, they  
12 transferred over to air operated valves in some of the  
13 major utilities because of the transfer of that  
14 knowledge over. I see some of our old colleagues there  
15 and they are now doing AOVs, so there is that transfer  
16 of knowledge over. And there is that OMN-12 code case  
17 which talks about AOVs, and adjusting that. And  
18 licensees are just starting to get there, so I think  
19 we're going to be in sort of a monitoring mode for a  
20 while with how that all fits together. But the good  
21 thing is that they work closely together. The MOV and  
22 the AOV user's group meets the same week and people  
23 stay like a whole week and go to both, so there's a  
24 lot of transfer of knowledge between the two groups.

25 MR. McMURTRAY: But another point in

**NEAL R. GROSS**

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

1 response to your question, we do think, though, that  
2 our feedback mechanisms both in the maintenance rule  
3 and the corrective action programs and other things  
4 like that, and we're not really seeing this large  
5 increase even though we've allowed for at least a  
6 decade with a lot -- with not only MOVs, but other  
7 valves, these increases in frequency. So, we would  
8 expect that we would see something going on there  
9 within either the maintenance rule, what's going on  
10 within maintenance rule, what would be going on in our  
11 corrective action program reviews, with our  
12 engineering inspections out there looking at this and  
13 looking at systems, seeing something up there. And as  
14 a former inspector, I would be all over that then,  
15 what's going on with your program if there's something  
16 out there with this. And we're not getting that kind  
17 of data, so I think that gives at least our group here  
18 confidence that we think that we're not at a cliff  
19 edge or whatever for these -- now, we don't disagree  
20 with you that we can introduce other failure  
21 mechanisms if you would extend out too far.

22 In fact, we think that there was -- Mike  
23 just got back from a special inspection on this where  
24 on MSIV closures for Harris they hadn't done anything  
25 with those valves for 26 years. Well, 26 years seems

**NEAL R. GROSS**

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

1 like a little -- long time for you to go without going  
2 into a valve, so that probably is too far out there.

3 We think with what the code has allowed,  
4 we think that there's sufficient data, like I say,  
5 with maintenance rule, with the other mechanisms that  
6 the licensees are required to do under Appendix B,  
7 that we have confidence that we think that those  
8 frequencies are okay.

9 MEMBER SHACK: Well, thank you very much.  
10 That was very helpful. Does the Committee have any  
11 further questions?

12 MEMBER RAY: Well, I guess I'm pondering  
13 just the reference to Harris, how that aligns with the  
14 requirements we're talking about here.

15 MR. McMURTRAY: Well, the code doesn't have  
16 any requirements as far as taking -- it was passing  
17 the testing. We don't disagree with that, and I think  
18 we're going to be looking at that. It was they were  
19 doing MSIV closure testing -- actually, I guess it was  
20 tech spec required testing. Is that correct? So, the  
21 question would be then, too, about the adequacy of the  
22 tech specs, but they were doing closure time testing  
23 per the tech specs at every outage interval, but what  
24 happened then is at the last outage, two of the three  
25 valves failed to close within the required time

**NEAL R. GROSS**

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

1 periods. And as they went in and opened them back up  
2 they found corrosion and degradation within the seats  
3 on those valves.

4 MEMBER RAY: They had passed the previous--

5 MR. McMURTRAY: They had passed --

6 MEMBER BLEY: They had evidence of jerky  
7 motion on the previous --

8 MR. McMURTRAY: That is true. And, in fact,  
9 the team is looking at that.

10 MEMBER STETKAR: But they passed the test.

11 DR. NOURBAKSH: Well, it's supposed to be  
12 smooth operation. I don't know how you alls read, but  
13 I know in the past they were supposed to be -- not  
14 choo, choo, choo, choo --

15 MR. McMURTRAY: And you're right. I mean,  
16 special inspection team is looking at should they pick  
17 this up, is that a performance deficiency? But the  
18 code from a testing standpoint, that really I think is  
19 more looking at how long can you go between  
20 maintenance, and going in and opening components up to  
21 look for these kind of degradations that you think  
22 should be out there.

23 MEMBER BLEY: But I think the thing Charlie  
24 just mentioned is really important to have a test and  
25 not take any action when you see something clearly not

**NEAL R. GROSS**

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

1 right.

2 MR. SCARBROUGH: And OMN-1 does say for  
3 MOVs any abnormal behavior has to be evaluated. I  
4 mean, not just watching a number.

5 DR. NOURBAKSHSH: Well, that was abnormal  
6 behavior and, apparently, it wasn't picked up on. That  
7 was pretty abnormal. I thought the other thing I  
8 remembered from reading, it's been like 26 years  
9 before -- in between doing anything.

10 MR. McMURTRAY: It was 26 years between  
11 when they had -- basically, they had never opened the  
12 valve up inside the valve itself.

13 MR. FARNAN: Just the valve.

14 MR. McMURTRAY: The valve, not the  
15 actuator. The actuators had --

16 MR. FARNAN: They had the actuator out  
17 period PM, and they had the air system out on periodic  
18 preventive maintenance. They just never went into the  
19 valve because they were passing their three to five  
20 second closure time every year. And, plus, it was  
21 seated leak-tight, so I mean, I have to admit taking  
22 the valves apart -- I looked at the seats and the  
23 valve was in really good condition for 26 years never  
24 going into it. It stuck on the ring.

25 MEMBER SKILLMAN: Would that cause you to

**NEAL R. GROSS**

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

1 look at the crossover intercept valves, CIVs?

2 MR. FARNAN: Caused us to look at just  
3 about everything, so -- anything that has rings, you  
4 know, see what the -- we're still delving into that  
5 issue.

6 MR. McMURTRAY: Right, but we do think  
7 there were some indications that maybe they should  
8 have been picking up through the testing. But this was  
9 actually tech spec required testing that they were  
10 doing on the MSIVs.

11 MEMBER BLEY: Just curious, any idea when  
12 the inspection report ought to be out?

13 MR. McMURTRAY: Mike?

14 MR. FARNAN: I have heard yet.

15 MR. McMURTRAY: He's actually sent his  
16 input in. I don't know when they --

17 MR. FARNAN: I sent my input in.

18 MR. McMURTRAY: Yes, so it should be I  
19 would imagine within the next month or so.

20 MEMBER SCHULTZ: Was there anything in the  
21 corrective action program associated with those  
22 valves?

23 MR. FARNAN: Through the years they had a  
24 -- they didn't meet their times on one of the valves  
25 in 2009, so that was in their corrective action

**NEAL R. GROSS**

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

1 program.

2 MEMBER STETKAR: But that was a solenoid or  
3 something. I think --

4 MR. FARNAN: Yes, that was part of the air  
5 system. Right.

6 MEMBER STETKAR: And usual suspects.

7 MR. FARNAN: Yes. I have one comment for  
8 you, John. At Ginna, the PRA guy always fed back the  
9 new numbers to me, and I fed that into the program on  
10 a periodic basis.

11 MEMBER STETKAR: That's the way it ought  
12 to work, but -- good.

13 MEMBER SHACK: Well, thank you very much.  
14 Turn it back to you, Mr. Chairman.

15 CHAIRMAN ARMIJO: Okay, very good. Thanks  
16 for the good presentations. We'll take a recess until  
17 2:30, and reconvene for Grand Gulf.

18 (Whereupon, the proceedings went off the  
19 record at 2:10:31 p.m., and went back on the record at  
20 2:30:05 p.m.)

21 CHAIRMAN ARMIJO: Okay, we're back in  
22 session. The next topic is the Grand Gulf Nuclear  
23 Station Unit 1 Extended Power Uprate. Dr. Joy Rempe  
24 will lead us through this briefing.

25 MEMBER REMPE: Thank you, Mr. Chairman. Our

**NEAL R. GROSS**

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

1 Subcommittee on power uprates reviewed this  
2 application on May 24<sup>th</sup> this year, and our  
3 Subcommittee members had the opportunity to review the  
4 Staff's SER, the licensee's power uprate safety  
5 analysis report, staff requests for additional  
6 information, and the specific topics that was  
7 presented at our meeting.

8 I think at the conclusion of our meeting  
9 that the consensus of the Subcommittee members was  
10 that the application was ready to be forwarded to the  
11 Full Committee, so we're here today.

12 Many of the topics that we reviewed during  
13 our Subcommittee meeting were similar to matters we  
14 reviewed in past EPU applications. There were two of  
15 the license conditions that were of special interest  
16 to our Subcommittee. The license condition for  
17 monitoring during power ascension testing, and the  
18 licensing condition that will be applied to perform  
19 periodic surveillance on absorbing material in the  
20 spent fuel pool.

21 We've asked that the Staff give us a  
22 briefing on those items today along with some other  
23 topics of interest. I do need to mention to you and  
24 the other members that some of these presentations do  
25 contain proprietary information, so part of this

**NEAL R. GROSS**

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

1 session will be closed. And I'm going to ask the staff  
2 as well as Entergy to tell us when they're going into  
3 closed session because we'll have to do some things  
4 with the room and the phone lines. So, at this point  
5 I'd like to turn over the meeting to the staff, and I  
6 believe that Ms. Louise Lund will start the  
7 presentations.

8 MS. LUND: Thank you very much and good  
9 afternoon. I'm Louise Lund, the Deputy Division  
10 Director in the Division of Operator Reactor  
11 Licensing, and I have responsibility for the plants in  
12 Region I and Region IV. And today we are here to  
13 summarize the staff's review of the Grand Gulf  
14 extended power uprate application.

15 And as evidenced by our Subcommittee  
16 presentation, the staff did a comprehensive review  
17 lasting around 18 months for this application. And  
18 there's a couple of things that the PM wanted me to  
19 point out, is that the licensee requested the EPU  
20 following the guidance of the NRR Review Standard RS-  
21 001 Review Standard for the extended power uprates,  
22 and also implemented a methodology that was approved  
23 by the staff in licensing topical report about  
24 constant pressure power uprate.

25 And, also, this is the first plant-

1 specific application of this plant-based load  
2 evaluation called the PBLE methodology for the steam  
3 dryer review. So, there's -- I'm not going to belabor  
4 this. I'm going to go ahead and turn it over for the  
5 licensee to make their presentation. And I'm  
6 introducing Mike Perito, who is the Site VP who's  
7 going to make this presentation of the licensee.

