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502nd Meeting

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

502nd MEETING

+ + + + +

THURSDAY

MAY 8, 2003

+ + + + +

ROCKVILLE, MARYLAND

The Committee was called to order at 8:30 a.m.,  
at 2 White Flint North, Room T2B3, 11545 Rockville  
Pike, Dr. Mario V. Bonaca, Chairman, presiding.

COMMITTEE MEMBERS PRESENT:

DR. MARIO BONACA	ACRS Chairman
DR. GEORGE E. APOSTOLAKIS	ACRS Member
DR. F. PETER FORD	ACRS Member
DR. THOMAS S. KRESS	ACRS Member
DR. GRAHAM M LEITCH	ACRS Member
DR. DANA A. POWERS	ACRS Member
DR. VICTOR H. RANSON	ACRS Member
DR. WILLIAM J. SHACK	Acting Member
DR. JOHN SIEBER	ACRS Member
DR. GRAHAM B. WALLIS	ACRS Member

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1 ACRS STAFF PRESENT:

2 JOHN T. LARKINS Executive Director, ACRS,  
3 Designated Federal Official

4 SHER BAHADUR Associate Director, ACRS

5 HOWARD J. LARSON Special Assistant, ACRS

6 SAM DURAISWAMY Technical Assistant

7 MAGGALEAN WESTON Cognizant Staff Engineer,  
8 Designated Federal  
9 Official, P.M. Session

10 MICHAEL R. SNODDERLY ACRS Staff Engineer

11 BILL BECKNER NRRR

12 RALPH CARUSO ACRS Staff

13 FRANK GILLESPIE NRR

14 ALLEN HISER, JR. NRR

15 JOSE IBARRA DSARE/RES

16 DOUGLAS KALINOUSKI RES

17 BRENDAN MORONEY NRR/DLPM

18 WILLIAM H. CULLEN, JR. RES/DET/MEB

19 RICHARD BARRETT NRR/DE

20 TERENCE CHAN NRR/DE

21 MATTHEW MITCHELL NRR/DE/EMCB

22 CHARLES ADER RES

23 SYED ALI RES/DET/ERAB

24 STEPHEN DINSMORE NRR/DSSA/SPSB

25 ANDREA KEIM NRR/DE/EMCB

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

(8:30 a.m.)

CHAIRMAN BONACA: The meeting will come to order. This is the first day of the 502nd meeting of the Advisory Committee On Reactor Safeguards. During today's meeting the committee will consider the following.

One, vessel head penetration cracking and degradation.

Two, proposed revisions to Regulatory Guide 1.178 and Standard Review Plan, Section 398, for risk-informed in-service inspection piping.

Three, operating experience, program effectiveness, draft Commission paper on the ACRS self-assessment, and proposed ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Dr. John Larkins is the designated Federal Official for the initial portion of the meeting.

We have received no written comments or requests for time to make oral statements from members of the public regarding today's sessions. A transcript of portions of the meeting is being kept, and it is requested that the speakers use one of the

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1 microphones, identify themselves, and speak with  
2 sufficient clarity and volume so that they can be  
3 readily heard.

4 Before we move to our agenda, I would like  
5 to draw your attention to items of interest. There  
6 are four speeches by the Commissioners provided during  
7 the regulatory information conference that took place  
8 in Washington on April 16th and 17th, and also some  
9 interesting issues about the operating plants.

10 With that, I would move to the first item  
11 on the agenda, and that is vessel head penetration  
12 cracking and degradation. We had a presentation  
13 scheduled by the NRC and I believe that Dr. Ford is  
14 responsible for this presentation, and will walk us  
15 through.

16 MEMBER FORD: Thank you, Mario. This  
17 segment addresses the question of vessel head  
18 penetration degradation. At the March full meeting,  
19 full ACRS meeting, we had presentation by the ERPI  
20 materials reliability program on this issue and how  
21 they are going to manage it.

22 And at that the Combined Materials and  
23 Plant Operation Subcommittee meeting on April 22nd and  
24 April 23rd, we heard both from the industry and from  
25 the NRC staff.

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1 Today we are going to hear solely from the  
2 staff, and an update of the inspections, findings, and  
3 also on the lessons learned task force action plan,  
4 and where we are going on that plan. I will ask Dr.  
5 Hiser to start.

