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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DECEMBER 6, 2001

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4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 488TH ACRS MEETING

6 + + + + +

7 THURSDAY

8 DECEMBER 6, 2001

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10 ROCKVILLE, MARYLAND

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12 The Advisory Meeting met at the Nuclear
13 Regulatory Commission, Two White Flint North, Room
14 2B3, 11545 Rockville Pike, at 8:30 a.m., Dr. George E.
15 Apostolakis, Chairman, presiding.

16 PRESENT:

17 DR. GEORGE E. APOSTOLAKIS, Chairman

18 DR. MARIO V. BONACA, Vice Chairman

19 DR. DANA A. POWERS, Member

20 DR. STEPHEN L. ROSEN, Member

21 DR. WILLIAM J. SHACK, Member

22 DR. THOMAS S. KRESS, Member at Large

23 DR. JOHN D. SIEBER, Member

24 DR. F. PETER FORD, Member

25 DR. GRAHAM B. WALLIS, Member

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ACRS STAFF PRESENT:

DR. NOEL F. DUDLEY, Executive Director

HOWARD J. LARSON, ACRS

SAM DURAIWAMY, Designated Federal Official

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

(8:30 a.m.)

VICE CHAIRMAN BONACA: Good morning. The meeting will now come to order. This is the second day of the 488th meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting the Committee will consider the following: NEI 97-06, Steam Generator Program Guidelines; Proposed Rulemaking for Risk-Informed Revisions to 10 CFR 50-44; Standards for Combustible Gas Control System in Light-Water Cooled Power Reactors; ACRS/ACNW Office Retreat; and Proposed ACRS Reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. Sam Duraiswamy is the designated Federal official for the initial portion of the meeting.

We have received written comments from Mr. Bob Christie of Performance Technology regarding proposed rule-making for Risk-Informed Revisions to 10 CFR 50.44.

You all have received a copy of Mr. Christie's statements, and this document would be made part of the record of this meeting. We have received

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1 no requests for time to make oral statements from
2 members of the public regarding today's sessions.

3 A transcript of portions of the meeting is
4 being kept, and it is requested that the speakers use
5 one of the microphones, and identify themselves, and
6 speak with sufficient clarity and volume so that they
7 can be readily heard.

8 Before we move to our agenda, I would like
9 to make an announcement. I am sorry to announce that
10 Jack Sorensen's term with the ACRS expires on December
11 31st, 2001. So, Jack will be leaving us. We will
12 miss him, because Jack over the past four years has
13 made significant contributions to the ACRS.

14 He has done work for the ACRS in a number
15 of areas, including defense in depth, risk informed
16 regulations, safety culture, and human performance
17 research.

18 The latest paper that he developed for us
19 was regarding risk-informing the GDCs, and we thank
20 him for all his contributions. Fortunately, Jack is
21 not going to move far away. He will be working with
22 the Office of Nuclear Materials Safety and Safeguards,
23 which is in this building.

24 So we will have hopefully many
25 opportunities to meet again with Jack over the next

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1 year or whatever period that you have with that
2 organization.

3 I want to especially thank you from George
4 Apostolakis. He really wanted to be here and
5 recognize you, but unfortunately had a conflict, and
6 I am sure that he will be sitting down with you and
7 thank you personally.

8 I don't know if you have any statement
9 that you would like to make.

10 DR. SORENSEN: Well, thank you for the
11 acknowledgement. I have thoroughly enjoyed the four
12 years that I have spent here. I certainly have had
13 experiences that I would not have had otherwise, like
14 writing a joint paper with Dana Powers, and Tom Kress,
15 and George Apostolakis, and a number of other
16 challenges.

17 I do thank you for the opportunity to work
18 with you, and I hope that I will see you periodically
19 over the next year or so.

20 (Applause.)

21 VICE CHAIRMAN BONACA: Okay. With that,
22 I think we will move to our agenda, and the first item
23 on the agenda is NEI 97-06, Steam Generator Program
24 Guidelines. I will now turn to the Chairman of the
25 Subcommittee, Dr. Peter Ford.

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1 DR. FORD: Thank you, Mario. The last
2 time the full ACRS subcommittee was briefed on the
3 industry steam generator program guidelines, and that
4 is NEI 97-06, was in April of 1999.

5 Sine then, there has been a hiatus in the
6 staff's review to the emerging issues associated with
7 Indian Point, Unit 2, tube failure event, and a
8 differing professional opinion. The staff's planned
9 actions in response to the steam generator integrity
10 issues have been reflected in the Agency's steam
11 generator action plan, in which we had a part.

12 In the last six months there have been a
13 significant number of constructive discussions between
14 the staff and NEI at all management levels. These
15 discussions centered around, first, the staff's
16 comments on EPRI guidelines referenced in NEI 97-06,
17 steam generator program guidelines; and that was dated
18 January of 2001.

19 And, secondly, the NEI generator license
20 change package, dated February of 2000, which
21 addresses irregularity aspects of changing the
22 technical specifications.

23 There is now substantial agreement between
24 the staff and NEI. The staff believes that the
25 revised generic license change package can be

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1 submitted that would offer sufficient regulatory
2 control.

3 Some issues have to be resolved. For
4 instance, management's inspection intervals need to be
5 justified, and suitable language needs to be included
6 in the administrative technical specifications in a
7 change package to provide necessary regulatory
8 controls on inspection intervals.

9 However, these issues are not seen as
10 show-stoppers. Presentations were made to the
11 Materials and Metallurgy Subcommittee on September
12 26th, and again on November 29th.

13 Given that the NEI plans to submit a
14 revised generic license change package in mid-2002,
15 and that the staff plans to review and approve the
16 change package by the end of 2002, we thought it was
17 timely that a full ACRS committee should be exposed to
18 the regulatory approach and to the remaining technical
19 issues, so as to offer advice to the staff and NEI as
20 they go into the home stretch.

21 We have specifically asked that the
22 presentations have data to back up the opinions and
23 conclusions, and at this point, I will hand it over to
24 Louise Lund to start off with the staff.

25 DR. SHACK: Before Louise starts, I would

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1 like to state that I do have a conflict of interest in
2 this area, because Argonne is doing work on some
3 generator programs for the NRC.

4 MS. LUND: Okay. Can everybody hear me?
5 Okay. Good morning. As Dr. Ford indicated, I am
6 Louise Lund, and I am the section chief of the
7 Component Integrity and Chemical Engineering Section.

8 And what I had hoped to present this
9 morning is an overview of NEI 97-06, Steam Generator
10 Program Guidelines, and give you kind of a basis for
11 which you can understand the next few presentations,
12 which one is going to be given by EPRI.

13 And then Jim Riley of NEI is going to make
14 some comments, and then Emmett Murphy of the NRR staff
15 is going to also get into more detail in some of the
16 issues that are in my slides.

17 Okay. This slide presents a little
18 history of the staff's activities in the past years in
19 the steam generator regulatory framework. I think
20 that most of you are familiar with that, and I am not
21 going to spend much time on this, because I think that
22 the committee is aware that there has been a
23 rulemaking generic letter on different things that we
24 worked through.

25 But I wanted to make a quick few points

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1 germane to today's discussion. NEI informed the NRC
2 in December of 1997 of the industry's intent to commit
3 to a formal industry initiative called NEI 97-06, with
4 all PWRs implementing at no later than the first
5 refueling outage, starting after January 1st, 1999.

6 What this means is that the industry is
7 currently implementing NEI 97-06 with the current tech
8 specs. In the next few slides, I will discuss the
9 components of the industry initiative of the NEI 97-06
10 document, the generic license change package, and the
11 EPRI guidelines, and how these all fit together.

12 And to then discuss which parts the
13 industry is currently implementing and what we are
14 trying to move to. The other thing is that another
15 reason that I put this together is to kind of give you
16 a sense for the dates on this, too.

17 Okay. As promised, here is what the
18 current framework looks like, and right now as you can
19 see the current plant tech specs, and the NEI 97-06
20 steam generator program guidelines that I just
21 mentioned, what it is, is that it is high level
22 guidance for utility steam generator programs.

23 And there is lower tier EPRI guidelines
24 which give you more of a detailed day-to-day guidance,
25 and it is referenced in the NEI 97-06 program

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1 document. So the question is what are we moving to.

2 Okay. This is where we are going, having
3 the NEI 97-06 program document the EPRI guidelines,
4 and a generic license change package, which is the new
5 part of it.

6 And what it does is that it formalizes the
7 NEI 97-06 into the NRC regulatory framework via new
8 tech specs. And how it is envisioned is a generic
9 license change package will provide a framework for
10 taking advantage of the flexibility envisioned by NEI
11 97-06.

12 As proposed the tech specs and the generic
13 license change package provide a framework for a fully
14 performance-based approach. Currently, NEI 97-06 and
15 the EPRI guidelines are implemented in conjunction
16 with the existing tech specs which are prescriptive,
17 with the expectation that soon they will be
18 implemented with the new tech specs in the new generic
19 change package.

20 The advantage to the generic license
21 change package to industry is a streamline process for
22 gaining NRC approval of longer steam generator
23 inspections strategies, alternate tube repair
24 criteria, and new tube repair methods.

25 For example, licensees will be able to

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1 implement performance based strategies for determining
2 inspection intervals which have been reviewed and
3 approved generically by the staff, without the need
4 for submitting changes to the tech specs.

5 The NRC also benefits, in that it is
6 assured that the steam generator programs will be
7 focused on tube integrity, rather than simply
8 following prescriptive surveillance strategies.

9 And just to kind of give you a sense for
10 what is in the 97-06 document, the program
11 incorporates a balance of these items -- prevention,
12 inspection, evaluation, repair, maintenance, and
13 leakage monitoring.

14 And I will discuss also a little bit about
15 what the generic license change package incorporates,
16 but it is also important to realize that --

17 DR. POWERS: Can I ask a question?

18 MS. LUND: Sure.

19 DR. POWERS: You say a balance.
20 Presumably any mix of those things is a balance. Is
21 there some significance to the word balance?

22 MS. LUND: Well, I think -- well, you
23 know, I am not exactly -- I don't think there is
24 really a terrific amount of significance to the
25 balance.

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1 DR. POWERS: That's what I thought.

2 MS. LUND: But I think that there is --
3 that as you look at it, none of these exist
4 independent of one another, you know, I guess is
5 probably a better way to put it.

6 All of these, as far as your evaluation,
7 your inspection, and what you repair, all of these
8 don't exist independent of one another. So you really
9 need to consider all of them within the same context.
10 Does that make sense? Do you understand where I am
11 going? Maybe the wording threw you off.

12 DR. POWERS: It seems like the most
13 hopeless -- I mean, there is nothing that I am going
14 to take home with this. I mean, I am not going to
15 remember this particular slide for any significant
16 period of time. Maybe I wasn't intended to.

17 DR. FORD: Well, maybe a better word might
18 be interrelationship between these various parts?
19 They are synergistic to a certain extent.

20 DR. POWERS: I guess I would understand it
21 better if I thought I was working with steam generator
22 tubes that are roughly intact, and don't have lots of
23 cracks in them. Is this directed towards Alloy 800
24 tubes, or is this directed towards some better type or
25 different type of tubes?

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1 MS. LUND: It is intended for all of the
2 different types.

3 DR. POWERS: Every one of them?

4 MS. LUND: Every one of them, and I think
5 that you need to have a program that makes sure that
6 not only you consider the inspection and repair, and
7 leakage monitoring.

8 It is really a whole package, regardless
9 of what type of tube material that you are talking
10 about. It is to make sure that you have a strategy
11 for dealing with the as-found condition.

12 DR. POWERS: So if I had a strategy on
13 repair on detect, I would be okay, right?

14 MS. LUND: As far as repair on detection
15 for --

16 DR. POWERS: Tubes? Let's say I find a
17 flaw. Fix it.

18 MS. LUND: Well, that has been one
19 strategy for doing it in the past.

20 DR. POWERS: Well, I think the difficulty
21 with -- I mean, the repair on detection strategy, I
22 would find that completely unacceptable, because it is
23 what happens between the time that I fixed everything
24 and the next time I look that becomes important.