8 MR. PERITO: Good afternoon. I'm Mike  
9 Perito, the Site Vice President at Grand Gulf, and on  
10 behalf of all of us here today, the staff at Grand  
11 Gulf and Entergy, I want to thank the Committee for  
12 allowing us to discuss the Grand Gulf extended power  
13 uprate in support of your review of the license  
14 amendment request.

15 Grand Gulf is a BWR6 with a Mark III  
16 containment design, operational history as shown here  
17 on this slide. Let me just say the extended power  
18 uprate mods that we're doing, implementing now during  
19 our refueling outage number 18 are significant for a  
20 couple of reasons. Firstly, this uprate has been  
21 identified as least cost source of electricity for our  
22 customers in Mississippi. And will provide additional  
23 safe, affordable electricity and capacity for the  
24 region in a challenging economic time.

25 This uprate is also significant investment

**NEAL R. GROSS**

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

1 in the Grand Gulf people and plant, many modifications  
2 including some major component replacements highlight  
3 our commitment to long-term safe and reliable  
4 operation of Grand Gulf.

5 Now, we've had the benefit of an extended  
6 power uprate organization staffed with literally  
7 hundreds of person years of Grand Gulf-specific  
8 experience involved in the planning, design,  
9 procurement, construction of this project. Throughout  
10 this process, the site organization has also been  
11 fully integrated with the extended power uprate  
12 organization, and is fully prepared to operate and  
13 maintain an upgraded Grand Gulf.

14 And speaking of operation, just a quick  
15 unit update status. We expect to transition to mode 2  
16 this evening, which will begin our startup sequence  
17 and close out refueling outage 18. And we look forward  
18 to returning to power operations here very shortly.

19 So, with that I'd like to turn it over to  
20 Mike Krupa, the EPU Project Director.

21 MR. KRUPA: Yes, I'm Mike Krupa, the  
22 Director of the EPU project for the implementation,  
23 and I'd like to thank you, too, for the short cycle  
24 since we were just here two weeks ago to present to  
25 the Subcommittee.

**NEAL R. GROSS**

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

1           As Mike mentioned, we just are finishing  
2           our implementation outage for this power uprate, and  
3           I'll go over with you primarily the overview of the  
4           systems and the mods that we performed at the plant.

5           As Louise said, it's a constant pressure  
6           power uprate and the parameters you see on the screen  
7           show that it's a -- the pressures, the temperatures,  
8           and the core flows are equivalent to pre-EPU  
9           conditions. We're adding 510 megawatts thermal, and  
10          the steam flow and feed flow obviously increase for  
11          the 15 percent over the original license, that's 13  
12          percent over the current license conditions.

13          So, again, I'm going to just take a few  
14          minutes and cover the major modifications we performed  
15          for this uprate. The uprate consisted of over 30  
16          discrete mods that were performed to Grand Gulf to  
17          accommodate the uprate. We spent over 2 million direct  
18          craft hours to implement these, and this is the outage  
19          we're just coming out of.

20          So, I'll start, about a third, a little  
21          more than a third of these mods were specifically to  
22          address enhanced margins, cooling water and flows for  
23          systems important to safety. And I'll kind of hit  
24          those first with the start with our ultimate heat  
25          sink. Our ultimate heat sink at the Grand Gulf

**NEAL R. GROSS**

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

1 Station, the source of water and pumps for an  
2 emergency or for just normal shutdown cooling are two  
3 independent cooling water bases with mechanical draft  
4 towers that supply about 6.7 million gallons per basin  
5 of water, and we've upgraded the cooling fill in these  
6 basins to supply a 15 percent improvement in heat  
7 exchange capability, and we've provided for a transfer  
8 between basins of an extended amount of water to allow  
9 for the 30-day run with no makeup in the event of an  
10 accident. So, a major improvement in the alternate  
11 heat sink capability.

12 The PRNMS system is a power range neutron  
13 monitoring. It's an upgrade, a digital neutron  
14 monitoring system over the analog system that we've  
15 had in the plant. It provides for the digital accuracy  
16 and reliability in addition to some auto functions  
17 that -- for scram for stability, and it also allowed  
18 us to use the stability solution that our analog  
19 system would not allow to provide.

20 For the SLCS system, we've enriched the --  
21 - even though the system as it was designed would meet  
22 the 660 parts per million boron concentration required  
23 even for EPU conditions, we have introduced an  
24 enriched boron which increase the concentration of  
25 boron 10 in the system, and it added -- it now has 780

**NEAL R. GROSS**

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

1 parts per million concentration capability. And, of  
2 course, that's a real enhancement for ATWS analysis  
3 conditions to have that.

4 Spent fuel pool cooling, due to the higher  
5 heat loads it will have with the new core, with an EPU  
6 core, we've added capacity to the fuel pool cooling  
7 system. We've upgraded the existing heat exchangers  
8 with new -- two new heat exchangers that add about 30  
9 percent capacity to the fuel pool.

10 Steam dryer, early on in the project we  
11 looked at modifying the existing steam dryer based on  
12 industry issues that had -- and meeting the 2.0, we  
13 opted for a total replacement of the steam dryer. And  
14 as Joy said, we used the methodology that GE has  
15 developed for the plant load based methodology. So, we  
16 have a new dryer with -- it's about 40 percent heavier  
17 in height, and improved designs from connections point  
18 to move stresses out of the T-joints and the other  
19 areas of high stress to lower the stress. And we have  
20 a whole -- we have a separate agenda item on the  
21 dryer.

22 Main transformers on the power generation  
23 side, we've replaced the main transformers on the  
24 unit, there's four units. We've added a new radial  
25 well system. Radial well system is how the plant gets

**NEAL R. GROSS**

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

1 its normal service water, so we've added two pumps in  
2 a new well that will give us another additional 10,000  
3 GPM of water to the power plant. We've expanded our  
4 aux cooling tower. We have an auxiliary cooling tower  
5 that supports a natural draft tower, and we've added  
6 eight additional fans to that tower for additional  
7 capacity.

8 We've replaced the high pressure turbine  
9 to accept the new steam flows that we're providing. We  
10 have completely replaced the generator. We refurbished  
11 a generator stater and rewound a rotor that we had  
12 from our Unit 2 that was never commissioned. And we've  
13 replaced that during this outage.

14 We've upgraded that generator with a  
15 higher capacity hydrogen cooler. We've increased the  
16 seal oil system so that we can run the generator at 75  
17 pounds of hydrogen now instead of 60. The condenser  
18 had some minor modifications. There are some tubes  
19 that required staking for the new -- in just one of  
20 the three condensers on the unit for vibration. We've  
21 replaced the reactor feedpump turbines with upgraded  
22 steam side turbines. And we've installed a full flow  
23 filtration system on the unit so that all flow to the  
24 reactor now has a particulate flow. It always had a  
25 demin system that -- for full flow, but did not have

**NEAL R. GROSS**

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

1 an iron removal system, so it's a really good  
2 enhancement for the plant.

3 And then, of course, the feedwater  
4 heaters. We replaced nine feedwater heaters, the low  
5 pressure heaters in the unit, and both moisture  
6 separator reheaters, so quite an extensive package of  
7 modifications that we just completed.

8 I think unless you have any questions, I  
9 just want to provide that level of update and overview  
10 to the Committee. From here, it's a matter of a  
11 control power extension, even during this startup  
12 we'll start at 50 percent power, tuning the feedwater  
13 system and the new feed pumps to assure we have an  
14 integrated control logic before we come up and start  
15 our power ascension testing for this new uprate.

16 With that, if there's no questions, I'll  
17 turn it over to Greg for safety analysis.

18 MR. BROADBENT: I'm Greg Broadbent. I'm the  
19 EPU Safety Analysis Supervisor, and just going through  
20 some of the analyses that were done for EPU.

21 We performed all these analyses as  
22 specified in the EPU licensing topical report. All  
23 these calculations used NRC-approved methodologies,  
24 and I've just listed some of them here. For example,  
25 for the reload analyses we had a equilibrium EPU core,

**NEAL R. GROSS**

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

1 24-month fuel cycles, and we ran the reload analyses  
2 based on that core design. For Appendix K LOCA, for  
3 example, the PCT was less than 1,690 degrees compared  
4 to 2,200 acceptance limit. The standby liquid control  
5 shutdown margin with the old system that we had, as  
6 Mike has pointed out, it was designed for a 660 PPM  
7 reactor vessel concentration. That didn't give us the  
8 margin that we wanted to see in shutdown margin. The  
9 requirement was 1 percent, and that analysis with that  
10 EPU core was like 1.005 percent or very close to the  
11 acceptance limit. So, we opted to go with the enriched  
12 boron for standby liquid control.

13 We ran all the containment performance  
14 analyses, the main steam line break, we saw some  
15 pressurization in the wet well which is an area in the  
16 containment that's below the HCU floor. I think the  
17 staff has some discussion about that in their  
18 presentation. That set our Appendix J containment test  
19 pressure.

20 Some of the special events, station  
21 blackout were 8-hour AC independent -- I'm sorry, 4-  
22 hour coping AC independent plant. For ATWS, the ATWS  
23 required a couple of tech spec changes. We currently  
24 require only 13 safety relief valves to be operable  
25 per our tech specs. We added two new safety relief

**NEAL R. GROSS**

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

1 valves to our tech specs, so now we're required to  
2 have 15 operable. The plant has 20 installed. Also,  
3 the SLC pump relief valve set point, which is in our  
4 tech specs was increased a little bit for the ATWS  
5 analysis.

6 In terms of radiological events, we met  
7 all the 50.63 acceptance criteria. We're an  
8 alternative source term plant. And in terms of  
9 containment accident pressure, we don't take any  
10 credit for containment accident pressure in our ECCS  
11 net positive suction head calculations.

12 And that was all I had. If there are any  
13 questions --

14 MR. PERITO: Okay. Turn it over to staff.

15 MEMBER REMPE: So, be sure and watch the  
16 signs and the microphones because it hurts the ears of  
17 the reporter, please. Thank you.