6 DR. HISER: Good morning. I am Allen  
7 Hiser with the Materials and Chemical Engineering  
8 Branch of NRR. What I would like to do today is  
9 provide you with an update on the status of pressure  
10 vessel head inspections, and in particular I would  
11 like to go through a little bit of background on  
12 findings over the last several years and NRC actions  
13 in response to those findings.

14 I want to describe the order that was  
15 issued approximately 3 months ago, and go over some  
16 recent plant experience for high susceptibility plants  
17 this spring, and also some findings on the lower head  
18 at the South Texas Project, Unit 1.

19 And then to wrap up, I want to provide a  
20 little bit of an outlook of where we think we are  
21 going in the future, and then describe what industry  
22 is doing, and how that feeds into a resolution of this  
23 issue.

24 The next three slides provide some  
25 detailed background. I don't want to go over this in

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1 too much detail, but this issue from the standpoint of  
2 findings of degradation in the United States really  
3 initiated in the fall of 2000 with the finding of  
4 deposits at Oconee Unit 1.

5 And following that in the spring outage  
6 season, two units at Oconee identified leaks, and also  
7 identified circumferential cracks in their nozzles at  
8 a location that could promote loss of coolant  
9 accident.

10 In response to that the NRC issued  
11 Bulletin 2001-01 in August of that year. The next  
12 spring, Davis-Besse identified head wastage and  
13 circumferential cracking in their nozzles.

14 In response to that, we issued another  
15 bulletin in March of 2002 that really focused on the  
16 safety issue of RPD head wastage for all PWRs. Last  
17 summer, we issued Bulletin 2002-02, and there was sort  
18 of a shift from the prior two bulletins from a focus  
19 of the safety concerns of circumferential cracking and  
20 nozzle ejection, and head wastage, to more  
21 implementation of inspection programs that would carry  
22 forth into the future.

23 In particular, the methods that were  
24 described in this bulletin were both non-visual and  
25 visual NDE. The bulletin talked about the methods and

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1 also the frequency that would provide a program that  
2 would be effective in controlling these issues.

3 Licensee responses were generally vague on  
4 their future program activities regarding the next  
5 outages. The responses were very consistent with the  
6 bulletin described and would appear to provide for  
7 effective inspections.

8 The inspection tha we had in reviewing  
9 those responses is that for the future inspections  
10 there was not a significant commitment there by  
11 licensees.

12 Some of the responses were vague and also many of them  
13 cited a report from the industry described as MRP-75  
14 at that time.

15 And still today the staff has a lot of  
16 concerns of the adequacy of the inspections described  
17 in that report. Following the issuance of Bulletin  
18 2002-02, many inspection findings in the fall  
19 continued to indicate that the problem was not well  
20 in-hand.

21 In particular, North Anna Unit 2  
22 identified prevalent weld cracking and ultimately  
23 decided to replace their head in an expedited manner.  
24 In addition, Oconee Unit 2 identified possible through  
25 wall cracking without boron deposits on the head.

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1           This was inconsistent with the general  
2           approach in the MRP bulletin, or the MRP report. As  
3           well, Sequoyah Unit 2 identified corrosion of the  
4           outer surface of the upper head, and the source of  
5           boron in this case was not from nozzle leakage but was  
6           from a source above the head.

7           And that identified a new problem area  
8           that we needed to address. In response to sort of the  
9           overall history and a desire to provide some  
10          continuity and consistency in this area, the NRC did  
11          issue an order in February, and this order mandates  
12          specific inspections of all PWRs.

13          And what I will do over the next few  
14          slides is go over some of the details of the order.

15                 MEMBER LEITCH: That was February of '03  
16          was it not?

17                 CHAIRMAN BONACA: '03.

18                 DR. HISER: Thank you. And what I will  
19          also do then later in the presentation is describe  
20          some of the recent findings at South Texas Project  
21          Unit 1, where boron deposits have been identified, not  
22          on the upper head, but on the lower head.

23                 MEMBER FORD: Before you move away from  
24          that one, Allen, on the question of the ANO Unit 1,  
25          where you have a leak through a repaired nozzle, that

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1 repaired nozzle was prepared with Alloy 52; is that  
2 correct?

3 DR. HISER: Yes, that's correct.

4 MEMBER FORD: And will you be talking  
5 about that specific instance later on?

6 DR. HISER: I did not have plans to do  
7 that, but we can if you would like.

8 MEMBER FORD: Well, it is important to  
9 touch upon, since it was repaired with the alloy that  
10 will be used for all of the replacements, and it does  
11 touch upon the weldability of Alloy 52.