25 MS. LUND: Yes, which I think is a key to

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1 this and why we are going away from just looking at
2 surveillance intervals, and going to more of an
3 approach where we do look at the condition, and we do
4 look at what has been determined and evaluated as far
5 as what the operational assessment -- you know, what
6 the condition of the tubes are and what we predict the
7 condition of the tubes to be at the end of the cycle.

8 And so I think that is certainly part of
9 the new approach, and I think that Emmett is going to
10 discuss this in more detail when he gets up here. But
11 that certainly is an important part of it.

12 DR. POWERS: Okay.

13 MS. LUND: Okay. And I think that this
14 one is another thing, and which we will discuss in
15 more detail later, is that if it does establish
16 performance criteria that define the basis for steam
17 generator operability.

18 And which the performance criteria include
19 the structural performance criteria, accident leakage
20 and operational leakage criteria. Now, the generic
21 license change package, the utilities are to submit
22 revised tech specs based on NRC approved generic
23 license change package.

24 And the generic license change package
25 will contain a commitment to follow NEI 97-06, and the

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1 licensee's submittal, as you will identify these three
2 items -- the performance criteria and repair methods,
3 and inspection interval criteria.

4 And we will be talking in some detail
5 later about the inspection interval. How we will do
6 this is through revised tech spec and bases, and a new
7 spec with new technical specification steam generator
8 tube integrity, and a new administrative tech spec,
9 which is the steam generator program.

10 This will include revised limiting
11 conditions for operations specification, and for
12 operational leakage, and a new limiting condition for
13 operational steam generator tube integrity.

14 The new admin tech spec states that the
15 steam generator program must be implemented to ensure
16 that tube integrity performance criteria are
17 maintained.

18 The licensees will be explicitly required
19 to assess the conditions of the tubes, versus the
20 performance criteria, and that shall be performed at
21 each steam generator inspection outage.

22 Changes to performance criteria, tube
23 repair criteria, and repair methods, are subject to
24 NRC review and approval. Now, just to give you a
25 little bit of overview as to where we are.

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1 This is the review status, is that the
2 industry had requested inspection intervals beyond the
3 current requirements, and where this is going to come
4 in is actually in Rev. 6 of the APRI steam generator
5 examination guidelines.

6 Mohamad Behravesh from EPRI is going to
7 discuss that in some detail. In the initial part of
8 the staff review, both the industry and the NRC were
9 intending a review of performance based inspection
10 intervals, and as we became aware of changes to the
11 guidelines, it was apparent that the predictive
12 methodologies to support performance based inspection
13 intervals had not been fully developed.

14 However, the industry is proposing a
15 reference inspection interval strategy for the newer
16 steam generator tube materials, and what I am talking
17 about is 600 thermally treated and Alloy 690 than
18 those currently allowed in the tech specs.

19 The industry is currently addressing both
20 NRC comments and internal industry comments with
21 respect to this proposal. And the staff believes that
22 this approach must ensure that tube integrity
23 performance criteria will continue to be met and that
24 tubing conditions not meeting the performance criteria
25 will be promptly detected.

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1 So based on that the staff concluded that
2 regulatory controls on the inspection intervals were
3 needed, and what we proposed was incorporating
4 provisions in the administrative tech spec regarding
5 the use of NRC approved inspection intervals.

6 And we have reached agreement with
7 industry on this approach. So where we are now is
8 that now that we have reached agreement with industry,
9 we had a meeting to work out a schedule to reach a
10 conclusion of the review of the generic license change
11 package.

12 So one of the items that we have been
13 asked to discuss is the schedule and based on recent
14 meetings, we expect the industry submittal in mid-
15 2002.

16 After the submittal is made, we will use
17 the process of issuing the safety evaluation that we
18 previously informed the Commission that we would
19 follow, and that was in SECY-00-0078, and sending it
20 out for public comment, resolving comments, briefing
21 the Commission, publishing it in a regulatory issue
22 summary.

23 And we anticipate that this will take
24 approximately six months after we get the industry
25 submittal.

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1 VICE CHAIRMAN BONACA: Ms. Lund, during
2 the Subcommittee Meeting that we had last week, we
3 really had some difficulty with the issue of going to
4 a performance based, because the ability to determine
5 tube integrity was not convincing at this stage.

6 And I think that the NRC is not convinced
7 either yet. And so we had some concern about this
8 package coming, and then we had a presentation from
9 EPRI that said that this is going to be far in the
10 future.

11 Right now we are going from a prescriptive
12 inspection interval process to a better and more
13 conservative prescriptive process, or something of
14 that kind.

15 MS. LUND: Kind of a reference interval is
16 what I think Emmett is calling it.

17 VICE CHAIRMAN BONACA: Yes, it was
18 specific to certain types of steam generators and so
19 on. And now when I look at your presentation, I get
20 the message that actually this new package within 2002
21 will also contain new criteria, new performance based
22 criteria?

23 MS. LUND: Well, it is going to include
24 performance criteria, but the performance criteria,
25 some of it is just more explicitly called out than

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1 what was called before.

2 But what I would suggest is that Emmett is
3 going to actually discuss some of the components of
4 it, and more of the details of what the performance
5 criteria are. So that would probably -- and not
6 wanting to steal his thunder, maybe -- well, would
7 that be acceptable?

8 VICE CHAIRMAN BONACA: Sure.

9 MS. LUND: Okay.

10 DR. FORD: One of the conclusions from the
11 meeting last week, Louise, was that if you take away
12 the conclusion that I came away with, which was that,
13 yes, in the long term -- and exactly what Mario was
14 saying, that in the long term, yes, you are heading
15 for performance based criteria.

16 But if we don't have the data quality to
17 get that by the end or the middle of this year, and
18 that we are going to a prescriptive --

19 MS. LUND: To an interim stage.

20 DR. FORD: That has not changed?

21 MS. LUND: Right. What we are doing is
22 that as far as inspection intervals, we are going to
23 have an interim step. Do you want to address that,
24 Emmett? It looks like --

25 DR. FORD: Well, so far, you have only

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1 been talking about -- in the words you have been using
2 or saying performance based.

3 MS. LUND: That's right, and the
4 performance based is more on the way that the program
5 is constructed, and the intent at the beginning was to
6 make it performance based, including the inspection
7 intervals.

8 But the actual issue that we have been
9 wrestling with has been that we are not ready for the
10 inspection interval part of it to be performance
11 based.

12 DR. FORD: So is it fair to say that the
13 overall plan that you are proposing is going to be
14 adaptable enough so that it can take a performance
15 based, but right now practically it is sticking with
16 a prescriptive --

17 MS. LUND: Right, for that issue, because
18 the program itself based on the condition monitoring
19 the operational assessment, and looking at the
20 conditions of your tubes, and looking at how they are
21 going to perform for the next cycle, and doing all
22 that evaluation, that is a performance-based part of
23 the program right now.

24 And the part that we are still trying to
25 iron out is this inspection interval strategy. So

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1 does that make sense?

2 DR. FORD: Yes.

3 MS. LUND: So I have just one more slide
4 and then I am going to hand it over for you to get a
5 lot more details on this. In our long term action for
6 review status is to resolve outstanding issues with
7 the EPRI guideline documents, and this will have
8 future benefits, such as permitting the use of
9 intended performance based approach for inspection
10 intervals, in lieu of these reference prescriptive
11 requirements.

12 If there is no questions on this overview
13 part of it, I would like to go ahead and turn it over
14 for more specifics in the next couple of speakers.

15 MR. BEHRAVESH: Good morning. I am
16 Mohamad Behravesh from EPRI, and before I go further,
17 I would like to get an idea of how much time do I have
18 for this presentation?

19 DR. FORD: The whole time that we have is
20 until 10 o'clock, and Emmett, it depends on how long
21 you need.

22 MR. MURPHY: I prepared a presentation
23 that is very short, and so your questions will drive
24 the length of it.

25 DR. FORD: So you are the only two

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1 presenters?

2 MR. BEHRAVESH: Well, Jim Riley from NEI
3 will have some concluding remarks.

4 DR. FORD: How long do you need?

5 MR. BEHRAVESH: I think it would be a
6 luxury to have about 25 minutes to 30 minutes. If I
7 could have that much, that would be good. If I take
8 less of that, then we will have time for questions.

9 DR. FORD: Okay. So, 25 minutes with
10 questions would be perfect.

11 MR. BEHRAVESH: As Louise mentioned, this
12 entire framework of NEI 97-06 stands on these various
13 pillars called guidelines, and the strength of this
14 framework really depends on the strength of these
15 guidelines.

16 And one of these guidelines is the
17 inspection guideline. A lot of the issues related to
18 steam generators, at the end it sort of culminates in
19 inspection questions.

20 So I would like to spend some time telling
21 you about this industry document that details
22 inspection requirements, and where it came from, and
23 what it all involves.

24 The steam generator inspection guidelines
25 goes way back to 20 years or so, and the reason for

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1 it, the impetus for it, was that there really wasn't
2 any recommendations or any guidance on how to do steam
3 generator inspections.

4 And unlike pressure vessels, and unlike
5 piping, steam ASME was somewhat silent, and to this
6 date it is still somewhat silent as it relates to
7 steam generating inspections.

8 So utilities took the initiative back in
9 '80, putting a set of requirements together, and over
10 the years that has continued, and from time to time
11 they have revised it, and formalized it, and brought
12 input from vendors to the process.

13 And they added some very important topics
14 to it, namely performance demonstration, and it went
15 on to a prescriptive sampling, and somewhat even
16 changed the language 2 or 3 years ago that it is
17 really no longer a recommendation or guidelines, but
18 rather that it is requirements.

19 Everything has attached to it the word
20 "shall" and it is sort of a de facto requirement for
21 the utilities. So the point that I want to make with
22 this slide with you is that the set of guidelines that
23 the industry used for conducting steam generator
24 inspections is very mature.

25 It is time tested, and it is field tested,

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1 and it has gone through a whole series of reviews, to
2 the point that it brings us to Revision 5, and that
3 has been what utilities have been using for the last
4 3 or 4 years.

5 And in the guideline it also says that
6 every two years it is required that we assess the need
7 for revision of these guidelines. That is that
8 Revision 5 of the guidelines, based on utilities input
9 and other input that we have received, have actually
10 been pretty good.

11 It has brought a lot of improvements to
12 the practice. However, it did lack one thing, and
13 that is that as utilities went and replaced steam
14 generators, and went to better materials, this
15 revision, this addition of the guideline did not make
16 any distinction between 600 mill annealed material and
17 600 thermally treated, and 690, the newer material.

18 And so there was a lot of impetus for
19 revising this, and for allowing for these new
20 materials.

21 DR. POWERS: Is Revision 5 the 1997
22 version, with all the strong language, the one that
23 was enforced at Indian Point at the time that they had
24 their tube rupture?

25 MR. BEHAVESH: It was one that they

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1 should have followed when they had the tube rupture.

2 DR. POWERS: Oh, they should have?

3 MR. BEHRAVESH: Yes.

4 DR. POWERS: Okay.

5 MR. BEHRAVESH: This slide pretty much
6 says what I mentioned to you, that the guideline
7 delineates the hows and whats, and all those things as
8 a result of using an assessment. It is a utility
9 developed document, and we have started work on
10 Revision 6 in March of 200, and we expect to finish it
11 by the middle of next year.

12 It has lots of things in it, but I am
13 going to concentrate basically on a couple of issues.
14 The highlights of Revision 6 is these prescriptive
15 examinations, and then some issues related to data
16 quality which came out of the Indian Point 2, as a
17 result of the experience at Indian Point 2.

18 We have a new addition of the new draft of
19 this guideline out for draft out for review, and we
20 should be receiving --

21 DR. FORD: Mohamad, could you just expand
22 a little bit on what you mean by data quality? Is
23 this laboratory data quality, field data, and what
24 sort of scatters are we looking at? What are the
25 quality issues specifically?

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1 MR. BEHRAVESH: Sure.