18 MR. WANG: My name is Alan Wang. I'm the  
19 Project Manager for Grand Gulf, and I'm going to  
20 present an overview.

21 During the Subcommittee meeting the staff  
22 discussed the transient and accident analysis, long-  
23 term stability, spent fuel pool criticality, the  
24 implementation of the power range neutron monitoring  
25 system, mechanical impacts, the steam dryer, and the

**NEAL R. GROSS**

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

1 PBLE methodology.

2 Today we plan to discuss the three license  
3 conditions that were needed for us to approve the EPU.  
4 One license condition was on the leak rate test  
5 schedule. The other two were mentioned by Dr. Rempe,  
6 the spent fuel pool criticality, and the steam dryer.

7 The steam dryer license condition will be  
8 discussed in the closed session. So, if there's no  
9 questions on that, I'd like to have Ahsan go over the  
10 Appendix J leakage.

11 MR. SALLMAN: Yes, my name is Ahsan  
12 Sallman. I'm in the Containment and Ventilation Branch  
13 of NRR. And I want to talk to you about two topics in  
14 the containment area. They're tech spec surveillance  
15 requirements in dry well to wet well bypass leakage,  
16 and ILRT schedule. And the other one is the EP value  
17 of Appendix J containment test pressure.

18 This slide presents the schedules for the  
19 SRs on dry well bypass leakage in ILRT. The dry well  
20 to wet well bypass leakage is measured in terms of an  
21 effective leakage area, A over square root of K. In  
22 the previous test results, the major effective bypass  
23 leakage area was 0.19 square feet. The EPU requirement  
24 of this parameter is less than 2.8 square feet, which  
25 is changed from its current value of .9 square feet.

**NEAL R. GROSS**

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

1 So, there's a significant margin between the measured  
2 and the required values.

3 The licensee proposed that the current  
4 test schedule be maintained, instead of performing  
5 this test at the EPU implementation. The staff  
6 accepted the licensee's proposal.

7 The SR 3.6.1.1., the EPU value of the  
8 piece of A is changed to 14.8 psig from its current  
9 value of 11.5 psig. The licensee analytically  
10 predicted the leakage at 14.8 psig from its later  
11 value at 11.5 psig, which was measured during the  
12 previous ILRT. So, we see there's a substantial  
13 margin. We saw that as a substantial margin in the  
14 predicted value from its acceptance criteria;  
15 therefore, the licensee proposed to perform the  
16 surveillance requirement for ILRT at its current  
17 schedule instead of at EPU implementation. The staff  
18 accepted the proposal.

19 This slide presents the EPU value of the  
20 ILRT test pressure. As a result of EPU, the piece of  
21 A or the containment test pressure is changed. To  
22 analyze the pressurization effects, the portion of  
23 containment above and below the HCU floor was modeled  
24 separately. Among the cases analyzed under EPU  
25 condition, the short-term blowdown for the double

**NEAL R. GROSS**

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

1 ended MSLV between the reactor nozzle and the flow  
2 limiter gave the most limiting pressure in the  
3 containment during the first six seconds of the  
4 transient. Pressure in the vessel region that is below  
5 the HCU floor was higher than in the portion of the  
6 containment above the HCU floor. Since wet well is a  
7 part of the containment, therefore, to meet the  
8 Appendix J definition, the short-term peak pressure in  
9 the wet well for MSLV became the EPU value of piece of  
10 A. The peak pressure increased to 14.8 psig from its  
11 current value of 11.5 psig.

12 MEMBER SHACK: That's not a real increase,  
13 though, because the 11.5 was based on their proposed  
14 definition. Right?

15 MR. SALLMAN: 11.5 psig was -- yes, that is  
16 true.

17 MEMBER SHACK: So, that should really be  
18 compared with the 11.9. I mean, that's the --

19 MR. SALLMAN: 11.9, yes. But the definition  
20 in the Appendix J is different.

21 MEMBER SHACK: It's just not such a  
22 dramatic increase in pressurization of the containment  
23 as you see from 11 to 15.

24 MR. WANG: Any other questions on this?

25 MR. WOOD: Good afternoon. My name is Kent

**NEAL R. GROSS**

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

1 Wood. I'm the Reactor Systems Branch Division of  
2 Safety Systems. I do the spent fuel pool criticality  
3 reviews.

4 For extended power uprate we're making  
5 conclusion in the SE regarding compliance with the  
6 general science which are 62, which is prevention of  
7 inadvertent criticalities, the methodology that was  
8 used in the analysis, which is the constant pressure  
9 power uprate says another about GE62, so we inquired  
10 from licensees for some information. The current  
11 analysis of record that relies on Boraflex. Boraflex  
12 degrades. The licensee has divided their spent fuel  
13 pool into two regions, one that credits Boraflex, and  
14 one that does not. That analysis was not submitted. We  
15 asked for that as part of the review. WE got it, and  
16 that review is not going to be able to be completed in  
17 time to complete the power uprate review, so we  
18 implemented a license condition to hold this over  
19 until we get that review completed.

20 What we did is for Region I where they're  
21 continuing to credit Boraflex, we have a license  
22 condition that has a minimum aerial density. That's a  
23 minimum aerial density higher than what the licensee  
24 has proposed in their analysis. They provided some  
25 margin until we can get that review completed. They

**NEAL R. GROSS**

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

1 have their dose, and they've also implemented a lower  
2 standard cold core geometry k infinity than what they  
3 have now. The Region II, which does not have a  
4 Boraflex credit is -- relies on empty cells. It's four  
5 out of 16 -- I'm sorry, six out of the 16, and it's a  
6 four by four array. Six cells empty, and the  
7 licensee's current -- original submittal design  
8 includes the possibility of misloading accident, so  
9 we've implemented a license condition here. You'll see  
10 a lower standard of cold core geometry k infinity for  
11 those 10 fuel assemblies to allow for the potential of  
12 a misloading event. And we've also limited this to the  
13 end of their cycle 19, so we have a time limit on  
14 that. That review is on -- the review for spent fuel  
15 pool criticality analysis is ongoing, and we have RAIs  
16 to issue to the licensee. Do you have any questions?

17 MEMBER REMPE: Just to make sure that I  
18 understand the nuances here, slide 12 says it wasn't  
19 submitted, but then I heard you say, which is  
20 something later which is my understanding, they did  
21 submit --

22 MR. WOOD: After we asked for it.

23 MEMBER REMPE: Oh, okay. But they had  
24 submitted it --

25 MR. WOOD: We have it now.

**NEAL R. GROSS**

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

1 MEMBER REMPE: -- but just now within  
2 this --

3 (Simultaneous speech.)

4 MR. WOOD: They had implemented this a  
5 while back and they had not submitted it, so when we  
6 were reviewing their licensing basis for compliance  
7 with GE62 for the EPU, we had to ask for that  
8 information.

9 MEMBER REMPE: So, they -- I thought they  
10 tried to submit it with some sort of probabilistic  
11 argument saying that --

12 MR. WOOD: That was the misloading. That  
13 was part of the submittal after we asked for it.

14 MEMBER REMPE: After you asked for it.  
15 Okay, I just was trying to understand the cases here  
16 a little bit more.

17 MR. WOOD: That was the misloading. Why  
18 they didn't initially have a misloading in their --

19 MEMBER REMPE: Okay.

20 MEMBER SCHULTZ: Is there some time frame  
21 associated with the allowance of Boraflex credit in  
22 the region where it's going to be allowed?

23 MR. WOOD: Well, I mean, the Boraflex is  
24 degrading as we speak.

25 MEMBER SCHULTZ: I understand.

**NEAL R. GROSS**

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

1 MR. WOOD: It's a matter of dose and time,  
2 and temperatures that affect that. The limits here  
3 were based on the gamma dose, so it -- the higher  
4 doses will accelerate the degradation. And when they  
5 get to a certain point here with a minimal aerial  
6 density, then they have to take that out of crediting  
7 for that cell, actually two cells, because it would be  
8 one panel, the two cells share that one panel, and put  
9 it into a Region II configuration.

10 MEMBER SCHULTZ: Okay. So, there's a  
11 monitoring program in place --

12 MR. WOOD: Yes, sir.

13 MEMBER SCHULTZ: -- that transitions cells  
14 from one region to the other.

15 MR. WOOD: Yes, sir.

16 MEMBER SCHULTZ: Thank you.

17 MR. WANG: Are there any other questions?  
18 If not, the next two sessions would need to be closed.

19 MEMBER REMPE: Okay. So, I'll ask John and  
20 Theron to help us with that.

21 MR. WANG: We're going to do two  
22 presentations during the closed, one on thermal  
23 conductivity degradation, and the other on the steam  
24 dryer. But I think the licensee also has a  
25 presentation, so we'll probably let the licensee go

**NEAL R. GROSS**

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

1 first.

2 MEMBER REMPE: Okay.

3 (Whereupon, the proceedings went off the  
4 record at 2:58:35 p.m., to resume in Closed Session.  
5 The Open Session began at 4:25:48 p.m.)

6 CHAIRMAN ARMIJO: I've got something in my  
7 throat. Why don't you just --

8 MEMBER STETKAR: While our Chairman --  
9 point to your throat if you can't breathe.

10 CHAIRMAN ARMIJO: No, I can breathe but I  
11 can't talk.

12 MEMBER STETKAR: Okay. Yes, I'll turn this  
13 over to the esteemed Dr. Corradini who will lead the  
14 next section about the assessment of the quality of  
15 Research projects.

16 MEMBER CORRADINI: As we do every year  
17 we've identified two products that we want to review  
18 for quality, and we've had three -- we've had two  
19 illustrious teams of us volunteering to do this  
20 review. So, the first one is NUREG-1953, Joy, John,  
21 and Sanjoy on a TH analysis to support success  
22 criteria for risk models. And then Bill, Dana and  
23 Dennis on NUREG/CR-7040 for evaluation of equipment  
24 fragility tests for seismic PRAs.