12 Maybe at some appropriate time during your  
13 presentation you could touch on that.

14 DR. HISER: Okay. We will do that. Now,  
15 the orders were issued on February 11th of 2003, and  
16 not 2002. These were issued to all PWRs. The basis  
17 was inadequate protection.

18 In particular the ASME code mandated  
19 inspections are not adequate in this area. Revisions  
20 to the ASME code requirements, and in particular  
21 implementation of those requirements to PWRs is not  
22 imminent.

23 RPV head degradation and nozzle cracking  
24 do pose safety risks if they are not promptly  
25 identified and corrected. With the issuance of this

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1 order, we now have a clear regulatory framework for  
2 inspections of the upper head area.

3 And this is clearly pending incorporation  
4 of revised requirements of 10 CFR 50.55a.

5 MEMBER FORD: Could you just make a quick  
6 comment as to why the current ASME code inspections  
7 are inadequate? Just very quickly.

8 DR. HISER: The current inspections are a  
9 visual inspection, and the ASME code does not require  
10 removal of insulation for inspection of the bare metal  
11 of the pressure vessel head.

12 The quantity of deposits that have been  
13 identified from leaking nozzles tend to be very small,  
14 on the order of square inches, or cubic inches, and  
15 the inspections just really are not sufficient to  
16 identify the problem.

17 And consistent with the bulletins that we  
18 have issued, the order does require an evaluation of  
19 susceptibility for each plant, and this is in terms of  
20 a quantity called effective degradation years, which  
21 is based on the operating temperature and time.

22 In particular, there is a normalization in  
23 this calculation to an operating temperature of 600  
24 degrees. The higher the operating temperature for a  
25 plant. the rapid the accrual of effective degradation

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1 years, and clearly the longer the plant operates the  
2 higher the effective degradation years would be.

3 Now, for high susceptibility plants, the  
4 order requires both bare metal visual and non-visual,  
5 non-destructive examination at every refueling outage.  
6 For moderate plants, the bulletin or the order  
7 requires bare metal visual and non visual NDE at  
8 alternating refueling outages.

9 So a licensee does not have to do both at  
10 any particular refueling outage. What they must do  
11 either is visual or non-visual NDE at each outage.  
12 For license susceptibility plants, the bare metal  
13 visual is required by the next two refueling outages,  
14 and then is repeated every third refueling outages or  
15 every five years.

16 And the nonvisual must be performed by  
17 2008, and then repeated every fourth refueling outage,  
18 or every seven years thereafter.

19 MEMBER FORD: Just to remind us, the  
20 subdivision between those three categories is somewhat  
21 arbitrary, in terms of the affected degradation years,  
22 which goes from moderate to high, or whatever. It is  
23 -- there is no science behind it, and it is purely an  
24 arbitrary choice of EDY. Is that correct?

25 DR. HISER: I would say it is more

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1 empirical based on the findings, the --

2 MEMBER FORD: I didn't mean arbitrary  
3 choice.

4 DR. HISER: There is no scientific basis  
5 that would indicate that the divisions that are made  
6 in the order are the correct divisions.

7 The points or the criteria that are in the  
8 order were based on a review of the operating  
9 experience, and so far with the inspections this  
10 spring, I think they confirm the validity of those.

11 And the choice of the inspection methods,  
12 bare metal visual, et cetera, is again just pure  
13 engineering judgment. It is not based on any risk or  
14 delta CDF, or anything like that. It is just purely  
15 engineering judgment?

16 DR. HISER: It is engineering judgment  
17 with an intent to provide a timely detection and  
18 remediation of both cracking and leakage. With the  
19 inspections that are required for the non-visual NDE,  
20 the intent there is to be able to identify any  
21 degradation before it becomes through wall, and can  
22 provide leakage to the head.

23 So that is really one of the intents of  
24 these inspections.

25 MR. BARRETT: Could I add a word to that?

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1 This is Richard Barrett, and I am with the staff. I  
2 think that when we have looked at the finalology here,  
3 we identify a couple of different ways that the  
4 cracking can lead to failure of these tubes.

5 One being cracking through the weld, and  
6 another being cracking, axial cracking through the  
7 tube itself. And then the third phenomenon of course  
8 is the wastage phenomenon. And in selecting the  
9 requirements for the order, what we tried to do was,  
10 was to get a combination of inspections that could  
11 identify either of those two phenomena leading to  
12 failure or rupture of the tube.