2 DR. FORD: If you could go briefly over
3 that.

4 MR. BEHRAVESH: Yes. Briefly, it is on-
5 line monitoring of the data as you are collecting it
6 to determine whether has the data quality, has the
7 data deteriorated to the point that it can no longer
8 be trusted for collecting and making decisions. So
9 changes have to be made.

10 And so it is on-line such that you would
11 know that the data that you have used can be -- that
12 the data that you have collected can be used, and if
13 that is not the case, then remedies must be made.

14 DR. FORD: So it is inspection data that
15 you are talking about?

16 MR. BEHRAVESH: Inspection data quality
17 while you are collecting it.

18 DR. SHACK: Sort of signal-to-noise?

19 MR. BEHRAVESH: Signal-to-noise would
20 certainly be the number one element, yes. Data
21 quality are other things, too. For example, are you
22 in the right tube. I don't want to get mundane, but
23 yes.

24 DR. WALLIS: Does it say what you do with
25 the data once you have got it?

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1 MR. BEHRAVESH: Well, what you do with the
2 data is that you do a whole lot of other things based
3 on your analysis procedures. But collecting it, and
4 before you take the instrumentation out and leave the
5 place, you want to make sure that what you have got is
6 acceptable and useable.

7 DR. WALLIS: But you are not addressing
8 what you do with the data.

9 MR. BEHRAVESH: Not at this stage, no.
10 There is a whole set of guidance on what to do with
11 the data.

12 DR. FORD: And on your graph beforehand,
13 or you slide beforehand, you said when. So there is
14 a time component to this?

15 MR. BEHRAVESH: Not to the data. A time
16 component to the data quality, but what I said by when
17 had to do with prescriptive inspections; when do you
18 do and how often.

19 DR. WALLIS: It sounds like a ritual.

20 DR. POWERS: That is not a bad
21 characterization.

22 VICE CHAIRMAN BONACA: Yes, if that is a
23 condition that is a ritual.

24 DR. POWERS: You get to anoint a brief to
25 it, and collect the data, and then they bless it.

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1 VICE CHAIRMAN BONACA: Yes.

2 DR. WALLIS: Once a day and twice on
3 Sundays.

4 DR. POWERS: And every day during a
5 outage.

6 VICE CHAIRMAN BONACA: Then you hope and
7 pray.

8 DR. POWERS: Twenty-four hours a day,
9 three shifts.

10 VICE CHAIRMAN BONACA: And then you hope
11 and pray.

12 DR. POWERS: And hope and pray that your
13 probability of detection is high enough.

14 VICE CHAIRMAN BONACA: Yes.

15 MR. BEHRAVESH: Now, let's wait a minute
16 now. You have to consider the following. It used to
17 be that you would go there and collect a bunch of
18 data, and go home, and then worry about what to do
19 about it.

20 What is being done now is that know what
21 it is that you are collecting, and is it what you
22 intended to collect, and can you use it, and does it
23 have all the attributes, before you leave the place.
24 It may sound like a ritual, but it is a good ritual.

25 DR. WALLIS: Well, did someone go through

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1 the exercise of what you are going to do with the
2 data, and how much data do you need in order to
3 satisfy the needs of whatever the process is for
4 processing the data?

5 MR. BEHRAVESH: Yes.

6 DR. WALLIS: And the questions which are
7 being asked by the whole process?

8 MR. BEHRAVESH: Yes. There is a whole set
9 of tables, and the rationale, and tables that says
10 this is the data that you collect, and this is where
11 you collect it from, and this is how many times you
12 collect it, and how much you collect.

13 DR. WALLIS: And you should deduce that
14 from your needs for whatever it is or whatever the
15 questions are that you are asking. The process for
16 collecting data seems to become lost once you have
17 figured out what questions you are asking, and how
18 much data you need, and on what frequency in order to
19 answer the questions.

20 MR. BEHRAVESH: That is correct.

21 DR. WALLIS: Am I right in assuming there
22 was a process of that type that you went through?

23 MR. BEHRAVESH: Yes. Now, in a nutshell,
24 the big changes that are happening in Revision 6 of
25 the guideline, in comparison to Revision 5, is that

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1 the distinction that has been made in inspection of
2 600 mill annealed thermally treated, and 690 thermally
3 treated.

4 And those distinctions are that for 600
5 mill annealed material that you inspect it at every
6 outage. For 600 thermally treated, it must be
7 inspected at least every other outage.

8 And for 690 thermally treated, it must be
9 inspected at least every third outage. And this means
10 that you cannot skip more than two times, and this
11 means that you cannot skip more than one outage.

12 DR. FORD: Last week, we discussed this,
13 and there are two issues, practical issues.

14 MR. BEHRAVESH: Yes.

15 DR. FORD: One is the probability of
16 detection, and the other one is what is the database
17 to give you those --

18 MR. BEHRAVESH: I can get to that and
19 these are all experience base. This material has
20 failed in service and is being looked at at every
21 opportunity.

22 In this material, there are, oh, 15 or 16
23 plants in the U.S. that have this material, and they
24 have gone without any cracking in them for as long as
25 15 years.

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1 DR. FORD: And did I understand that there
2 are some incidences of cracking of 600 TT?

3 MR. BEHRAVESH: Well, two things. There
4 are alleged cracking in the U.S. that have not been
5 confirmed. For example, what they thought was
6 cracking in the Braidwood and Bryon plants that are
7 600 thermally treated, and they took three tubes out.

8 And after a destructive assay, they
9 decided that those were really manufacturing flaws,
10 and they were not cracks, and they were basically what
11 is called OD groups. This is in those two plants.

12 They thought that they had the same or
13 they thought they had what appeared like cracking at
14 Turkey Point 3 and 4, and then they went and did an
15 additional examination with the ultrasonics, and in
16 reviewing the data and comparing it with the other
17 similar indications, they again have concluded that
18 those are not cracks.

19 Now, there are facts that have been
20 confirmed in this material in foreign plants, and
21 there is an explanation for them. For example, in
22 France, they have quite a few of these, but their
23 expansion are all very different, done differently,
24 and what is called the KISS rule, which has introduced
25 additional residual stresses.

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1 And in those cases, the ones in France,
2 they have failed in the cracking mode. No such
3 expansions do exist in the U.S. There may be cases in
4 Japan where again the thermal treatment has been
5 different than in the U.S. based on everything that we
6 know today.

7 Again, I need to add that this study is
8 ongoing and we have a study under way to get all of
9 these details in one place to support these things for
10 the NRC review.

11 That in everything that we know today,
12 this material in the U.S. has not failed in the
13 cracking mode, and the experience with it in the
14 field, the number of plants are 13 effective full
15 power years, and up to 15.

16 And there are two 30 plants, both of them
17 are at 15 plus effective power years. So this one is
18 new and there have been no evidence of failure of it
19 in the cracking mode in the field. So there is data
20 being collected for all of this.

21 DR. POWERS: Your slide implies that the
22 800 Alloy will be treated the same as the 600
23 thermally treated?

24 MR. BEHRAVESH: Pretty much. That is what
25 we are considering.

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1 DR. POWERS: Is there a reason for
2 treating 800 the same as 600?

3 MR. BEHRAVESH: Nothing that I can
4 elaborate on.

5 DR. POWERS: I mean, the Germans seem to
6 be pretty enthusiastic about 800.

7 MR. BEHRAVESH: Yes, and 600 has not been
8 bad here either.

9 DR. POWERS: Yes, apparently not.

10 DR. SHACK: Do we have any 800 plants in
11 the U.

12 MR. BEHRAVESH: Not fully, no. Things are
13 made with 800 material, but not fully steam generated
14 plants. Anyway, this is in a nutshell what the
15 changes are. Now, let's look and see --

16 DR. FORD: Mohamad, you are going to get
17 to this question about why these specific multiples in
18 the inspection periodicities. You are going to get to
19 it?

20 MR. BEHRAVESH: Well, I would come to it.
21 Again, I would come back to it and hopefully be able
22 to answer your questions. So when we go to 600 mill
23 annealed, the requirement is that you inspect all of
24 the tube in every steam generator within 60 effective
25 full power. And also it means that mechanical --

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1 MR. ROSEN: You are talking about full
2 power months?

3 MR. BEHRAVESH: Months, effective full
4 power months, 60 effective full power months. Steam
5 generators shall be inspected at every outage, and
6 every time you do an inspection, you must do at least
7 20 percent random samples.

8 If you do samples of less than 20 percent,
9 this is really no change. This is the way that we
10 have been doing it in the Revision 5 as well.

11 DR. WALLIS: Typically, how many months
12 are there between outages?

13 MR. BEHRAVESH: It depends on the outages,
14 which are often times dictated by fuel cycles, and so
15 you can assume about 12 months, all the way to 24
16 months, but typically 18 to 22 months or so.

17 DR. WALLIS: And this is 20 percent
18 guessed at by some experts or where does it come from?

19 MR. BEHRAVESH: Well, 20 percent is sort
20 of the optimum sampling that if you do less, you are
21 not going to get a lot more information. And if you
22 do more, it is not going to give you a whole lot more.
23 So it is backed by -- in fact, it was based on the
24 study that was done --

25 DR. WALLIS: So 20 percent if you do it,

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1 say, three times between the time that you inspect
2 everything, and the chance of missing a cracked tube
3 is pretty high. Just take the probablistic thing.
4 You do three measurements of only 20 percent, there is
5 probably a 50 percent chance --

6 MR. BEHRAVESH: Well, the idea is that it
7 doesn't matter how many cracks you have in tubes. You
8 need to catch one of them to have knowledge of the
9 tubes being cracked.

10 DR. WALLIS: But there is quite a chance
11 that you wouldn't catch a particular cracked tube if
12 you did that?

13 MR. BEHRAVESH: A particular cracked tube,
14 that is correct, but if you find a cracked tube, then
15 you must expand your inspection all the way to a
16 hundred percent, which would allow you to catch every
17 cracked tube.

18 DR. WALLIS: I am just trying to get the
19 rationale for it.

20 DR. POWERS: Graham, do you think that is
21 true that if I inspect 20 percent randomly selected,
22 that I have a high probability of having missed a
23 tube?

24 DR. WALLIS: Yes.

25 MR. RILEY: This is Jim Riley from NEI.

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1 Mohamad, would you take a couple of minutes and
2 explain the degradation assessment? That might help
3 answer this question I think. The selection of tubes
4 is not completely random.

5 MR. BEHRAVESH: Well, as part of this
6 whole process, you select the tubes to inspect, and
7 also at the end you must inspect all of them. You
8 select them based on the knowledge of at which
9 locations degradation may have the strongest chance of
10 appearing.

11 DR. WALLIS: Oh, so it is not random
12 cracks.

13 MR. BEHRAVESH: No. Within a given
14 population, once you have selected a population,
15 within that population is random. It is random.

16 VICE CHAIRMAN BONACA: But again going
17 back to the previous slide, an important bullet is
18 missing, which is that if you find one, you expand
19 your inspection beyond the 20 percent?

20 MR. BEHRAVESH: Oh, yes, exactly that.

21 VICE CHAIRMAN BONACA: Okay. That's
22 important.

23 MR. BEHRAVESH: In 600 thermally treated,
24 if the steam generators are free from cracking, and
25 that is a big if, you must inspect all of them first

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1 within 120 effective full power months, and --

2 DR. WALLIS: If you know that they are
3 free from cracking, you don't have to do anything.

4 MR. BEHRAVESH: Pardon me?

5 DR. WALLIS: It seems to me that if you
6 know that they are free from cracking, you don't have
7 to inspect anything.

8 MR. ROSEN: Really, what is being said
9 there is that if they have been free from cracking in
10 the past.

11 DR. WALLIS: If they were free from
12 cracking?

13 MR. ROSEN: Yes.

14 VICE CHAIRMAN BONACA: If no cracks had
15 been identified yet.

16 MR. BEHRAVESH: Once we get back here, if
17 this material is cracking, you don't go through this.
18 You don't go through this. The first time around is
19 120 months, and 120 months is effectively about 10
20 years.