25 So, at this point, the hope is the two

**NEAL R. GROSS**

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

1 groups of three have read the document so that they  
2 can start having meetings --

3 PARTICIPANT: We can hope.

4 CHAIRMAN ARMIJO: They should provide  
5 reports.

6 MEMBER CORRADINI: At this point, it's  
7 hopeful that the team has read the documents so they  
8 can schedule meetings with the staff if they want to  
9 get clarifications, or understand more about whatever  
10 was done. And then in July we would get the initial  
11 ratings from the teams, and the Chairmen, a/k/a Dr.  
12 Rempe and Dr. Shack can get the accumulated results  
13 and talk to us about them in July. And then either in  
14 September or October, depending upon how the writeup  
15 is going on the report of their quality review, we --  
16 the teams would present it to the Full Committee, and  
17 we go through an understanding of how they resolved  
18 their three different scores into one composite score.

19 And then by then Dana would be here, and  
20 he'll just turn back and get mad at everybody that  
21 we're too generous with all the ratings.

22 MEMBER BLEY: Part of one of them, right?

23 MEMBER CORRADINI: He still will get upset  
24 at the other team. That's kind of common practice. So,  
25 the point of today is (a) the teams know who they are.

**NEAL R. GROSS**

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

1 (B) The teams at least have the products so they can  
2 review them, and (c) that if they know who they are  
3 and they actually have what they're going to read,  
4 they at least have worked with the Chairman to have a  
5 side meeting so they can clarify any questions they  
6 have relative to the two products. NUREG-1953 or  
7 NUREG/CR-7040.

8 MEMBER STETKAR: Sixty-seven percent is not  
9 bad.

10 MEMBER CORRADINI: You know what your name  
11 is and you know what you're supposed to review. That's  
12 it.

13 CHAIRMAN ARMIJO: It's always the same with  
14 this thing.

15 MEMBER SIEBER: But two is not bad.

16 MEMBER CORRADINI: Right. So, I would  
17 encourage you, though, that if you want to have a side  
18 meeting, letting Hossein know so he can connect with  
19 the staff for tomorrow.

20 MEMBER SIEBER: Good luck.

21 MEMBER CORRADINI: Or Friday.

22 MEMBER REMPE: Actually, if you could do it  
23 this week, it would --

24 MEMBER STETKAR: Well, but, I mean, in  
25 principle we are given to review what is there. It is

**NEAL R. GROSS**

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

1 a printed report. If things are missing from that  
2 report --

3 MEMBER CORRADINI: You can ask for a  
4 meeting.

5 MEMBER STETKAR: Huh?

6 MEMBER CORRADINI: You could ask for a  
7 meeting if you'd like.

8 MEMBER STETKAR: Like equations missing  
9 from a report, why is it fair to ask for a meeting?  
10 This is a finished document.

11 MEMBER CORRADINI: You can deal with your  
12 Chair, who is an able person -- so, yes, you don't  
13 have to have a meeting, but if you want  
14 clarifications, we will schedule a meeting for you.

15 MEMBER BLEY: This was a point of  
16 disagreement in the past. Dana has responded to the  
17 Director of Research's desire that we pay attention to  
18 things that aren't in the reports, and some of us  
19 think what's in the report is what's in the report.  
20 And if this is a review of what's in the report, why  
21 should there be a briefing on it?

22 CHAIRMAN ARMIJO: Well, if you don't need  
23 a meeting --

24 MEMBER CORRADINI: Okay. I'm not going to  
25 say any more than this, because you all know who you

**NEAL R. GROSS**

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

1 are. And Bill and Joy will keep you in line.

2 MEMBER REMPE: Yes.

3 MEMBER CORRADINI: Or at least try. Okay?  
4 Anything else? John, Dennis? Sanjoy, of course, is  
5 gone again. Joy is at the head, Sanjoy is behind her,  
6 I'm way at the end. And I'm okay with that.

7 MEMBER REMPE: This issue about things  
8 missing. There are equations that are just not there  
9 in the PDF in the report. I mean, it's an issue. The  
10 staff has done this. Whoever selected this RIS to  
11 review didn't notice it, I guess.

12 MEMBER CORRADINI: Our job is not to review  
13 the product. The product has been put out, therefore  
14 the product ought to be complete in and of itself. I'm  
15 not going to review the --

16 MEMBER STETKAR: I view that as a  
17 documentation --

18 MEMBER REMPE: Definitely it lacks clarity  
19 when you've got some things missing --

20 (Simultaneous speech.)

21 MEMBER SHACK: The printed document is  
22 different than the PDF. Do we know that?

23 MEMBER REMPE: I would wonder if it's just  
24 a Bill Gates Adobe Acrobat issue, and if we could find  
25 that out and somebody could find a better PDF, that

**NEAL R. GROSS**

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

1 would --

2 (Simultaneous speech.)

3 MEMBER STETKAR: Joy, it would be fair to  
4 ask Hossein, I think, to see if he could get a printed  
5 copy if it has those equations on it.

6 MEMBER REMPE: Yes. I mean, sometimes the--

7 DR. NOURBAKHS: Received your print but  
8 I'll check that.

9 MEMBER CORRADINI: Okay. What else for --  
10 what other comments at this point?

11 MR. HACKETT: Mike, I was just going to add  
12 say the context to going back I think a year or two to  
13 a meeting with a Brian Sheron and Dana about this  
14 process, which is, as you all know, is always a  
15 dynamic thing anyway. Brian's emphasis was on you  
16 don't always -- you can't always glean from the  
17 printed word exactly what this means, for instance, to  
18 use the user need office. So, one of his pleas to Dana  
19 at the time is please enlighten us. Please consider if  
20 this is a report that's supposed to go to NRR, and  
21 consider the audience. Is NRR happy with it, and it  
22 may not have everything that an academic evaluation of  
23 the report would want, including basic equations and  
24 other things.

25 MEMBER STETKAR: If the report says the

**NEAL R. GROSS**

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

1 failure rate is derived from the following equation,  
2 and the equation looks like this, this is being for  
3 the record a blank piece of paper.

4 PARTICIPANT: The user might not have read  
5 it.

6 MR. HACKETT: Okay. Unless, John, unless  
7 it's referencing another report or something.

8 PARTICIPANT: No.

9 MR. HACKETT: Okay. Then that shouldn't be  
10 the case.

11 MEMBER CORRADINI: So, Hossein will check  
12 into that and see if the printed copy --

13 MEMBER REMPE: It's on page 13.

14 MEMBER CORRADINI: -- is available so we  
15 can do the double check. What else?

16 MEMBER REMPE: This group of things, it's  
17 page 13. Okay?

18 MEMBER CORRADINI: Send us an email.  
19 Anything else?

20 MEMBER BANERJEE: Why are you being a tough  
21 guy?

22 MEMBER CORRADINI: I want to move it along.  
23 I don't want to sit here and dwell on lost equations.

24 MEMBER REMPE: So, the Subcommittee does  
25 not to have a meeting with the staff. Last year I know

**NEAL R. GROSS**

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

1 Bill had one, and I couldn't make it, but we just  
2 don't want to do it. What it is, is what it is. I  
3 mean, it's up to you all.

4 MEMBER BANERJEE: You know, I did one  
5 before which was interesting. This was called -- this  
6 fire stuff. I forget what -- Carol Fire, and we never  
7 really met with the people.

8 MEMBER CORRADINI: We did Carol Fire in two  
9 years. The first year I did Carol Fire, and we met  
10 with the staff. Then there was another Carol Fire  
11 modeling report that you guys did.

12 MEMBER BANERJEE: Yes.

13 MEMBER CORRADINI: And I'm not sure if you  
14 met or not.

15 MEMBER BANERJEE: I don't recall that we  
16 did. I don't see a necessity to meet with the staff,  
17 but --

18 MR. HACKETT: I don't think there's a  
19 necessity.

20 MEMBER CORRADINI: We're just offering it  
21 as an option.

22 MR. HACKETT: An option, I would encourage  
23 it.

24 CHAIRMAN ARMIJO: This is one thing. I've  
25 been on three of these, and one thing I did was just

**NEAL R. GROSS**

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

1 ask the staff for the user need document in addition  
2 so it's not going to --

3 MEMBER CORRADINI: So you could see the  
4 context.

5 CHAIRMAN ARMIJO: Yes.

6 (Simultaneous speech.)

7 DR. NOURBAKSH: And the representative of  
8 staff are going to be here later during the July or  
9 September meeting if the need for clarification.

10 MEMBER BANERJEE: Well, it's to be fair.  
11 Let's be fair.

12 MEMBER CORRADINI: Bill, do you have any  
13 comments? You're just a happy camper.

14 MEMBER SHACK: No, I'm just a happy camper.  
15 I just downloaded the report. Now I can actually look  
16 at it.

17 MEMBER BANERJEE: Can we have sort of less  
18 voluminous reports.

19 MEMBER CORRADINI: Do you want to put  
20 installing a page limit on what we review?

21 MEMBER BANERJEE: Yes.

22 MEMBER CORRADINI: Okay, fine. We'll come  
23 -- we'll keep that in mind for next year.

24 MEMBER STETKAR: They tried, they left the  
25 equations out.

**NEAL R. GROSS**

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

1 MEMBER CORRADINI: Mr. Chairman, back to  
2 you.

3 CHAIRMAN ARMIJO: Excellent report, Mike.

4 (Whereupon, the proceedings went off the  
5 record at 4:35:49 p.m.)