13 And in addition address the wastage issue,  
14 and so that was the thinking and it was a logical  
15 process that led to this. I think that is fair to  
16 say, isn't it, Allen?

17 DR. HISER: Yes.

18 MEMBER APOSTOLAKIS: Now, I have a  
19 question. Peter, why did you say there is no  
20 scientific basis for EDY? I mean, where were you  
21 going with that? If it has worked in practice, what  
22 would be the problem with it?

23 MEMBER FORD: Well, the issue will come up  
24 as obviously the conversation goes on as to whether it  
25 is adequate EDY as we look at all of the inspection

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1 findings that we have gotten so far.

2 Fundamentally, it is a simplistic  
3 algorithm, EDY, and it is probably a good engineering  
4 judgment at this stage, but you have to question it,  
5 and that's why I was asking the question what was the  
6 criteria to define whether you go from moderate to  
7 high or low to moderate, et cetera.

8 And Allen says, it was to a certain extent  
9 engineering judgment.

10 MEMBER APOSTOLAKIS: Is it the  
11 conservative judgment here?

12 DR. HISER: I think at this point it is,  
13 yes; and I think that the inspection findings to date,  
14 there has been no cracking identified in plants that  
15 are not in the high susceptibility range by the order.

16 CHAIRMAN BONACA: The point that you make,  
17 Peter, is that the dependency only from temperature is  
18 a simplification, right?

19 MEMBER FORD: And it is a reasonable  
20 simplification given what we knew at the time and this  
21 was derived. It is an absolutely reasonable  
22 simplification, but it is a simplification, and  
23 therefore what risk are we at continuing to use it?

24 CHAIRMAN BONACA: And the parameters that  
25 you mentioned I believe in your correspondence was

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1 stress?

2 MEMBER FORD: Stress and materials.

3 MEMBER WALLIS: But you are looking for  
4 more of a rationale. One of the things would be how  
5 long do we wait before every plant has an BMV, and  
6 looking at this, it is not very long is it? It is a  
7 couple of years or something.

8 And after a couple of years, every plant  
9 would have had a BMV. So you have some sort of  
10 criterion here, as well as just arbitrarily saying  
11 low, moderate, high.

12 MEMBER FORD: Yes.

13 MEMBER WALLIS: Presumably there is some  
14 hidden criterion somewhere there.

15 MEMBER FORD: And that is the reason for  
16 the question, and the answer was it is based on  
17 engineering judgment.

18 MEMBER WALLIS: Yes, but you don't expect  
19 anything to happen for more than -- you know, for the  
20 next 5 years in the low plants. Therefore, we will  
21 inspect them and make sure that they all have some  
22 sort of an inspection within the next 2 or 3, or  
23 whatever it is.

24 DR. HISER: And I think that's right.  
25 These categories really are based on expectations.

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1 For the high susceptibility plants, I think there is  
2 an expectation that cracking may occur.

3 The intent of these inspections is to  
4 identify the cracking before it can pose any kind of  
5 a safety risk, such as leakage, head wastage, nozzle  
6 ejection.

7 For moderate susceptibility -- well, let  
8 me jump down to low susceptibility. I think it would  
9 be somewhat surprising if a low susceptibility plant  
10 identified cracking on the upper head. Now, as we  
11 will talk about a little bit later, the findings at  
12 South Texas may pose some challenges to that  
13 rationale.

14 CHAIRMAN BONACA: That's right, and that  
15 is the question that I had in fact; does South Texas  
16 tell us anything different.

17 MEMBER FORD: Well, I think what is going  
18 to come out of this discussion is that the current  
19 algorithm that you have got is incomplete, but it  
20 seems to work for the majority of the plants, provided  
21 it is only the vessel head that you are looking at,  
22 and the residual stresses which are common to the  
23 vessel head.

24 And go to another penetration and we might  
25 have a completely different residual stress profiles.

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1 You would not expect that algorithm to still apply,  
2 and I think that is true, isn't it, Allen?

3 DR. HISER: Yes, I think that is correct.  
4 For the upper heads, the fabrication processes are  
5 very similar, and the geometries are similar, and the  
6 welding is similar. So I think that the findings that  
7 we have are internally self-consistent.

8 If you begin pulling data, for example,  
9 from the lower head, then it may be that you are  
10 looking at a different population. It may be that EDY  
11 may be effective, but there is a different relative  
12 scale that you need to use for the lower head relative  
13 to the upper head.