21 And what I mentioned to you is that there
22 are a number of plants that have 15 years of crack
23 free experience. So that is part of the rationale for
24 this 120.

25 Now, the second time around, the

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1 prescriptive methodology is getting more conservative,
2 and you drop to 90, provided that you live through 220
3 orderly and completely trouble free.

4 If you live through that, then the next
5 period would be 90, and after that, 60 and 60, and 60,
6 and so forth.

7 DR. FORD: Mohamad, again looking at this
8 graph, and the following graph, I come back to my
9 original question. What is the database upon which
10 presumably a statistical analysis has been done to
11 come up with these periodicities? Where is that
12 database?

13 MR. BEHRAVESH: That database is the
14 collection of 15 or 16 plants that have this material
15 in them, and they have been operating for periods that
16 exceed this number. So, this number has been taken as
17 a conservative representation of that experience.

18 If you have an experience that says 15
19 years, I would say that at 10 years would be a
20 conservative representation of that.

21 DR. FORD: And maybe we are not playing
22 fair, but have the staff seen that data, and have they
23 confirmed that those are significant?

24 MR. BEHRAVESH: Those are public data, and
25 those are all the --

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1 DR. FORD: Well, has the staff examined
2 these data? You can have publicly available data, but
3 have they examined the data?

4 MR. BEHRAVESH: There has not been a table
5 that in one page that we have handed it to them, but
6 they periodically get reports from all of the -- they
7 continuously get reports from all of these plants that
8 they know their operational experience.

9 And the other part of the answer to your
10 question is that as I mentioned, we are embarking on
11 a study that is ongoing now to formalize all of this
12 information; that on one hand appears to be obvious,
13 and on the other hand, doesn't appear to be obvious to
14 the uninitiated.

15 DR. FORD: I guess I am going away with
16 the impression from this graph and the next one, and
17 indeed the previous one, that these inspection
18 periodicities are completely empirical.

19 MR. BEHRAVESH: Empirical?

20 DR. FORD: Yes. Is that a fair statement?

21 MR. BEHRAVESH: Yes, it is, experienced
22 based. So there is no closed form formula that I can
23 put some input in it, and out comes on the other side
24 120.

25 DR. WALLIS: You could. You could say

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1 that you want to be sure that there is some 99 percent
2 probability that if there is a crack that you detect
3 it before it becomes serious, and you determine from
4 some technical basis how long you can allow it to be
5 undetected.

6 DR. FORD: Maybe we can cut this one
7 short. Emmett, are you going to discuss it?

8 MR. MURPHY: I don't have viewgraphs that
9 speak directly to your question.

10 DR. FORD: But this is one of the concerns
11 that you have, correct?

12 MR. MURPHY: Yes.

13 VICE CHAIRMAN BONACA: Okay. I'm sorry,
14 but I would like to ask a question of clarification
15 here. Is the 120 90-60 starting from the
16 implementation of the tech specs, or from the
17 construction of the steam generator?

18 MR. BEHRAVESH: From the replacement or
19 construction of the steam generator, with a caveat
20 that after the first cycle of operation -- because
21 what happens is that once you start, at the end of the
22 first cycle of operation, you do a hundred percent
23 examination of everything to make sure that everything
24 is okay. And from that point onward, this clock
25 starts.

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1 VICE CHAIRMAN BONACA: Okay. Very good.
2 Thank you.

3 DR. FORD: I keep coming back to where
4 there is data out there, statistical data, and Staehle
5 has done a lot of this sort of stuff. Does this come
6 into your argument? I mean, that is scientific data.

7 MR. BEHRAVESH: Those are all of the ones
8 that we -- well, we thought that it was obvious, but
9 apparently they are not. We are collecting it to make
10 this case as you are mentioning, and that is what I
11 keep saying, is that it is ongoing now.

12 VICE CHAIRMAN BONACA: But since you have
13 no history of cracking whatsoever in the 650, and how
14 could you possibly have a probablistic basis? I mean,
15 I don't understand that.

16 DR. FORD: Some of that is based on the
17 laboratory data that --

18 VICE CHAIRMAN BONACA: I'm sorry?

19 DR. FORD: Some of it is based on the
20 laboratory data.

21 VICE CHAIRMAN BONACA: Okay.

22 MR. ROSEN: Well, just because you have no
23 failures doesn't mean that you can't do statistics.
24 You have thousands and thousands of tubes that have
25 been in service for many years.

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1 VICE CHAIRMAN BONACA: I am talking about
2 the fact that you are changing from 1210 to 90 to 60,
3 okay? And you would have to have some criteria of
4 understanding of how, for example, how cracks initiate
5 and develop to the point where you can detect them.

6 I mean, it is not an easy task to simply
7 understand -- well, all right. Why don't we just hear
8 from Mohamad further on this.

9 MR. RILEY: This is Jim Riley again from
10 NEI. Let me talk a little about where we are going
11 here. This is a draft document and I would like to
12 remind everybody of that. The values that have been
13 put into this document initially are based on
14 experience.

15 We have got a bunch of folks who are
16 working on the documents that are experts in the
17 field, and they have a good idea of what is going on
18 out there, both within our country and outside.

19 And they have put together what they
20 believe are achievable inspection intervals. The
21 industry is involved in a study to develop the basis
22 for these intervals to back up what we are putting in
23 this document.

24 Please, right now, these are what we have
25 in a draft document. We are developing the basis to

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1 prove that they are indeed the right intervals, and we
2 will have that done before this document is issued in
3 final form.

4 There are lots of other things that I
5 think Mohamad is going to go into that explains not
6 only the basis, but why these values, even where they
7 are, are quite conservative.

8 We have what is called a degradation
9 assessment, and we have briefly touched on it. A
10 degradation assessment is required before every steam
11 generator inspection, and it is required every time
12 you shut down your plant for a refueling outage, and
13 you take a look at what is going on in my steam
14 generators, and even if I am not doing an inspection.

15 And that degradation assessment looks at
16 what is going on around the industry, and what is
17 going on around the world. Do I have anything, any
18 mechanisms that are going on. If I do, I need to
19 evaluate how that affects me.

20 It may change the time that I have until
21 I do my next steam generator inspection, and it may
22 change what I look at when I do my inspections. These
23 degradation assessments plan.

24 They plan what you are going to look at,
25 and how you are going to look at it, and what

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1 techniques you are going to use. And they, along as
2 you are going through your conditions and looking back
3 and determining what your steam generator looks at,
4 affects your sampling.

5 How much do you sample, and what do you
6 look at, and how do you look at it. All of that then
7 is rolled up into this operational assessment. The
8 operational assessment looks at where am I now, and
9 what is going on, and how long can I go before I have
10 to worry about exceeding the performance criteria.

11 That establishes your next inspection
12 interval. All these values have to be supported by an
13 operational assessment. So there is a lot of things
14 that are going on behind the scenes that back up these
15 values.

16 DR. FORD: And that's why those things are
17 synergistic.

18 MR. RILEY: Yes.

19 DR. FORD: Sorry, Mohamad, that we got off
20 on a different subject.

21 MR. BEHRAVESH: So if they are free from
22 cracking, and you inspect a hundred percent of them in
23 these periods -- and again these go way into the
24 future, and these guidelines are supposed to get
25 revised every two years, which means that if new

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1 information comes up any time within these, that these
2 recommendations will change.

3 DR. WALLIS: I don't understand how that -
4 - how is that compatible with this bottom bullet about
5 no SG can operate for more than two refueling cycles
6 without being inspected. There are lots of refueling
7 cycles within 120.

8 VICE CHAIRMAN BONACA: That is confusing,
9 and I was speaking to that last week, because if it is
10 a hundred percent of the tubes within 120 months, but
11 every other cycle you have to inspect some.

12 DR. SHACK: You inspect a 20 percent
13 sample.

14 VICE CHAIRMAN BONACA: So, I guess --

15 DR. FORD: I guess these are
16 uncertainties, and I was trying to move it along here,
17 guys. My feeling is that all of these questions are
18 tied up with the statistical evidence.

19 DR. WALLIS: Sure. Of course, they are.

20 DR. FORD: They haven't shown us that it
21 will be developed.

22 DR. WALLIS: Well, I think these numbers
23 ought to be deduced from something else. Let these
24 numbers be "X" and you solve from "X" by working out
25 some other --

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1 DR. POWERS: Well, if it helps at all, if
2 I assume that the probability in any given tube cracks
3 is one in a thousand, and I take a sample of a fifth
4 of the tubes, there is about a 50 percent chance that
5 I am going to find any cracks.

6 If it goes up to five out of a thousand,
7 there is only about a five percent chance that I am
8 going --

9 DR. WALLIS: There is one in a thousand
10 that what you are looking for, or one in 10,000 for
11 what you are looking for. Are you looking for one
12 tube or are you looking for 10 tubes typically before
13 you do anything? It is all tied to your action, and
14 I want you to find and detect.

15 MR. SIEBER: Right. Three thousand.

16 MR. BEHRAVESH: In a steam generator where
17 you have two or three thousand, or something about
18 that number of tubes, when you do 20 percent sampling,
19 if you have 11 tubes in there that are cracked, this
20 20 percent sampling allows you to catch at least one
21 of them.

22 DR. WALLIS: Yes, but is 11 tolerable is
23 the question. I mean, what is the threshold were you
24 do something I think is the key question there.

25 MR. SIEBER: Well, you something when you

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1 get the 40 percent through all, and detect that, and
2 a single tube in a steam generator isn't going to
3 corrode and crack all by itself.

4 The whole steam generator starts to go
5 back the very day it is born, okay? So when you take
6 a 20 percent sample, you are going to take a sample of
7 tubes that are beginning to corrode and crack and so
8 forth.

9 And that gives you the confidence to say
10 I generally know what the condition of the steam
11 generator is, even though you may not have found a
12 defective tube, but you will find a corroded tube
13 after a few years.

14 And once you find a defective tube, then
15 all of a sudden --

16 MR. BEHRAVESH: Well, if expansion comes
17 into place, then you look at all of them, as opposed
18 to --

19 MR. SIEBER: And you look at them and
20 everything that you can get to.

21 MR. BEHRAVESH: Yes. The objective is to
22 detect the onset of degradation. All you need to find
23 is one degraded tube, and not even defective. One
24 tube that you believe to be degraded, that puts you in
25 the expansion of your sampling.

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1 Again, these periods must be supported by
2 degradation assessment and operational assessment, an
3 acronym for degradation assessment and operational
4 assessment, which means that if your degradation
5 assessment says that you are more likely to have
6 degradation in your plant, then these things do not
7 hold. They must be revised.

8 This is where the industry experience
9 comes in. You must also satisfy all of the secondary
10 side requirements, meaning that foreign objects and
11 things of that sort.

12 There is also a safeguard in there such
13 that you don't inspect all of the tubes at the
14 beginning of the period, and then go on for 10 years
15 not looking at something, or inspect all of the tubes
16 at the end of the period, going for 10 years and not
17 inspecting everything.

18 And at least 50 percent of them must be
19 done by about the mid-point within the period, and the
20 other 50 percent towards the end. And in all of
21 these, no steam generator can go for more than two
22 cycles without being looked at.

23 And then if cracking is discovered in any
24 time along here, then these things will not hold, and
25 you go to 600 mill annealed requirements, which means

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1 to look at every steam generator at every refueling
2 outage.

3 DR. WALLIS: I could suggest that you skip
4 this one, and it is exactly the same, but it is just
5 different numbers.

6 MR. BEHRAVESH: Different numbers. Now,
7 the basis for this is that you have 15/16 600
8 thermally treated, and you have about the same number
9 of 690 more oncoming on line, and if you look at the
10 industry as one aggregate of so many steam generators,
11 you will find out that with more steam generators with
12 new materials, experience of every one of them must be
13 considered in the collective experience.

14 And such that although a steam generator
15 may not be looked at, although your steam generator
16 may not be looked at at this time, someone else is
17 looking at this, and someone else is looking at this,
18 and all of that information must be considered.