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25



**U.S.NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

**SECY-12-0064**

**ACRS**

**June 6, 2012**

Donald A. Cool

U.S. Nuclear Regulatory Commission

# Presentation Outline

- **Background**
- **Staff Activities**
- **SECY Paper Purpose**
- **Staff Conclusions**
- **Technical Issue Recommendations**
- **Policy Options**
- **Staff Recommendations**

# Background

- **NRC regulations last revised in 1991**
- **Radiation protection requirements in 10 CFR Part 20, Licensing Parts**
- **NRC staff analysis following publication of revised ICRP recommendations indicated areas warranting consideration for revision**
- **Commission approved staff recommendation to engage stakeholders and initiate development of technical basis materials on April 2, 2009**

# What Have We Done?

- **Phase I of outreach included:**
  - Presentations to numerous organizations and groups
  - FRN published inviting inputs (74 FR 32198)
- **Phase II Workshops**
  - FRN published with issues and questions (75 FR 59160)
  - Workshops in Washington, Los Angeles, and Houston
- **Phase III Comment – Lens of the Eye**
  - FRN published asking for feedback (76 FR 53847)
- **Staff Recommendations provided to Commission  
April 25, 2012 – SECY-12-0064**

# Purpose of SECY Paper

- **Summarize staff's interactions with stakeholders**
- **Request approval of recommendations for policy and technical directions for further development of a detailed regulatory basis**
- **Request approval to develop regulatory basis for 10 CFR Part 50, Appendix I in parallel with 10 CFR Part 20**

# Staff Conclusions

- **Current regulations are a mixture of concepts, quantities, and terminology from the last 50+ years, and do not, in part, reflect current assessment of radiation risk**
- **Occupational exposures at levels close to existing limits could result in accumulated exposures that may pose a potential to exceed recommended cumulative dose recommendations**
- **Appropriate and scientifically justified changes should be made in a number of specific areas that do not reflect current radiation risk estimates**

# Staff Conclusions

- **Increased alignment with international recommendations, and the standards used in other countries, have qualitative benefits, but each technical issue is justified by technical and scientific rationale**
- **A change to limits is a more straight forward, performance based approach than additions to ALARA program requirements**
- **Rulemaking would require backfit justification on both quantitative and qualitative grounds**

# Staff Conclusions

- **Additional efforts will be needed to develop regulatory basis for a proposed rule**
  - Explore possible draft rule text
  - Explore possible guidance for implementation
  - Dose coefficients needed before Appendix B values can be revised
  - Detailed cost-benefit information needed for specific proposals

# Technical Issue Recommendations

- **Update scientific information and models to ICRP Publication 103 system**
- **Update terminology to reflect updated scientific information and models**
- **Reduce Occupational TEDE limit to 2 rem (20 mSv) year**
- **Reduce Occupational LDE limit to 5 rem (50 mSv) or 2 rem (20 mSv)**
- **Reduce Occupational Embryo/Fetus limit to 100 mrem (1 mSv)**

# Technical Issue Recommendations

- **Explore increased use of SI units of activity and dose**
- **Explore adding categories of licensees reporting annual occupational exposures**
- **Align 10 CFR Part 50, Appendix I to updated scientific information, models, and terminology**

# Policy Options

- **Option 1 – Status Quo – No Action – no further consideration of changes in response to international recommendations**
- **Option 2 – Limited Revision – develop basis for revision to scientific information, models, and terminology, but make no changes to limits. Develop revision of 10 CFR Part 50, Appendix I with alignment of scientific information, models and terminology.**

# Policy Options

- **Option 3 – Revision for Greater Alignment – develop basis for revision to scientific information, models, terminology, and to reduce dose limits and explore SI units and reporting of exposure. Develop revision of 10 CFR Part 50, Appendix I with alignment of scientific information, models and terminology.**

# Staff Recommendations

- **Staff recommends approval of Policy Option 3 to continue development of regulatory basis using recommended direction for each technical issue.**
- **Staff recommends stakeholder outreach and participation on possible rule text, guidance, benefits, and impacts**
- **Staff recommends parallel regulatory basis development for proposed rules for 10 CFR Part 20 and 10 CFR Part 50, Appendix I**

# Questions





**U.S.NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

# **Japan Lessons Learned Tier 3 Recommendations**

**John Monninger**

**ACRS Meeting  
Rockville, Maryland  
June 6, 2012**

# Initial NRC Actions

- NRC Operations Center to Monitoring Mode
- Staff Sent to Japan
- Generic Communications
- Temporary Instructions
- Near-Term Task Force Established

## **U.S. Plant Safety**

- Similar sequence of events in the U.S. is unlikely
- Existing mitigation measures could reduce the likelihood of core damage and radiological releases
- No imminent risk from continued operation and licensing activities

# Identifying Lessons Learned

- July 2011
  - Near-Term Task Force (NTTF) report issued
- September/October 2011
  - NTTF recommendations prioritized into Tiers 1, 2, and 3
- February 2012
  - Draft orders and requests for information provided to the Commission
- March 2012
  - The NRC staff issued the Tier 1 orders and request for information on March 12, 2012

## Tier 3 Recommendations

- NTTF 2.2 Periodic Confirmation of Seismic and Flooding Hazards
- NTTF 3 Potential Enhancement to the Capability to Prevent or Mitigate Seismically-Induced Fires and Floods (ACRS R1(g) and R2(d))
- NTTF 5.2 Reliable Hardened Vents for Other Containment Designs
- NTTF 6 Hydrogen Control and Mitigation Inside Containment or in Other Buildings (ACRS R1(e), R2(b), and R2(c))
- NTTF 9.1/9.2 EP Enhancements for Prolonged SBO and Multiunit Events
- NTTF 9.3 ERDS Capability
- NTTF 10 Additional EP Topics for Prolonged SBO and Multiunit Events (ACRS C3)

## **Tier 3 Recommendations (cont.)**

- NTTF11 EP Topics for Decision-making, Radiation Monitoring, and Public Education
- NTTF12.1 Reactor Oversight Process Modifications
- NTTF12.2 Staffing Training on Severe Accidents and Resident Inspector Training on SAMGs
- Transfer of Spent Fuel to Dry Cask Storage
- Pre-staging of Potassium Iodide Beyond 10 Miles
- Basis of Emergency Planning Zone Size
- Reactor and Containment Instrumentation Ability to Withstand Beyond Design Basis Conditions (ACRS R2(e) and C4)



**U.S.NRC**  
UNITED STATES NUCLEAR REGULATORY COMMISSION  
*Protecting People and the Environment*

## **2.2 Periodic Reassessment of External Hazards**

*Issue - Initiate rulemaking to require licensees to confirm seismic hazards and flooding hazards every 10 years*

- **Action**
  - Initiate pre-rulemaking activities



# **3 Seismically Induced Fires and Floods**

*Issue – Evaluate potential enhancements to the capability to prevent or mitigate seismically induced fires and floods*

- **Action**
  - Development of PRA methodology
    - Engagement with PRA standards development organizations
    - Feasibility study to assess approaches for evaluating multiple concurrent events
  - Assess results from Tier 1 activities and other related work
  - Future re-evaluation of Recommendation 3



## **5.2 Reliable Hardened Vents for Other Containment Designs**

*Issue – Reevaluate the need for hardened vents for other containment designs*

- **Action**

- Defer further consideration of venting for other containment designs
- Resume consideration when issues for Mark I and II designs are resolved

# 6 Hydrogen Control and Mitigation

*Issue – Identify insights about hydrogen control and mitigation inside containment or in other building as additional information is revealed through further study of the Fukushima Dai-ichi accident*

- **Action**

- Examine additional H<sub>2</sub> control measures in adjacent buildings
- Evaluate the sources and timing of H<sub>2</sub> generation
- Assess the potential migration/release pathways
- Review the Technical Basis for 10 CFR 50.44

# Emergency Preparedness

## *Issues*

*9 – Initiate rulemaking to require EP enhancements for multiunit events*

*10 – Pursue additional EP topics related to multiunit events and prolonged SBO*

*11 – Pursue EP topics related to decisionmaking, radiation monitoring, and public education*

- **Action**

- Issue an Advance Notice of Public Rulemaking (ANPR) to determine if a technical-basis for rulemaking can be developed for EP-related NTTF Recommendations (9, 10, and 11).

## 12.1 ROP Enhancements

*Issue – Expand the scope of the annual ROP self assessment and biennial ROP realignment to more fully include defense-in-depth considerations*

- **Action**
  - Implement the ROP in accordance with current policy
  - Consider potential changes to the ROP self assessment and realignment programs when an action plan for Recommendation 1 has been established

## 12.2 Staff Training

*Issue – Enhance NRC staff training on severe accidents*

- **Action**
  - Near-term actions
    - Frequency of severe accident courses
    - Update courses based on Fukushima lessons-learned
    - Evaluate qualification programs for training on severe accidents

## 12.2 Staff Training (cont.)

### – Longer-term actions

- Dependent on Recommendation 8
- State-of-the-Art Reactor Consequence Analysis
- Level 3 Probabilistic Risk Analysis
- Fukushima lessons-learned
- Qualification Program SAMG courses
- Potential new course development



# **Expedited Transfer of Spent Fuel to Dry Casks**

*Issue – Evaluate the expedited transfer of spent fuel to dry casks*

- **Action**

- Complete validation of our current understanding of spent fuel safety with respect to the Commission Safety Goals, considering past evaluations and results of spent fuel pool scoping study
- Identify any inconsistencies or gaps that may need additional research
- Gather stakeholder input on staff analysis of information
- Recommend course of action to the Commission

# Emergency Planning Zone

*Issue – Evaluate the basis of emergency planning zone size*

- **Action**

- Existing Emergency Planning Zone (EPZ) size provides reasonable assurance of adequate protection of public health and safety
- EPZ size re-evaluation is being assessed by existing activities
- Utilize insights from the current Level 3 Probabilistic Risk Assessment (PRA) study to inform the process for evaluation of potential impact that a multi-unit event may have on the EPZ

# Potassium Iodide (KI)

*Issue – Evaluate the prestaging of potassium iodide beyond 10 miles*

- **Action**

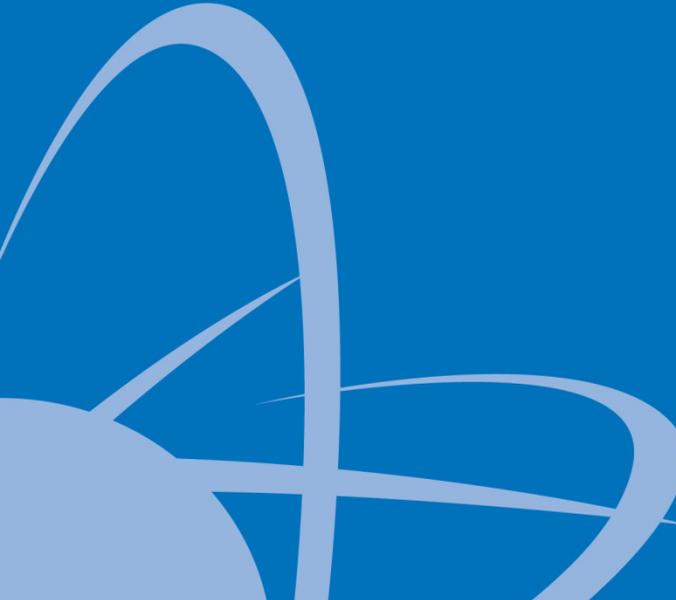
- The existing KI framework and regulations provide reasonable assurance of adequate protection of public health and safety
- Based on available data to date, it is unlikely that the FDA thyroid dose PAGs were exceeded beyond 10 miles as a result of the accident at Fukushima.
- Continue to monitor and evaluate the results of the findings by the Japanese government from studies conducted in and around the Fukushima