19 And also if cracking is detected the
20 inspection interval has to revert back to the 600 mill
21 annealed, and the second requirement must be met, and
22 of course this is a considerable enhancement over what
23 is currently the law of the land, which is the
24 technical specification, which says that you must do
25 three percent in about every 40 months.

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1 And it doesn't even say that that has to
2 be a different three percent. Effectively, you could
3 go and look at the same three percent sample of tube
4 within 40 months. So it is a big improvement.

5 VICE CHAIRMAN BONACA: When you are
6 looking at this collective experience, I imagine you
7 are also tracking differences in chemistry, and so on
8 and so forth?

9 MR. BEHRAVESH: Yes. That is all part of
10 the degradation assessment.

11 DR. WALLIS: Now, the basis for being more
12 conservative than the current tech spec is presumably
13 experience, and statistics, or something? Is there
14 some reason why you have made it more conservative?

15 MR. BEHRAVESH: Well, if you look at this,
16 these are plans that have 600 mill annealed material
17 that have all degraded, and 3 percent would have been
18 hardly sufficient to detect the onset of that.

19 DR. WALLIS: So then you can do so kind of
20 math which says three percent leads to something
21 unacceptable?

22 DR. POWERS: You need another term that we
23 just don't have I think, Graham, to answer the
24 question; and that is that given that there is a crack
25 in a tube that you don't know about, what is the

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1 probability that that tube will rupture during a cycle
2 of operation. And that is a number that I just don't
3 know.

4 MR. BEHRAVESH: That's right.

5 DR. WALLIS: Yes, but apparently his
6 experience has led him to change the inspection, and
7 so there must be some kind of qualitative connection
8 between what you expect and what you --

9 MR. BEHRAVESH: Yes. The operational
10 experience. Remember that I said these guidelines,
11 and these recommendations have been evolving over a 20
12 year period.

13 And so once you started seeing a cracking
14 through this type of material, it was obvious that the
15 three percent was not the right number. And I doubt
16 that it has been exercised by anyone.

17 On the matter of data quality, is that the
18 question is the data getting noisy to the point of
19 effecting detectability and sizing, and this is really
20 a synopsis of all the objectives for data quality.

21 And then these examination techniques
22 specification sheets are all those attributes of a
23 technique and system and those parameters that you
24 need to follow.

25 And then if data gets to get noisy and

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1 affects these parameters, and affects your probability
2 of detection, and so the question again is to have the
3 bounds of these examination technique specification
4 sheets, and if performance has been exceeded such that
5 the performance indices have been degraded, these are
6 the basic questions that are being asked.

7 And as a result, the guidance provides
8 frequency, location, acceptance criteria, and
9 corrective action for each of the listed quality
10 parameters. And these are some of the attributes of
11 Revision 6 of the guideline.

12 Currently as I mentioned, too, the draft
13 of the guideline is outside for review, and we expect
14 to get comments by December 18th, and start evaluating
15 those comments early in January, with the hope of
16 getting this revision out by the middle of the year.

17 VICE CHAIRMAN BONACA: That is the same
18 question that we had during the subcommittee meeting,
19 and again you presented to us a plan that is going
20 from a description inspection intervals to
21 prescriptive inspection intervals.

22 MR. BEHAVESH: Okay. Let me take a
23 minute to answer that.

24 VICE CHAIRMAN BONACA: You didn't say
25 anything about changing to --

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1 MR. BEHRAVESH: Sure. I was looking at
2 the time. Let me take a minute to address that.
3 Everyone talks about prescriptive versus performance
4 based, and most of them are saying that ultimately we
5 have to go by way of performance based, where the
6 prescriptive methodology is not good.

7 What you need to do in order to do
8 performance based is that you need two things to do
9 performance based. You need data and you need
10 methodology. You can sit around the table and discuss
11 methodology as long as you want until you agree upon
12 methodology and put it aside.

13 When it comes to data, you can't
14 manufacture data. You can manufacture history, and
15 you have the data that you have. Now, if you take
16 that data and put it through the methodology, then are
17 you willing to accept the outcome.

18 If the outcome is very good, chances are
19 that the outcome will be more credible. If the data
20 is questionable, then the outcome would not be very
21 good.

22 The industry recognizes that the NRC
23 recognizes that the way to go about this performance
24 based, but right now if you don't have sufficient data
25 as we have had an example, you put the data that you

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1 have in the methodology, and it comes out and says
2 here you can go for about 22 years and not look at
3 this thing.

4 And everybody says, whoa, wait a minute.
5 Do I really want to go 22 years without looking at
6 this, and then you step back, and then the question is
7 asked, well, what is the problem. Why don't you
8 accept this.

9 Is it the methodology that you don't
10 accept, or is it the data that you don't accept.
11 Well, data is what you got. There are 690 and there
12 are two plants in the U.S. that have the experience of
13 about 8 years or so.

14 Is that sufficient information, and you
15 can debate that. Is that good enough information, and
16 you can go along with it and accept it, and so as
17 experience, as this collective experience is
18 accumulated for all these plants, the industry as a
19 whole will be in a much better position to use that
20 data and put it in an acceptable methodology to come
21 up with performance based.

22 And we have provisions for performance
23 based within Revision 5 of the guideline, as well as
24 within Revision 6 of the guideline. In Revision 5, no
25 one had taken it up.

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1 In Revision 6, some people have sort of
2 experimented with it, and they are sort of discussing
3 it, and discussing whether they want to go along with
4 it or not.

5 And we anticipate that there will be more
6 exercises in that arena and with the new agreements
7 that are being discussed with NRC, there will probably
8 be some limitations on the maximum interval that the
9 utility can go without getting that approved by the
10 NRC.

11 And I think Jim Riley had some concluding
12 remarks as part of our collective representation.

13 MR. ROSEN: Well, I had something to say
14 on a different issue.

15 DR. FORD: I will allow 10 minutes at the
16 end here to ask the Committee here their advice as we
17 move forward on this. So between the two of you can
18 you take 10 minutes?

19 MR. RILEY: I think it is going to take me
20 longer to walk up there than it is to tell you what I
21 have to tell you here.

22 DR. FORD: All right.

23 MR. RILEY: I am kind of jumping subjects
24 on you here a little bit. My name is Jim Riley, and
25 I am NEI's project manager for steam generator issues.

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1 And I came here to talk about another item
2 that we are addressing as an industry, specifically on
3 an application of safety factors in one of our
4 performance criteria.

5 Now, this issue has not come up today,
6 but I will go ahead lay it on you anyway. We are you
7 know have been working on this generic license change
8 package for a number of years, and as it is getting
9 nearer to its completion, we have asked the NSSS
10 vendors to take a look at what we are putting down
11 here to make sure that we are consistent with the
12 design basis requirements.

13 Let me step back a little and put this
14 into context. As you have already been told, NEI 97-
15 06 is the overall document that governs steam
16 generator programs. Its details are handled through
17 a whole series of EPRI guidelines.

18 NEI 97-06 establishes what are called
19 performance criteria to make sure that your steam
20 generators continue to operate properly. There is
21 three of them.

22 There is a structural integrity
23 performance criteria which is what its name implies,
24 and which ensures that the tubes are capable of
25 withstanding the forces that they are going to need to

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1 withstand in order to prevent their failure.

2 There is an accident-induced leakage
3 performance criteria that addresses how much they can
4 leak, which again is based on design basis
5 requirements and exposures, and those kinds of things.

6 And then there is an operational leakage
7 performance criteria, which is one that you can
8 actually measure real time while you are operating,
9 and it is basically just a leakage requirement, a
10 primary-secondary leakage requirement.

11 The three of them together act to ensure
12 or to maximize the probability that you will maintain
13 tube integrity between steam generator inspections.
14 And that is the whole goal of what we are doing here.

15 You know, the old tech specs were very
16 prescriptive, and very small sample sizes, and they
17 were based on surveillances that you did every time
18 you shut down the new steam generator for inspection.

19 This whole program is set up much more on
20 maintaining tube integrity. It includes not only a
21 look back at what my condition is right now, but it
22 includes methodologies to look forward, and to make
23 sure that the next time that you shut down and do an
24 inspection, there is a very high probability that you
25 will continue to meet your performance criteria.

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1 So within all of this mixture, performance
2 criteria are very important. They are central. As we
3 were reviewing the performance criteria this summer,
4 we found an issue that needs to be addressed, and
5 right now it is an open issue, and I am not going to
6 be able to give you much detail at all on the
7 specifics because we are still looking at it.

8 But this is a performance criteria for
9 structural integrity. I won't read the whole thing.
10 The underlying portion of this is the portion that we
11 have some questions about, and it has to do with what
12 safety factor you apply to the loads during an
13 accident condition.

14 The current performance criteria says that
15 you apply a safety factor of 1.4. It turns out that
16 when we asked the NSSS guys to take a look at it,
17 there was some questions about how that 1.4 is being
18 applied under the different designs, and whether that
19 criteria is accurate for everybody.

20 Now, all I can tell you at this point is
21 that we are undertaking some work internal to the
22 industry to take a look at how this 1.4 is applied,
23 and may possibly end up revising the performance
24 criteria to make sure that what it states can be met,
25 will be met, for all the NSSS designs for the

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1 different steam generator designs that are out there.

2 We will incorporate that change, that
3 generic license change package revision as we proceed
4 for its final submittal to the staff at the middle of
5 this year.

6 And we will involve the staff in our
7 discussions on what we come up with on this
8 application for safety factors and as we come up with
9 something more concrete. But this is another open
10 issue. That's really all that I have to say in the
11 interest of moving things forward.

12 DR. FORD: Thank you.

13 MR. RILEY: If you have any questions on
14 NEI 97-06, or how this all fits together --

15 DR. WALLIS: Well, it seems to me that the
16 testing has got to be related to the performance
17 criteria.

18 MR. RILEY: It certainly is.

19 DR. WALLIS: And somewhere or another
20 there must be a link that is explicit.

21 MR. RILEY: The testing that we do is
22 called condition monitoring, and it is done every time
23 you do an inspection, and the testing includes all the
24 stuff that Mohamad was talking about, or that his
25 guidelines talk about.

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1 DR. WALLIS: He didn't explain how it is
2 related to the performance criteria.

3 MR. RILEY: No, there is a different
4 guideline that is called the integrity assessment
5 guideline.

6 DR. WALLIS: But they must be linked. You
7 don't want to assure the others.

8 MR. RILEY: Yes. And the results of the
9 testing gets fed into an integrity assessment that
10 actually does an analysis of whether or not you meet
11 the performance criteria now, and whether you will in
12 the future.

13 DR. WALLIS: Good. Thank you.

14 MR. RILEY: You're welcome.

15 MR. MURPHY: Okay. I am Emmett Murphy of
16 the Materials and Chemical Engineering Branch, NRR,
17 and I have a relatively short presentation, but I am
18 going to go out of sequence right from the get go.

19 I want to first talk about performance
20 sine what I say here I think will serve as useful
21 background purposes for subsequent discussion about
22 inspection interval issues.

23 During the briefing that we provided to
24 the subcommittee last week, questions were raised with
25 respect to the basis and the adequacy of performance

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1 criteria that are being proposed for inclusion as part
2 of the generic license change package.

3 Before answering that question directly,
4 I would like to just reiterate that it was the intent
5 -- it was ours and the industry's intent when
6 developing these performance criteria to maintain
7 consistency with the original design basis, in terms
8 of structural margins and in terms of accident induced
9 leakage.

10 This is also consistent with the
11 philosophy of Section XI of the Code, which in the
12 absence of a specific safety margin criteria, directs
13 you back to Section III of the Code.

14 Also, these criteria are consistent with
15 the current licensing basis of PWRs as embodied in the
16 specification plugging limits. But are these -- well,
17 before getting on to your question then, with respect
18 to the issue that Jim Riley was just discussing
19 concerning the 1.4., I can't really respond to what he
20 said yet until we see what they come up with.

21 All I can tell you right now is that it
22 has been our intent to maintain consistency with
23 design basis and with the licensing basis, and to the
24 extent that we have not fully done that, then of
25 course we will be open to discussing how we do that,

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1 and I will just leave it there.

2 With respect to the thrust of your
3 question from last week, I think we have to turn to
4 experience, and what does experience tell us about the
5 adequacy of these criteria.

6 We have had eight tube ruptures. When you
7 examine the circumstances of these eight tube
8 ruptures, the safety margin goal that you are trying
9 to maintain really was not material to the
10 circumstances of the rupture.

11 Five of these ruptures took place because
12 the utility was not aware of the damage mechanism
13 taking place in its generators. Irrespective of
14 structural margins that you are applying to your
15 analyses, if you are not aware of the mechanism, it is
16 going to hit you.

17 On three of the ruptures, the licensee
18 utility had some knowledge of the damage mechanism,
19 but he was not adequately managing the program, either
20 because of inadequate inspections, or inadequate
21 assessment of how quickly the damage mechanism was
22 progressing.

23 Again, a question or an issue of safety
24 margins was not really material to the circumstances
25 of the rupture. I think we also need to consider risk

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1 when answering the questions that arose last week.

2 The staff has examined risk issues
3 pertaining to tube integrity in NUREG-0844, the steam
4 generator U.S. side program. Also more recently, in
5 NUREG-1570. In spite of the eight tube rupture events
6 to date, the risk associated with spontaneous SG-TR
7 events has been found to be acceptably low.

8 Similarly, the risk associated with tube
9 ruptures which occur as a consequence of transients or
10 accidents that are within the design basis again have
11 been found to be acceptably low.

12 Before going on, and as background for our
13 next discussion on inspection intervals, I think it is
14 important to note that this risk experience reflects
15 the way that steam generators have been managed
16 through the years.

17 And one of the important attributes of
18 that management process has been to inspect steam
19 generators in general in every refueling outage. Very
20 few plants have ever had the opportunity to operate
21 for more than a single fuel cycle between inspections.

22 When plants were first coming on line in
23 the late '60s and early '70s, they ran into problems
24 very quickly, and they didn't have the opportunity to
25 take advantage of the 40 month provision in the tech

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1 specs.

2 It has only been in very recent times, and
3 I don't know how many plants with the latest
4 replacement generators were able to take advantage of
5 the 40 months. I think it is only a handful; 1, 2, or
6 3, something along that order.

7 And in the main through the years people
8 have been examining their steam generators every fuel
9 cycle, and these risk numbers reflect that practice.
10 And as we contemplate moving to longer intervals, we
11 have to consider what are the risk implications.

12 Are we able through inspection and
13 analysis and tube integrity assessment to ensure that
14 the necessary margins will be maintained. And a final
15 point about risk, is that the studies that have been
16 performed do show that medium performance criteria are
17 also important from the standpoint of minimizing
18 severe accident risk beyond design basis type
19 situations.

20 However, severe accident risks as you,
21 know, clearly there is a lot that we don't know about
22 it as of yet, and it is a subject that is being
23 assessed as part of the SG action plan.

24 That program addresses issues addressed or
25 identified by ACRS in its DPO findings, and it is our

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1 objective that an approved generic license change
2 package will not increase risk relative to the current
3 regulatory framework.

4 We will go now to inspection intervals,
5 and let me make a couple of observations here up
6 front. I think as we sat in the back of the room
7 listening to some of the proceedings it was observed
8 that perhaps there is some confusion or some confusion
9 between the performance-based attributes of the
10 framework, the new framework that we are trying to put
11 into place in the tech specs, versus a prescriptive
12 versus performance based strategy for dealing with
13 inspection intervals.

14 We are putting into place a framework
15 which is performed based in the sense that the
16 specific objective of the program is to ensure that
17 you are meeting the performance criteria; rather than
18 to ensure that you are inspecting every so often, and
19 you are plugging tubes essentially at 40 percent.

20 But the specific objective is to or the
21 main objective is to ensure that you are meeting the
22 performance criteria, and that you periodically assess
23 the condition of the generators relative to that
24 performance criteria.

25 And in that sense we are performance

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1 based. The tech specs do not include the development
2 of strategies for determining inspection intervals
3 that are also performance based. That is, you have
4 determined how long you can operate before you will
5 exceed the performance criteria.

6 As we discussed last week, and as we have
7 been talking about today, so far the guidelines are
8 not sufficiently well developed to allow people to
9 make these kinds of determinations accurately.

10 And so we rely on a prescriptive strategy,
11 which based on experience expects to prove corrosion
12 resistance of the material, and give us reasonable
13 assurance that we will be maintaining the performance
14 criteria.

15 Time is very limited, but we have had the
16 opportunity to look at the strategy, the prescriptive
17 strategy that Mohamad was presenting earlier, and we
18 commented on that strategy quite extensively back in
19 September.

20 We identified quite a number of issues,
21 and among them was the importance of receiving as much
22 information as can be gathered concerning operating
23 experience with the Alloy 600 thermally treated and
24 Alloy 690 thermally treated tubing.

25 We were aware of reported incidences of

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1 cracking abroad, and we didn't know the circumstances,
2 or even if it was real, or if people were just making
3 conservative calls. So, we do think that this is an
4 important consideration as we consider revising the
5 prescriptive strategy for determining inspection
6 intervals.

7 The second important issue has to do with
8 the definition of active degradation. Mohamad talked
9 about operating for 2 or 3 cycles, depending upon your
10 tube material, to the extent that you are free of
11 active degradation.

12 Well, that is not quite exactly what they
13 mean. Active degradation doesn't mean the absence of
14 degradation activity under the proposal. It does
15 allow for a certain minimal or a certain level of
16 degradation.

17 And we think that there needs to be a
18 tightening up of that definition to ensure that we
19 don't have significant degradation actively taking
20 place, particularly cracking activity, if one is going
21 to be operating for multiple intervals.

22 DR. FORD: Just to -- Emmett, because of
23 time, do I in just reading the rest of that, you
24 really are reiterating the concerns that we have
25 independently brought up. Is there anything new with

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1 the "burst" small volumetric flaws? What is that in
2 relation to, the last bullet?

3 MR. MURPHY: This is an issue that is not
4 uniquely related to inspection intervals. It is a
5 general issue that exists with respect to how you
6 conduct condition -- as to how you conduct operational
7 assessment relative to the performance criteria for
8 small volume flaws.

9 It is an issue that has existed all along
10 up to now, and going to a new regulatory framework
11 doesn't change the significance of this issue, unless
12 you are going to operate from alternate intervals.

13 To the extent that the treatment of small
14 volume flaws relative to performance criteria is to
15 the extent that that treatment is not appropriate,
16 then if you go to longer intervals, then you can
17 aggravate the potential risk associated with that.

18 So we would need -- that to the extent
19 that we are going to go along with longer intervals,
20 we need some interim approach for ensuring adequate
21 safety margins for small volumetric flaws.

22 DR. WALLIS: I hate to slow you up --

23 MR. MURPHY: Well, let me make one more
24 comment.

25 DR. WALLIS: This is the first time in

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1 time detectable cracking that I have seen any evidence
2 that this inspection procedure somehow is related to
3 what you think of the actual characteristics of the
4 material.

5 How does it behave is probably related to
6 what you do, and this is the first time that I have
7 seen any kind of mechanical term defined which you are
8 actually trying to detect.

9 And so it would be useful if there were
10 some scientific basis for how you expect things to
11 perform, and what you do in order to measure various
12 characteristics of performance.

13 MR. MURPHY: Well, we have a fleet of
14 plants out there with advanced materials, and there
15 will be plants on the leading edge in terms of the
16 accumulated operating time.

17 DR. WALLIS: Well, I am not saying that.
18 I mean, it is not a random process. Either they fail
19 randomly or there is some kind of physics which says
20 that they tend to last pretty well up to certain
21 times, and then they begin to crack.

22 And then they are all going to crack very
23 soon after that. That there is some kind of
24 mechanical basis for how you expect them to perform,
25 and which has terms associated with it.

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1 And that has got to be related to what you
2 actually have as a strategy to inspect, and this is
3 the first time that I have seen a term actually
4 brought up in the discussion.

5 MR. MURPHY: Okay. Well, let me just make
6 one other general point. It is not the objective. It
7 has never been the staff's objective either with the
8 old regulatory framework or with this new one to
9 eliminate the likelihood of future tube ruptures.

10 The strategies that we have been
11 considering are not going to accomplish that
12 objective. It is to maintain the frequency of such
13 occurrences, tube ruptures or situations where we
14 don't meet the performance criteria's sufficiency low
15 frequency, and that the risk implications are
16 acceptable.

17 DR. KRESS: Do you have a number for that
18 sufficiently low frequency that you want to give us?

19 DR. POWERS: If I back calculate from the
20 numbers, and assuming that the past frequency is
21 acceptable, which I think Emmett said, it turns out
22 that they want to be 99 percent sure that tubes are
23 not cracking. And it comes out in such a round number
24 that I can't believe it is an accident.

25 DR. WALLIS: Well, that must be based on

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1 some model of how they crack.

2 DR. POWERS: It is strictly a probablistic
3 model.

4 DR. WALLIS: Yes, assuming that it is
5 random.

6 DR. POWERS: Yes.

7 DR. WALLIS: But it ain't random.

8 DR. POWERS: Well, I don't know whether it
9 is or not, but what struck me as interesting is the --

10 DR. WALLIS: Well, old tubes are more
11 likely to crack than new ones presumably. So, it is
12 not random.

13 DR. FORD: I'm just forgetting the time.
14 Mr. Chairman, what leeway do I have on time? I mean,
15 we can call a halt right now.

16 VICE CHAIRMAN BONACA: Well, I was just
17 pointing out that we had a goal to even shorten the
18 upcoming 50.44, and so your time is very short. I
19 would say another five minutes, and then that's it.

20 DR. FORD: So, five minutes?

21 VICE CHAIRMAN BONACA: Yes.

22 MR. MURPHY: All right. I would like to
23 complete a thought. It is not our objective to
24 prevent tube ruptures entirely. In some small
25 frequency of tube ruptures and failure to meet the

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1 performance criteria is not going to be unacceptable.

2 With that in mind, I would argue that it
3 is possible to entertain the notion of longer
4 inspection intervals before you developed
5 methodologies and data, and have data concerning how
6 long it is going to take to develop degradation
7 mechanisms that you have not seen before; new cracking
8 mechanisms and I-690, for example.

9 How long is it going to take to initiate
10 those cracks before it may threaten the performance
11 criteria. So long as the industry works in a
12 coordinated fashion, and everybody is aware of
13 everybody else's experience, and to the extent that
14 one plant is finding cracking, then that information
15 is disseminated among all the utilities.

16 And then all the utilities take that
17 experience into account in determining when they
18 should be doing their inspections. This kind of
19 empirical or approach based on experience I think if
20 properly set up and properly designed will do or will
21 accomplish the objective of minimizing the frequency
22 at which you're not meeting the performance criteria
23 and minimizing risk at acceptable levels.

24 That concludes my comments.

25 DR. FORD: Bear in mind that the objective

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1 of this particular presentation was to let the full
2 committee know where we stood on that particular steam
3 generator program, and to give advice on any of the
4 outstanding technical issues that still remain as they
5 go into the home stretch.

6 Obviously, we don't have time for us to go
7 around the table, and I would suggest that we do that
8 when we come to the letter writing session. Thank
9 you.

10 MS. LUND: Excuse me, but could I make one
11 quick comment? On the handout, I noticed that there
12 was a typographical error, and I just wanted to bring
13 that to everybody's attention on the last page.

14 Emmett, I assume that it is fuel cycles
15 not to exceed 24 effective full power months, correct?

16 MR. MURPHY: That's correct.

17 MS. LUND: Okay. It says EFPY, but it is
18 actually supposed to be EFPM, and so as long as this
19 is transcribed, at least we have it in the record,
20 okay?

21 VICE CHAIRMAN BONACA: Thank you. Any
22 other questions or comments from the members? If not,
23 we will recess now for 15 minutes.

24 (Whereupon, at 10:01 a.m., the meeting was
25 recessed, and was resumed at 10:18 a.m.)