# Reactor and Containment Instrumentation

*Issue - Selected reactor and containment instrumentation should be enhanced to withstand beyond-design-basis accident conditions*

- **Action**

- Ensure that the need for enhanced instrumentation is being adequately considered during Tier 1 actions
- Review/participate in domestic & international efforts to study/develop severe accident info needs and identify instrumentation gaps
- Gather and review information results from higher Tier actions
- Determine need for a regulatory framework for enhanced reactor and containment instrumentation



Dr. Christopher Cook

ACRS Meeting

June 6, 2012

**Follow-up from May 22 ACRS Meeting:  
Recommendation 2.3 Flooding Walkdowns**

# Background

- **May 21, 2012**
  - Industry (via NEI) submitted flooding walkdown guidance document [NEI 12-07]
- **May 22, 2012**
  - ACRS meeting on flooding walkdowns
- **May 31, 2012**
  - NRC endorsed the walkdown guidance with 'necessary changes' (ACRS feedback) and 'suggested corrections'
- **June 10 (flooding); July 10 (seismic)**
  - Each licensee to confirm guidance to be used
- **Nov 27, 2012 (180-days after NRC endorsement)**
  - Licensees submit walkdown reports including a list of any inaccessible areas (& completion dates)

# Necessary Changes

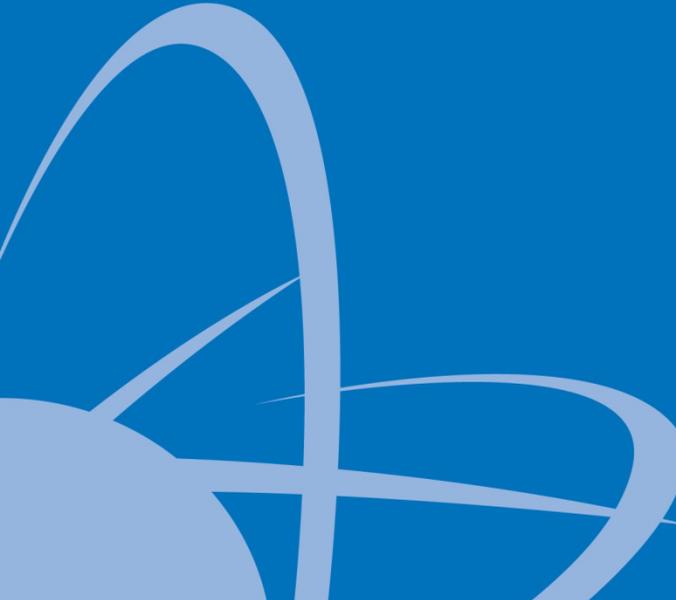
1. Add extreme air temperature to the list of examples of adverse weather conditions that could reasonably be expected to simultaneously occur in the following areas:

Page 6, Section 3.10, Last Bullet

Page 18, Section 5.7, First Paragraph

Page 18, Section 5.7, First Bullet

2. Include a citation reference to NUREG-1852, “Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire,” as an additional information source that licensees may consider when evaluating operator manual actions.



# Thank You

**Follow-up from May 22 ACRS Meeting:  
Recommendation 2.3 Flooding Walkdowns**



**Dr. Annie Kammerer**  
**R2.3 Seismic Walkdown Team**

**ACRS Meeting**

June 2012

**Overview and Development of R2.3  
Seismic Walkdown Guidance**

# ACRS Input

- Risk-informed development of the SWEL

“Additionally, the development of SWEL 1 should include consideration of the importance of the contribution to risk for the SSCs. For example, numerical measures derived from the available PRA models (internal or seismic), such as Fussell-Vesely Importance and Risk Achievement Worth, could be used to determine potentially risk-significant SSCs.” p.3-5

# ACRS Input

- Incorporation of operations personnel

Plant Operations Personnel section found on page 2-2.

“The participation of plant operations personnel is an integral part of this program. Two of their most important responsibilities are described below.

First, plant operations personnel should provide information to the Equipment Selection Personnel who develop the SWEL, as described in Section 3: Selection of SSCs. (continued)

# ACRS Input

- Incorporation of operations personnel

“For example, plant operations personnel may be able to point to major changes or additions to the plant since the IPEEE program had been completed. Their input may also be useful in identifying SSCs that are in a variety of environments and that are accessible for inspection during the plant walkdowns. Along with Equipment Selection Personnel, a plant operations staff member should sign off on the SWEL to indicate their participation in the SWEL development process.” (continued)

# ACRS Input

- Incorporation of operations personnel

“Second, plant operations personnel should provide information and support to the Seismic Walkdown Engineers (SWEs) during the walkdowns to answer questions on the function and operation of equipment so the SWEs can decide whether malfunction of certain features of an item of equipment will affect its safety-related function. In addition, the plant operations personnel should be available to give the SWEs access to and facilitate inspection of equipment, including its anchorage.” (repeated again in section 4) (continued)

# ACRS Input

- Incorporation of operations personnel

“To fulfill these responsibilities, the plant operations personnel should have knowledge of and experience with the specific plant systems being evaluated for potentially adverse seismic conditions. This knowledge should cover both steady state and transient operations of various systems and the associated plant-specific operating procedures. The plant operations personnel should also be able to supply information on the consequences of, and operator recovery from, functional anomalies.”

# ACRS Input

- Incorporation of operations personnel

“Along with Equipment Selection Personnel, a plant operations staff member should sign off on the SWEL to indicate their participation in the SWEL development process.” p.3-1

# ACRS Input

- Incorporation of operations personnel

“In the process of selecting equipment for the sample, it is recommended that the Equipment Selection Personnel consult with and obtain advice from plant operators and others. For example, operators may be able to identify equipment with operational issues or that have been exposed to repeated maintenance activities. Such activity may have left the equipment in a state that no longer conforms to its seismic licensing basis.” p.3-6

# ACRS Input

- Incorporation of operations personnel

“It is recommended that the Equipment Selection Personnel consult with and obtain advice from plant operators and others (e.g., systems engineers, maintenance personnel, etc.) to also identify those items of equipment that have been modified or upgraded recently (e.g., within the past year or so).” p.3-7

# ACRS Input

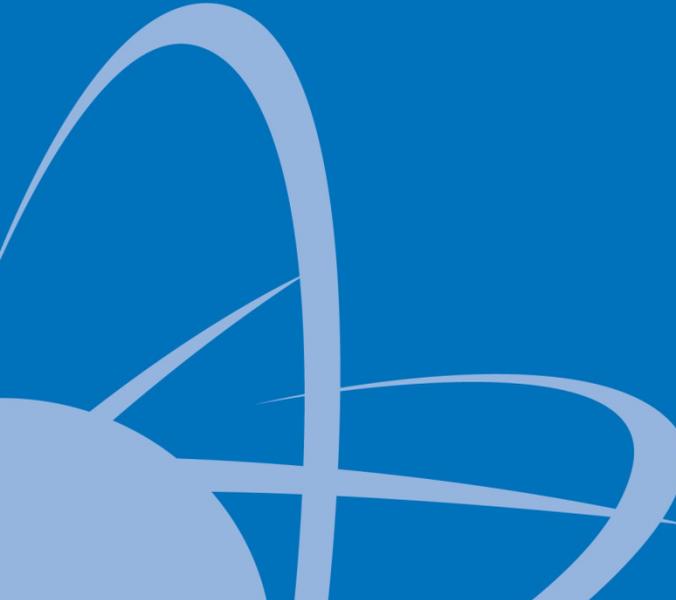
- Incorporation of operations personnel
  - “The following preparations are recommended prior to the Seismic Walkdowns and Area Walk-Bys:
    - Arrange for plant operations and/or maintenance personnel to open cabinets and other equipment for anchorage inspection
    - Arrange for plant operations/systems personnel to provide answers to operations/systems questions than may arise during the Seismic Walkdowns and Area Walk-Bys” p.4-5

# ACRS Input

- Complete removal of word “credible” from the document
- The word “likely” is used with care
- Boil-off added to discussion of analysis of drain down of spent fuel pools (p. 3-9)
- Clarified that the status of items in the CAP should be updated in any revised submission report (required if inaccessible items are delayed)
- Stronger description of structural elements and when they are and aren't included

# ACRS Input

- Follow up of items entered into the CAP
  - Intention is that all items entered into the CAP will be followed and the outcomes become part of lessons learned report
  - Final submittal report by licensees will provide updated status
  - Two approaches currently identified for any remaining items
    - Additional future TI such that resident inspectors collect information
    - Request through NRR/DORL PMs to obtain status on an item by item basis



# Thank You

## **Overview and Development of R2.3 Seismic Walkdown Guidance**

I) Nuclear power plants (“NPP”) need to operate with in-core thermocouples at different elevations and radial positions throughout the reactor core

A) In October 1979, the President’s Commission on the Three Mile Island accident recommended that:

Equipment should be reviewed from the point of view of providing information to operators to help them prevent accidents and to cope with accidents when they occur. Included might be instruments that can provide proper warning and diagnostic information; for example, *the measurement of the full range of temperatures within the reactor vessel under normal and abnormal conditions*<sup>1</sup> [emphasis added].

In the last three decades, the NRC has not made a regulation that would help fulfill the President’s Commission recommendations.

B) Petition for Rulemaking, PRM-50-105,<sup>2</sup> requests that NPPs operate with in-core thermocouples at different elevations and radial positions throughout the reactor core to enable operators to accurately measure a large range of in-core temperatures in steady-state and transient conditions.

1) In the event of a severe accident, in-core thermocouples would enable operators to accurately measure in-core temperatures, providing crucial information to help operators manage the accident; for example, indicating the time to transition from emergency operating procedures to implementing severe accident management guidelines.