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1 CHAIRMAN APOSTOLAKIS: The next topic is
2 Proposed Rulemaking for Risk Informed Revision to 10
3 CFR 50.44. Dr. Shack is the Chairman of the
4 Subcommittee.

5 DR. SHACK: Okay. We previously reviewed
6 a staff feasibility study of developing a risk
7 informed version of 50.44, and we now have a draft
8 version of the rule, and it is presumably the first
9 fruits of the Option 3 approach, and Mr. Markley will
10 be giving us an introduction to the proposed rule.

11 MR. MARKLEY: Good morning. My name is
12 Tony Markley, and I work in the Office of Nuclear
13 Reactor Regulation. I think you know one of my
14 siblings here at the table.

15 Before we get too much further, I would
16 like to introduce to you our project team. We formed
17 this team back in early March. To my left is Mike
18 Snodderly, who is in the Division of Systems and
19 Safety Analysis.

20 We have in the audience Jim Pulsipher, who
21 worked with us on the standard review plan and other
22 input; David Cullison, who worked with the regulatory
23 guidance; Pete Precinas and Charlie Tinkler from the
24 Office of Research; Kerri Kavanagh, who worked with us
25 on tech specs; and a number of other folks who

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1 provided us input on new reactors and so forth.

2 Basically, we are here today to discuss
3 the draft proposed rulemaking for Risk Informed 50.44,
4 and we would appreciate receiving your feedback on our
5 plans as we present them to you on moving forward with
6 that rule making.

7 With respect to the background, as Dr.
8 Shack indicated, this issue has been before the
9 Committee in the past in the form of SECY-00-0198,
10 where a framework for risk informing Part 50
11 regulations was presented.

12 In addition, in that paper the
13 presentation also included some specific
14 recommendations on how we were going to proceed with
15 risk informing 50.44, and we also included within that
16 paper an attachment that addressed some of the issues
17 that the petitioner, MR. Bob Christie, had raised with
18 respect to 50.44.

19 Since that time, we have received a staff
20 requirements memorandum from the Commission in
21 January, that directed the staff to proceed
22 expeditiously with the rulemaking on Risk Informed
23 50.44.

24 We sent another paper to the Commission in
25 August, and that was SECY-01-0162, that specifically

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1 indicated the staff's plans for moving ahead with
2 50.44.

3 There were some changes in approach that
4 were identified in that paper. The first was that as
5 opposed to providing a voluntary alternative rule
6 making for 50.44, the staff looked at the fundamental
7 mission of what RIP50, Option 3, was all about.

8 That was going back and looking at the
9 fundamental reason why we had a regulation, and what
10 does it do, and how does it work. And then once we
11 had established a need for that regulation, we took
12 risk insights and risk information to look at the
13 relative importance of what we think we need for
14 regulation in that area.

15 And then to the extent possible
16 afterwards, we tried to incorporate some performance
17 based concepts in the regulation, and specify more of
18 what is to be done, as opposed to how to do it.

19 So this was discussed in the SECY that
20 went up in August, and there was another item that
21 went up and that was a major issue in that paper. One
22 of the issues that was identified in this RIP50 option
23 pre-process associated with 50.44 was an issue
24 associated with the MARK III blowing water reactor
25 containments, and the PWR ice condensers.

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1 The issue basically involves if you look
2 at the risk significance sequences for those
3 facilities that would get you into a severe accident,
4 if it involves station blackout, then was there a need
5 for independent or backup power to the igniter systems
6 of those facilities.

7 This was identified as a generic safety
8 issue and has been transmitted to the Office of
9 Research, and the Office of Research is now in the
10 process of evaluating that issue.

11 And that is moving on an independent track
12 to the rulemaking. So we are not constrained in terms
13 of moving ahead by the resolution of that generic
14 safety issue.

15 With respect to stakeholder interactions,
16 we have had numerous public meetings on what --

17 CHAIRMAN APOSTOLAKIS: Are you going to
18 use your transparencies or --

19 MR. MARKLEY: I'm sorry. I am going right
20 ahead here. We will get this up. I had a captive
21 audience here that was paying attention to my speaking
22 and no watching the board here.

23 Now, we did have quite a number of
24 stakeholder interactions on this subject. We held
25 meetings and workshops in 1999 and 2000, and based on

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1 the input and feedback that we received back from
2 that, that has been taken into consideration, in terms
3 of where we stand on this proposed rule.

4 We also had a Commission briefing
5 associated with the Option 3 and some of the other
6 risk informed initiatives in July. In addition to
7 that level of stakeholder interaction, the Commission
8 also asked the staff to make draft rule language
9 available to stakeholders.

10 And as of November 14th, we did have draft
11 rule language for 50.44, as well as some bracketed
12 information, to try and provide stakeholders some
13 additional insights into where we were headed with
14 that regulation, rather than just raw old language on
15 the paper for them to try and guess at the meaning.

16 So we received a few comments and
17 questions and so forth on that, that we have had by
18 means of telephone communications and so forth, but we
19 have yet to have any formal comments submitted.

20 Well, I take that back. We did receive
21 Mr. Christie's comments yesterday, which I believe you
22 received as well. So with that, let's go to the next
23 slide.

24 Basically where I want to take you with
25 what we are doing with this rulemaking today is

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1 basically a summary of the changes -- where we are,
2 and where we are going, and what we believe the rule
3 is going to look like.

4 For currently licensed and future reactor
5 licensees, this rulemaking will eliminate the design
6 basis accident as a source of significant combustible
7 gas.

8 Based on the analysis and the work that
9 was done in the framework, and previous studies, and
10 so forth, the design basis LOCA accident just cannot
11 produce enough combustible gas to challenge
12 containment.

13 The second thing that this rule will
14 accomplish is that it eliminates. Because the design
15 basis accident in essence goes away, you are more
16 concerned with beyond design basis, and consider
17 accidents.

18 And you no longer have a need for
19 recombiners, or purge and repressurization systems.
20 So this rule eliminates the requirements for those.
21 Once again because the design basis accident is
22 eliminated, your monitoring systems and other
23 combustible gas control systems no longer meet the
24 definition of equipment required to be safety related.

25 So what this will in essence do will allow

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1 the commercial grade procurement of these items. The
2 next item. While these are -- well, while the items
3 that I have discussed already allows a significant
4 level of burden reduction for current licensees and
5 future licensees, there are a number of regulations
6 within 50.44 that are still pertinent. And this
7 rulemaking endorses those regulations.

8 DR. SHACK: One thing I noticed is that
9 most of this is consistent with what you had in the
10 feasibility study. The one element that I found that
11 was different was that you were retaining the 75
12 percent hydrogen generation; whereas, the feasibility
13 study talked about coming up with a combustible gas
14 source term that was more mechanistically based.

15 And you seemed to have punted on that. Is
16 that a matter of time, or you just decided that it
17 wasn't worth the effort?

18 MR. SNODDERLY: Dr. Shack, let me try to
19 address that. Basically what we found was that the
20 time frame that had been established for completing
21 the hydrogen source term was such that it was going to
22 hold up the rule.

23 And the Commission challenged us to
24 present alternatives for speeding up the rule. One of
25 the options that we presented was to use the 75

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1 percent metal/water reaction, and that has been
2 produced to the Commission, and we have not heard from
3 them one way or the other on how we should proceed.

4 But we were told to continue to proceed,
5 and we have done so. But we feel that the -- and we
6 discussed the adequacy of the 75 percent metal/water
7 reaction in Section 4 of the paper.

8 And basically what we found was that the
9 hydrogen source term work that was performed by the
10 Office of Research -- Charlie Tinkler and Pete
11 Precinas are here today from the Office of Research to
12 help support us.

13 But what we found was that the hydrogen
14 generation -- that there is two key variables when
15 designing a hydrogen control system. One is the
16 amount of hydrogen, and the other is the generation
17 rate.

18 And what we found was that the generation
19 rates that were used in the design of the existing
20 systems are comparable to the generation rates that
21 are being calculated in the latest calculations.

22 So that gives us a level of comfort to go
23 ahead and continue with the 75 percent metal/water
24 reaction as an adequate basis for the purposes of this
25 rulemaking.

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1 MR. MARKLEY: One thing that I would like
2 to comment on is that the thought and the idea as far
3 as evaluating the individual source terms, and going
4 through uncertainty analysis, that effort is still
5 under way, and is progressing as we speak.

6 Its function will be more to help resolve
7 that generic safety issue associated with the MARK
8 IIIs and PWRI condensers. We will get some additional
9 information as far as other containment types, but the
10 initial indications that we have coming back from that
11 is that even with this source term here, we are still
12 on the mark for where we need to be with this
13 regulation.

14 DR. SHACK: Why embedded in the rule,
15 rather than -- you know, than putting it in some
16 guidance document?

17 MR. MARKLEY: Essentially, this is a
18 historical construct. One of the things that we are
19 looking at is that we are risk informing, and we are
20 trying to make the rule more aligned to the needs that
21 are out there.

22 The decision was made to utilize this, as
23 opposed to trying or as opposed to waiting for perhaps
24 more detailed information.

25 DR. SHACK: Well, I can see utilizing it.

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1 But once you put it in a rule though, then it is a
2 rule change, and you are going to have a Reg guide
3 associated with this rule anyway. Why not --

4 MR. MARKLEY: Does it potentially beg
5 another rulemaking down the road if we get better
6 information and so forth? Yes, it possibly does.
7 That is a risk that you do take by putting this in
8 here.

9 Okay. The last bullet on this page also
10 deals with a petition that we received. We became
11 aware of this petition a little bit later in the
12 process. Another part of our organization was working
13 on it, and looking at it.

14 We had already made a decision to focus
15 the applicability of this rule on the containment
16 types, and the challenge to those containments, as
17 opposed to using specific fuel cladding information.

18 And whether it is a Zircalloy or ZIRLO, or
19 that sort of thing. So we had already encompassed
20 that when we became aware of this. So that is another
21 change to this rule. And the next slide.

22 DR. SHACK: And couldn't -- well, couldn't
23 that potentially affect the source term though?

24 MR. MARKLEY: We are not so much -- I
25 think in this case if we are looking at the studies,

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1 the source term that is out there for the large drawn
2 and sub-atmospherics will not challenge the
3 containments.

4 The source term that is utilized in the
5 MARK I's and MARK II's will not challenge those
6 containments because those are maintained inerting,
7 and we are maintaining the requirements for those.

8 The question is whether the PWR ice
9 condensers and the MARK IIIs. We don't have a final
10 answer yet on whether this source term would be
11 significantly increased for those facilities, or it
12 could be less for those facilities.

13 We are relying on this research to be
14 accomplished, and that research is supporting the
15 generic safety issue. And that generic safety issue
16 as I indicated earlier is on its own independent track
17 for resolution.

18 And what comes out of that could affect
19 rulemaking in terms of the PWR ice condensers and BWR
20 MARK IIIs, or it could affect plant specific backfits
21 if you will.

22 You are looking at a very defined set of
23 population with the BWR MARK III containment types.
24 I think there is four in the country, and then the ice
25 condensers, I think there is eight facilities for

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1 those.

2 So it is a discreet population that you
3 are dealing with. So our decision at this point is to
4 let the generic safety issue sort itself out, and what
5 comes out of that, then we will look at the
6 implications of that, and whether we need to go to
7 plant specific backfits, or do we need to get back
8 into the rulemaking space to adjust what we have here
9 for the ice condensers and MARK IIIs.

10 On our next slide, the first bullet for
11 future reactors is we took advantage of this
12 opportunity at risk-informing 50.44 to try and
13 consolidate a lot of the combustible gas regulations.

14 Part 52 has a reference in there that
15 endorses the technical requirements of 50-34(f), and
16 we essentially pulled those at the same level that
17 they currently exist into the revised 50.44, with two
18 exceptions.

19 The exceptions of course being as noted on
20 the previous page that you don't need recombiners, and
21 that you are allowed a commercial grade other
22 combustible gas controlled systems and monitoring
23 systems.

24 There were some other conforming changes
25 that we had to consider when making this change. We

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1 looked at that, and we made a change to -- this says
2 50.43, and that should be 50.34, and that is a typo on
3 my part, but 50.34(a)(4).