2) In-core thermocouples would provide crucial information for tracking the progression of core damage during a severe accident.

## II) An Oversight of Westinghouse's probabilistic risk assessment ("PRA") for severe accidents which could occur at AP1000 reactors:

A) Westinghouse's PRA for the AP1000 states that in the event of a severe accident, the AP1000 containment's "hydrogen igniters are actuated by manual action when [the] core-exit temperature exceeds a predetermined temperature [1200°F<sup>3</sup>] as directed by the emergency response guidelines (ERG)."<sup>4</sup> Westinghouse does not consider that experimental data shows that core-exit temperature ("CET") measurements would not be an adequate indicator for when to either correctly or safely actuate hydrogen igniters in a severe accident.<sup>5</sup> (If the hydrogen igniter system were actuated after a detonable concentration of hydrogen developed in the containment, it could directly initiate a detonation, which could, in turn, compromise the containment.)

1) Experimental data from tests (simulating design basis accidents) conducted at four facilities shows that CET measurements would not be an adequate indicator for when to either correctly or safely actuate hydrogen igniters in a severe accident. Two of the main conclusions from such tests are that CET measurements display in all cases a significant delay (up to several hundred seconds) and that CET measurements are always significantly lower (up to several hundred Celsius) than the actual maximum cladding temperature.<sup>6</sup>

2) In LOFT LP-FP-2 (a severe accident experiment that was an actual reactor core meltdown), in a time period when maximum core temperatures were measured to exceed 3300°F, CETs were typically measured at 800°F—more than 2500°F lower than maximum core temperatures. In LOFT LP-FP-2, "during the rapid oxidation phase the CET appeared essentially to be disconnected from core temperatures."<sup>7</sup>

---

<sup>1</sup> John G. Kemeny, *et al.*, “Report of the President’s Commission on the Accident at Three Mile Island: The Need for Change: The Legacy of TMI,” October 1979, p. 72.

<sup>2</sup> Mark Leyse, PRM-50-105, February 28, 2012, available at: [www.nrc.gov](http://www.nrc.gov), NRC Library, ADAMS Documents, Accession Number: ML12065A215.

<sup>3</sup> Westinghouse, “AP1000 Design Control Document,” Rev. 19, Tier 2 Material, Chapter 19, “Probabilistic Risk Assessment,” Appendix 19D, “Equipment Survivability Assessment,” June 13, 2011, available at: [www.nrc.gov](http://www.nrc.gov), NRC Library, ADAMS Documents, Accession Number: ML11171A416, p. 19D-3.

<sup>4</sup> Westinghouse, “AP1000 Design Control Document,” Rev. 19, Tier 2 Material, Chapter 19, “Probabilistic Risk Assessment,” Sections 19.41 to 19.54, June 13, 2011, available at: [www.nrc.gov](http://www.nrc.gov), NRC Library, ADAMS Documents, Accession Number: ML11171A409, p. 19.41-4.

<sup>5</sup> Robert Prior, *et al.*, OECD Nuclear Energy Agency, Committee on the Safety of Nuclear Installations, “Core Exit Temperature (CET) Effectiveness in Accident Management of Nuclear Power Reactor,” NEA/CSNI/R(2010)9, November 26 2010.

<sup>6</sup> *Id.*, p. 128.

<sup>7</sup> *Id.*, p. 50.

# **Proposed Revision 1 to Regulatory Guide 1.192, “Operation and Maintenance Code Case Acceptability, ASME OM Code”**

Component Performance and Testing Branch  
Division of Engineering  
Office of Nuclear Reactor Regulation

ACRS Meeting  
Rockville, MD  
June 6, 2012

# Purpose of Meeting

- To provide the history of Regulatory Guide 1.192 and the allowance of frequency extensions for Inservice Testing (IST) of components subject to the ASME OM Code requirements
- To discuss the intent and purpose of ASME OM Code Case OMN-1, “Alternative Rules for Preservice and Inservice Testing of Active Electric Motor-Operated Valve Assemblies in Light-Water Reactor Power Plants”
- To obtain ACRS endorsement to issue the proposed revision to Regulatory Guide 1.192 in the proposed rulemaking for 10 CFR 50.55a



# Outline

- Introduction
- RG 1.192 Background
- Component IST Frequency Extensions via Code/Code Case/Alternatives or Relief Requests
- Code Case OMN-1 Background
- Code Case OMN-1 Feedback from Operating Units
- Questions/Discussion



# RG 1.192 Background

- RG 1.192 Rev. 0 issued in June 2003
- RG 1.192 Rev. 0 endorsed in 10 CFR 50.55a in 2004
- Six same Code Cases were conditionally acceptable in RG 1.192 Rev. 0 and proposed Rev. 1
- Conditions in proposed Rev. 1 of RG 1.192 are identical to conditions in Rev. 0



# RG 1.192 Background (cont.)

- Code Case OMN-1 was acceptable with three conditions
- Licensees can use OMN-1 (with conditions) without NRC approval
- OMN-1 has minor changes between RG 1.192 Rev. 0 and proposed Rev. 1
- No change in the three OMN-1 conditions in Rev. 0 and proposed Rev. 1



# Component IST Frequency Extensions via Code/Code Case/Alternatives or Relief Request

- Pump And Valve Test Frequency
  - Up to 1980, all pumps tested **Monthly**
  - 1980 to 1995, all pumps tested **Quarterly**
  - Since 1995, Group A or Group B pump tests performed **Quarterly**, and a comprehensive test for all **Biennially**
  - Up to 1990 full stroke test **Quarterly** on POVs & MOVs. If test not practical during plant operation, code allowed extension to **Cold Shutdown**
  - Since 1990, if full stroke tests not practical during plant operation and cold shutdown, code allows test extension to **Refueling Outage**
  - Up to 1990, check valves required to be exercised quarterly
  - Since 1990, disassembly/inspection/reassembly is allowed as an acceptable alternative for testing check valves at **Refueling Outage Frequency**



# Component IST Frequency Extensions via Code/Code Case/Alternatives or Relief Request

- Frequency Extension POV, MOV & Check Valve
  - 1996, 1998, 1999 & 2001 ASME issued OM Code Cases OMN-1, OMN-3, OMN-11 and OMN-12 which provide guidance for determining test interval up to maximum Ten (10) years for a qualified group of similar valves
  - Process requires MOV test every 2 refuel outages or 3 years until sufficient data or performance history is available
  - To increase test interval, adequate margin must be demonstrated before next test activity
  - Since 1995, grouping and sampling of check valves is allowed and test interval could be extended to Eight (8) years for a qualified group of 4 valves or more
  - Since 1998, ASME OM Code Appendix II “Check Valve Condition Monitoring” could extend test interval up to sixteen (16) years
  - Sufficient data is required for extension and test frequency extension is limited to one fuel cycle per extension



# Component IST Frequency Extensions via Code/Code Case/Alternatives or Relief Request

- Frequency Extension for Safety/Relief Valve
  - Up to 2009, Code specified that a certain minimum number of valves shall be tested each refuel cycle and all valves shall be tested every Five (5) years for Class I valves and Ten (10) years for Class 2 and Class 3 valves
  - In 2009 ASME issued OM Code Case OMN-17 which extended test interval for Class I pressure relief valves from Five (5) years to Six (6) years plus Six (6) months. In addition to the extension, the owner shall disassemble and inspect each valve to verify parts are free of defects. NRC has authorized the use of the alternative described in Code Case OMN-17
  - If valve in sample group fails to meet acceptance criteria, two additional valves shall be tested. If any of the additional valves fails the test, all remaining valves in group shall be tested



# Component IST Frequency Extensions via Code/Code Case/Alternatives or Relief Request

- Acceptance Criteria, Corrective Actions, NRC Regulations
  - Primary goal of IST program is to monitor components for degradation
  - Trending rate of degradation determines if component needs rework prior to next test
  - ASME OM Code specified alert and required action ranges for pump and valve tests. Required action range usually more limiting than TS limits or FSAR design basis conditions
  - ASME OM Code requires test frequency increase when data in alert range
  - ASME OM Code requires component declared inoperable until corrective action is taken when data is in required action range
  - ASME OM Code allows test frequency increase to Sixteen (16) years only for sampling and grouping of similar valves. A minimum # of valves in group must be tested each refuel cycle



# Component IST Frequency Extensions via Code/Code Case/Alternatives or Relief Request

- Acceptance Criteria, Corrective Actions, NRC Regulations
  - Code of Federal Regulations 10 CFR 50.65 provides regulatory requirements for monitoring the effectiveness of maintenance including IST program
  - NRC Inspection Manual Part 9900 provides guidance on operability determinations and functionality assessments for resolution of degraded (including failures) or non conforming conditions adverse to quality or safety



# ASME OM Code Case OMN-1 Background

## MOV Operating Experience

- In 1980s, operating experience revealed that quarterly stroke-time testing required by ASME Code was inadequate to demonstrate MOV operational readiness
- Bulletin 85-03 requested that licensees flow test MOVs in high pressure systems
- GL 89-10 requested that licensees verify design-basis capability of all safety-related MOVs through flow testing where practicable
- GL 96-05 requested that licensees develop programs to periodically verify design-basis capability of safety-related MOVs



# ASME OM Code Case OMN-1 Background (cont.)

## ASME Code Case OMN-1

- Allows replacement of quarterly MOV stroke-time testing with exercising every refueling outage and periodic diagnostic testing up to 10 years
- Requires verification of MOV design-basis capability
- Requires consideration of more frequent exercising for MOVs with high-risk significance
- Allows risk-based criteria for MOV performance testing with functional margin
- Requires MOV functional margin to support test interval
- Requires corrective action if MOV performance unacceptable



# ASME OM Code Case OMN-1 Background (cont.)

## 10 CFR 50.55a

- 10 CFR 50.55a requires that licensees establish programs to ensure that MOVs continue to be capable of performing their design-basis safety functions
- In 10 CFR 50.55a (1999), NRC accepted OMN-1 with
  - Evaluation of diagnostic test interval not later than 5 years or 3 refueling outages from implementation
  - Ensuring that potential increase in core damage frequency and risk associated with extension of exercising of high-risk MOVs beyond quarterly is small and consistent with Commission's Safety Goal Policy Statement