4 And we are revising that to make sure that
5 the need for high-point vents for the reactor coolant
6 system is addressed in the applicant's PSAR. We are
7 also revising adding a new paragraph (g) in 50.34 that
8 will ensure all new applicants include the analysis
9 required by 54 in their applications.

10 And the issue with the high-point vents.
11 This was an interesting issue that we discussed in the
12 team. It basically came down that the high-point
13 vents were more associated with proper ECCS
14 functioning than it really dealt with combustible gas.

15 Now, it did provide a combustible gas
16 source term to the containment, which the containment
17 systems have to deal with, but we felt that this
18 regulation was really misplaced in 50.44, and so we
19 are going to move that to 50.46, in a new a paragraph
20 in 50.46.

21 Now, in moving this, I will say that there
22 is an independent effort that is trying to risk-inform
23 50.46. So we chose not to try and improve the
24 language or the risk basis for these high-point vents.

25 Rather, we let the team that was working

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1 on that project have that opportunity. The last item
2 on this page is the change to 52.47. That is that
3 reference to the technically pertinent requirements of
4 50.34(f), the post-TMI stuff.

5 What we essentially did was say that
6 except for X, X, and X, that would have referred them
7 to the requirements if it was combustible gas control
8 systems.

9 And essentially that is it with respect to
10 where we are trying to go with 50.44. Now, we do have
11 two other slides here that I wanted to present to you,
12 because we do have two petitions for rulemaking and
13 you have been apprised certainly of one, if not both
14 of them.

15 The first one, of course, is Mr. Christie,
16 who has made presentations here in the past. The
17 proposed rule and his petition are significantly
18 consistent in terms of where he felt the regulation
19 ought to go, and in terms of what we came up with, and
20 where we believe the regulation ought to go.

21 There is only three areas that we differ
22 a bit, and one is the functional requirement for
23 hydrogen monitoring. He didn't think that there was
24 a need for monitoring. Well, from a combustible gas
25 basis, we would tend to agree with him.

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1 However, the monitoring of combustible gas
2 in the containment is pertinent in your response to
3 the emergencies, both for the actions that the
4 operators would have to take, as well as input into
5 emergency planning decision makers on whether your
6 containment barrier is being challenged, and do you
7 need to initiate protective action recommendations to
8 either evacuate the surrounding population, or have
9 them sheltered.

10 And so the monitors still provide a
11 significant function, but it just is not combustible
12 gas control. And since we are looking at a regulatory
13 efficiency issue, would it be better to just keep all
14 this monitoring here in one place, or try and put it
15 in emergency preparedness and so forth, and we look
16 from an efficiency standpoint to maintain it in the
17 existing 50.44.

18 The other area that we differed from Mr.
19 Christie's petition is the capability for ensuring the
20 mixed atmosphere. We still feel that is very
21 important, and that they have either passive or active
22 means to have a mixed atmosphere, and to preclude
23 detonations.

24 We will probably still have the potential
25 for the flaming or the burning of the hydrogen, but we

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1 would certainly like to preclude the detonation aspect
2 of it.

3 DR. SHACK: You had indicated that you
4 would accept either passive or active means?

5 MR. MARKLEY: That is the way that it
6 currently exists.

7 DR. POWERS: Right. When they propose the
8 passive means; that is, natural circulation will
9 accomplish the mixing, what standards of proof do you
10 require on that?

11 MR. SNODDERLY: Dr. Powers, I will try and
12 answer that. I think what we were trying to do here
13 was to codify the fact that active systems are
14 important for ensuring a mixed atmosphere.

15 But during station blackout those systems
16 are not available, and as part of the IPE process,
17 licensees were requested to go through their
18 containments and look for possible vulnerabilities.

19 So the answer to your question is what we
20 would like to do is to formalize and put into the
21 regulatory guide that guidance which is consistent
22 with that which was used to implement that part of
23 Generic Letter 88-20.

24 We want licensees to be aware of places
25 where possible stratification could occur, and to be

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1 aware of that. And for future designers, we want them
2 to keep in mind the importance of having an open
3 containment and want good communication between
4 compartments to assist in natural circulation.

5 DR. POWERS: In a station blackout, you
6 have steam enerting also on your site, and so it is
7 not so important to have a well-mixed atmosphere
8 there; is that true?

9 MR. SNODDERLY: Yes. But again I think
10 the purpose of the rule is to communicate the fact
11 that mixing is an important aspect of reducing the
12 risk from combustible gas, and you can accomplish that
13 by active systems, such as fan coolers and sprays.

14 But in the absence of those systems, we
15 also need to look at the fact that you may be
16 susceptible because of stratification. Now, the fact
17 that you have steam is also going to be on your side,
18 per se, but as time goes on that steam will be
19 condensing out.

20 And certainly if you engage containment
21 sprays you are going to be taking the steam out of it
22 to some extent, and you will have some separation of
23 the hydrogen. I think that is one of the insights
24 that we have also gained from the Office of Research.

25 And that is that if you were in station

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1 blackout situation, and then if you did get power back
2 and you decided to use the sprays, it is important --
3 well, one aspect would be to bring one train on at a
4 time, as opposed to two trains.

5 There was some experiments done at Sandia
6 that looked at the fact that if you got sprays back
7 and you quickly took out the steam, could you go into
8 the detonable region.

9 And what they found was that for
10 prototypical spray rates that it did not appear to be
11 a vulnerability.

12 DR. POWERS: I wouldn't think so. I mean,
13 mixing -- I mean, you turn on the sprays, and you
14 condense the steam, but in doing that you do an awful
15 lot of mixing.

16 MR. SNODDERLY: That's right.

17 DR. POWERS: And so I guess what I am
18 driving at really is that I am trying to see how this
19 plays out looking at like an AP600 type design, where
20 you have a feed up until a cooled dome, and you are
21 relying on the flow in that dome region to keep from
22 ending up with a stratified hydrogen layer at the top.

23 MR. SNODDERLY: Yes. We wrote the rule in
24 a way that the licensee could meet it with that type
25 of an approach, and we would expect the analyses that

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1 were done in support of AP600 to meet that
2 requirement.

3 Now, for current plants though, we would
4 not expect them to do anything more than what they
5 have done --

6 DR. POWERS: Well, you have really
7 answered my question, which was were you thinking
8 about AP1000.

9 MR. SNODDERLY: Yes.

10 DR. POWERS: And the answer is yes.

11 MR. SNODDERLY: Yes.

12 DR. POWERS: Okay.

13 MR. ROSEN: Your presentation is silent on
14 the impact of these activities on technical
15 specifications. Could you tell me what you think
16 about that?

17 MR. MARKLEY: I think actually that there
18 is going to be a lot of benefit to technical
19 specifications. We included in the package some draft
20 changes, and essentially all the text specs with
21 respect to hydrogen monitors are being proposed for
22 elimination because this is more in terms of the
23 emergency response and that type of activity.

24 And we don't normally have emergency
25 response equipment in tech specs. With respect to the

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1 oxygen monitors for the inerted containments, we are
2 proposing to maintain those in technical
3 specifications, because how do you know if your
4 containment is inerted unless you have a monitor that
5 would provide that indication.

6 And so we would look for that to still be
7 retained in tech specs.

8 MR. SNODDERLY: And if I could add that we
9 have Kerri Kavanagh here from the Standard Technical
10 Specifications Branch, and she has been a member of
11 the team and has helped us in this area.

12 What is interesting is that if you look at
13 5-36 and the four criteria for tech specs, the fourth
14 criteria talks about demonstrating that the structure
15 system or component is needed in tech specs because of
16 risk significance.

17 This is a criteria that is not used very
18 much at all, but we used it in this case in trying to
19 make the determination of what stays in tech specs and
20 what doesn't.

21 As Tony mentioned, we have determined that
22 an inerted environment for MARK I's and II's is risk
23 significant. That would stay in the tech specs, and
24 the oxygen monitors for verifying that would also
25 stay.

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1 But now the basis will change slightly,
2 and instead of being there for design basis accidents,
3 it will be there for Criteria 4, and the fact that it
4 shouldn't be risk significant.

5 Now, if you look in the past, hydrogen
6 monitoring was there for design basis accidents, and
7 to know when to turn on the recombiners, or when you
8 might have to use the vent and purge system.

9 Now what we have found is that -- and
10 maybe also what was needed was to actuate hydrogen
11 igniter systems in MARK IIIs and ice condensers.
12 Well, there is other indications that you can use to
13 determine when you should turn those on.

14 And as Tony said, the hydrogen monitors
15 now are more for core damage assessment and emergency
16 planning, and to be consistent, they would not lead to
17 -- hydrogen has not been shown -- hydrogen combustion
18 has not been shown to be a risk significant threat to
19 containments because of the mitigative features that
20 have been put in.

21 So that made us say, okay, we don't need
22 hydrogen monitors to actuate those mitigative
23 features, but we do feel that we need them to support
24 adequate severe accident management, and therefore, we
25 felt that it was supported removing these from the

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1 technical specifications.

2 MR. ROSEN: Well, your comments have been
3 responsive with regard to monitoring, but what about
4 control?

5 MR. SNODDERLY: Control? No changes.
6 Igniters will stay in the tech specs, and inerting
7 from MARK I's and II's will stay in the tech specs
8 because those systems have been shown to be risk
9 significant in the absence of those systems. So
10 that's why they need to stay in the specifications.

11 MR. ROSEN: What about -- well, control in
12 large dry containments, PWR?

13 MR. SNODDERLY: There aren't -- currently
14 the only -- the recombiners are in the tech specs, and
15 we proposed to remove those from the tech specs and
16 large dry containments because they would not impact
17 risk significant source terms.

18 The problem that you have is that the
19 recombiners work at 200 standard cubic feet per
20 minute, and when you talk about a large dry
21 containment with a volume of 2 million cubic feet, it
22 takes seven days to turn over that containment volume.
23 And so the recombiners were not shown to mitigate the
24 consequences of --

25 MR. MARKLEY: Basically, they are very

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1 ineffective.

2 MR. ROSEN: So for summary in a large dry
3 containment, you would not be required to continue to
4 operate the recombiners.

5 MR. MARKLEY: That's correct.

6 MR. ROSEN: And they could be moved from
7 the plant effectively?

8 MR. MARKLEY: That's correct.

9 MR. ROSEN: And the control or the
10 monitoring would be required to remain, but would not
11 be safety grade anymore?

12 MR. MARKLEY: That's correct.

13 MR. SNODDERLY: Exactly. It would just be
14 a functional requirement and it would be removed from
15 the tech specs and it could be met with commercial
16 grade.

17 MR. ROSEN: Thank you.

18 MR. MARKLEY: The last item on this page
19 is that we did explain the basis for the exceptions
20 that we took in the statement of considerations. The
21 last slide that I have is with respect to the NEI
22 petition.

23 And as we had stated previously, they were
24 concerned about the restrictive applicability language
25 of using Zircalloy and ZIRLO, claddingness, and the

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1 applicability entry for the existing 50-44.

2 And as I indicated earlier, we early on
3 decided that that was not an appropriate applicability
4 statement for what we were trying to deal with in
5 terms of the subject matter.

6 So as you have seen in our discussions
7 today, the new rule as we propose it focuses on
8 containment types for the applicability of the various
9 technical requirements.

10 There is going to be many different types
11 of fuel come up, and certainly the pebble bed reactor
12 and other things of that nature, and there is other
13 things that we probably can't perceive at this time.

14 So this concludes our presentation, and I
15 would certainly be happy to entertain any additional
16 questions.

17 DR. SHACK: Any additional questions from
18 any of the Committee Members? There being none, then
19 thank you for a very clear and lucid presentation on
20 the proposed rule.

21 MR. MARKLEY: Thank you.

22 CHAIRMAN APOSTOLAKIS: Okay. So we will
23 recess until 1:30.

24 (Whereupon, at 10:50 a.m., the meeting was
25 recessed.)

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Meeting

Docket Number: (Not Applicable)

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were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.



Paul Intravia
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