# ASME OM Code Case OMN-1 Background (cont.)

## 10 CFR 50.55a (cont.)

- After RG 1.192 was issued, specific reference to OMN-1 was removed from 10 CFR 50.55a



# ASME OM Code Case OMN-1 Background (cont.)

Regulatory Guide 1.192  
June 2003

- OMN-1 (up to 2004 Edition) acceptable where:
  - Diagnostic test interval evaluated not later than 5 years or 3 refueling outages from implementation
  - When extending high-risk MOV exercise interval, ensure that potential increase in CDF and risk is small and consistent with Commission's Safety Goal Policy Statement
  - When applying risk insights, categorize MOVs using OMN-3 or other MOV risk-ranking methodologies accepted by NRC staff



# ASME OM Code Case OMN-1 Background (cont.)

## Regulatory Guide 1.192 June 2003 (cont.)

- OMN-11 (up to 2004 Edition) acceptable with conditions on high-risk MOV exercise interval, and low-risk MOV test evaluation and grouping



# ASME OM Code Case OMN-1 Background (cont.)

## Code Case OMN-1 (2006 Addenda)

- OMN-1 (2006) updates previous version of OMN-1
- OMN-1 (2006) incorporates OMN-11 provisions for application of risk insights for high and low risk MOVs and conditions specified in RG 1.192 (2003) for use of OMN-11
- Conditions for use of OMN-1 regarding evaluation of initial diagnostic test interval, high-risk MOV exercise interval, and MOV risk ranking are specified in proposed Revision 1 to RG 1.192



# OMN-1 Feedback from Operating Units

- OMN-1 has the following attributes:
  - Design Basis Verification Test
  - Preservice test (baseline)
  - Inservice test (mix of static and dynamic)
  - Inservice test interval (established after evaluation of test data)
  - MOV exercising
- 29 plants have adopted OMN-1
- 39 additional plants are planning to implement OMN-1
- 98 plants are Joint Owners Group (JOG) participants and are in the final stages of implementing final program



# OMN-1 Feedback from Operating Units

- JOG was a five year study on valve degradation in response to GL 96-05
- JOG final program plan has all the attributes of OMN-1 with the exception of exercising
- Test data must justify test interval extension
- Test interval determination shall account for potential performance related degradation
- Maintenance activities and associated intervals are considered
- Known parameters that affect margin are tracked and trended and factored into interval decision



# OMN-1 Feedback from Operating Units

- General information representing 7 units
  - Approximately 1015 MOVs
  - 700 MOVs are on a 10 year or 6 RFO interval
  - On average, 120 MOVs are tested per year
  - As found test results rarely render an MOV inop (<1 per year)
  - Each test is evaluated and trended
  - Each MOV test interval is based on component margin, risk, trending and performance review, and work order history review
  - PMs and PM intervals prevent and address potential degradation
  - Testing validates PM adequacy
  - Potential degradation in available thrust/torque is assessed in the static testing and measured against JOG requirements



# OMN-1 Feedback from Operating Units

- General information representing 7 units
  - In 2003 an extensive analysis of 500 as-found static test data was performed to identify degradation and support longer test interval
  - No adverse trends were identified
  - There was considerable data scatter (beyond what could be explained by measurement error and torque switch repeatability) so a 10% random degradation value was incorporated into MOV calculations
  - The interval between the as left test to the as found test ranged from 12 to 100 months



# OMN-1 Feedback from Operating Units

- General information representing 7 units
  - Parameters examined and their affect on measured thrust at torque switch trip setpoint include:
    - Effects of sensor combinations
    - Effects of multiple strokes and multiple tests
    - Effects of torque switch setting versus thrust measured
    - Effects of stem speed versus thrust measured
    - Effects of valve/actuator manufacturer and gate versus globe
    - Effects of actuator spring compensation
    - Effects of actuator size
    - Effects of thread pressure, stem configuration, stem lubrication
    - Effects of stem lubrication type and lubrication frequency
    - Effects of ambient room temperature
    - Effects of different systems and time between tests
    - Effects of stem nut replacement



# Questions/Discussion



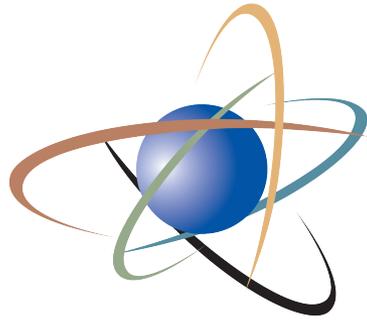
# 595<sup>th</sup> ACRS Meeting

---

## Evaluation of Extended Power Uprate Grand Gulf Nuclear Station



June 6, 2012



**U.S.NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

# **GGNS EPU Opening Remarks**

Louise Lund

Deputy Director

Division of Operating Reactor Licensing

Regions I and IV

June 6, 2012

# GGNS EPU Review Methodology

- The licensee requested the EPU following the guidance of NRC Office of Nuclear Reactor Regulations Review Standard (RS)-001, Revision 0, “Review Standard for Extended Power Uprates.”
- The licensee implemented the methodology that was approved by the staff in licensing topical report NEDC-33004P-A, “Constant Pressure Power Uprate.” (CLTR)
- In general the licensee followed the guidance in the CLTR. However, because GGNS uses GNF2 fuel, NEDC-33004 was not applicable for the fuel-design-dependent evaluations and transient analyses. For fuel dependent topics and transient analyses, the licensee followed the review guidance in NEDC-32424, “Generic Guidelines for GE BWR EPU,” (ELTR1) and NEDC-32523 (ELTR2).
- The NRC did not identify any major deviations in the application for the implementation of the CLTR, ELTR1 and ELTR2 topical reports.



The EPU review was extended, in part, because GGNS is the first application to an operating plant of GEH's Plant Based Load Evaluation (PBLE) methodology for the steam dryer review. Neither the licensee or the staff referenced prior efforts related to the PBLE as related to the ESBWR review.



**U.S. NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

## **Overview**

**Review of Grand Gulf Nuclear Station  
Extended Power Uprate**

**Alan Wang, Project Manager**

# Topics Discussed During Subcommittee

- Major considerations of the review which were discussed during the subcommittee included:
  - Transient and Accident Analyses
  - Long-term Stability
  - Spent Fuel Pool Criticality
  - Power Range Neutron Monitoring System
  - Mechanical Impacts
  - Steam Dryer Review

# License Conditions

- Leak Rate Test Schedule
- Steam Dryer and the Spent Fuel Pool reviews resulted in new license conditions
- The spent fuel pool review resulted in a separate nuclear criticality safety review amendment. In the interim the licensee has proposed a license condition for the spent fuel pool loading until this amendment can be completed
- The steam dryer review resulted in a license condition requiring the submission of a power ascension test program and specific conditions for accession to extended power uprate conditions



# **Grand Gulf Nuclear Station Unit 1** **Extended Power Uprate**

Appendix J Leak Rate Testing Schedule

Ahsan Sallman

Containment and Ventilation Branch

Division of Safety Systems

June 6, 2012

## **Surveillances (SRs) for Drywell (DW) Bypass Leakage Test & Integrated Leak Rate Test (ILRT)**

### **SR 3.6.5.1.1 for DW to Wetwell (WW) Bypass Leakage Test**

- Frequency- once in 120 months
- From previous test result,  $A/\sqrt{K} = 0.019$  sq ft, CLTP requirement  $A/\sqrt{K} \leq 0.9$  sq. ft, EPU requirement  $A/\sqrt{K} \leq 0.8$  sq. ft. is met with significant margin.
- Next bypass leakage test will be performed at current schedule.

### **SR 3.6.1.1.1 for 10 CFR 50 Appendix J ILRT (Type A Test)**

- Frequency- once in 120 months
- Licensee predicted leakage at EPU 'Pa' by extrapolating the CLTP leakage test results using leakage ratio equal to the sq. root of pressure ratio relationship
- Confirmed predicted leakage at EPU 'Pa' satisfied the acceptance criteria if tested at the EPU 'Pa' with substantial margin.
- Next ILRT will be performed at current schedule.

## 10 CFR 50 Appendix J Test Pressure

- **Definition of ‘Pa’ given in 10 CFR 50 Appendix J, Option B, Section II:** “*Pa* (*p.s.i.g*) means the calculated peak containment internal pressure related to the design basis loss-of-coolant accident as specified in the Technical specifications.”
- EPU containment peak pressure in short term is limiting for large MSLB (3.54 sq ft) and in long term is limiting for SSLB (0.01 sq ft)
  - In short term, portions below and above HCU floor are modeled separately to capture the short term pressurization effects in the wetwell (below HCU floor). Peak pressure = 14.8 psig occurs in wetwell within first 6 seconds,
  - In long term, due to considerable mixing between regions above and below HCU floor the conditions are essentially uniform. Peak pressure = 11.9 psig
- Appendix J test pressure Pa increased from 11.5 psig to 14.8 psig for EPU conditions.
- EPU Pa satisfies the above definition because wetwell is considered as a part of the containment



**U.S. NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

**GGNS EPU  
Spent Fuel Pool  
Nuclear Criticality Safety Analysis**

Kent A. L. Wood

Division of Safety Systems

Reactor Systems Branch

June 6, 2012

# Extended Power Uprate

- Post EPU Conclusion on GDC 62
  - NEDC-33004P-A: nothing on GDC 62
- SFP NCS AOR relies on Boraflex
- Boraflex Degradation
  - Divided SFP into two regions
  - Not submitted
- SFP License Condition

# SFP License Condition

- Region 1: Boraflex Credit
  - 0.0179 g/cm<sup>2</sup> B-10 Areal Density
  - 2.3 E10 Gamma Dose
  - SCCG  $k_{inf} \leq 1.26$
- Region 2: No Boraflex Credit
  - 10 of 16 storage configuration
  - SCCG  $k_{inf} \leq 1.21$
- Limited to EOC 19



# Questions

## **Conclusions**

- The NRC staff concluded that, in general, Entergy's EPU did not deviate from the guidance in the RIS, the CLTR, and the ELTRs 1 and 2 and therefore, is acceptable.