14 That is speculation, and we need to allow  
15 some of the results from South Texas to be firmed up,  
16 in terms of the source of degradation.

17 MEMBER SHACK: When you talk about the  
18 spread of EDY on the lower head, because they probably  
19 all operate closer to the same temperature, I am  
20 assuming --

21 DR. HISER: There is a fairly good spread.

22 MEMBER SHACK: There is a good spread?

23 DR. HISER: Yes, and actually I think  
24 South Texas is relatively high in the cold leg  
25 temperature, which is correlated with the lower head

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1 temperature. So it may be that South Texas may be the  
2 leading indicator on the lower head, much as the  
3 Ocone units were on the upper head.

4 We need to gather additional information  
5 to understand that better.

6 MEMBER LEITCH: When a plant replaces  
7 their head, the advantage that they gain is just  
8 resetting the timer so to speak. In other words, they  
9 would move into the low susceptibility category  
10 because there is zero hours on the new head?

11 DR. HISER: Right.

12 MEMBER LEITCH: There is no recognition in  
13 the order that new heads -- that the penetrations are  
14 of different material than originally? In other  
15 words, there is no recognition for different  
16 materials.

17 DR. HISER: At the present time the order  
18 makes no distinctions between Alloy 600 heads and  
19 Alloy 690 heads. But when a plant does replace their  
20 head the EDY does reset to zero and then they begin to  
21 accumulate again.

22 For example, a new Alloy 600 head, such as  
23 Davis-Besse has, would accumulate EDY at a  
24 proportional manner, the same as the North Anna,  
25 Surry, Ocone heads that use Alloy 690 in the nozzles.

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1           MEMBER LEITCH: But the order just applies  
2 to head penetrations. For example, you could reset  
3 the timer so to speak with replacing the head, but yet  
4 still have some old 690 penetrations in other parts of  
5 the system, and the order does not specifically  
6 address that; is that correct?

7           DR. HISER: Yes, the order only addresses  
8 the upper head and all of the penetrations in the  
9 upper head would be 690, other than I guess the one  
10 case of Davis-Besse, where they do have a head that is  
11 fabricated from Alloy 600 nozzles.

12           MEMBER LEITCH: Okay. But the other 690  
13 penetrations are not really addressed by the order,  
14 just head penetration?

15           DR. HISER: No. The order only addresses  
16 -- and only the upper head. The lower head is not  
17 described or discussed in the order in any way.

18           MEMBER LEITCH: Okay. Thank you.

19           DR. HISER: Okay. The non-visual NDE that  
20 the order specifies is either an ultrasonic exam, or  
21 wetted surface examination, and just to illustrate  
22 what those mean, I use this figure. The purple areas  
23 illustrated on the top surface are the areas that are  
24 covered by the bare metal visual inspection, and it  
25 does not come out very well.

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1 MEMBER SHACK: You need another color  
2 selection.

3 DR. HISER: Yes. And the bare metal  
4 visual again applies to all plants, just at various  
5 frequencies. The ultrasonic inspection involves an  
6 examination of the areas covered in green here, would  
7 be basically the nozzle inside diameter, and looking  
8 for cracks in the nozzle base material itself.

9 Now, the nozzles on the upper head have an  
10 interference fit zone in which the outside diameter of  
11 the nozzle is larger than the whole diameter in the  
12 head, and so that provides a good metal to metal  
13 contact.

14 The order specifies that licensees must  
15 assess leakage through this interference fit zone.  
16 One technique that is used by vendor -- inspection  
17 vendors is to interrogate the ultrasonic data in that  
18 area. So that is one approach that is addressed in  
19 the order.

20 MEMBER WALLIS: So this stainless steel  
21 tube is driven into this hole?

22 DR. HISER: Actually, it is called a  
23 shrink fit approach. And what they do is they chill  
24 the nozzle --

25 MEMBER WALLIS: Yes, but it is not driven

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1 in any way where it would scratch the surface?

2 DR. HISER: No.

3 MEMBER WALLIS: And when you said there  
4 was interference, I was not clear on how they put it  
5 in.

6 DR. HISER: Yes.

7 MEMBER WALLIS: Or inconel tubes.

8 DR. HISER: And actually one point is that  
9 there is an interference fit at ambient temperature  
10 where the inspections are performed, and at operating  
11 temperature, it appears that all nozzles and all heads  
12 have some sort of a gap from the J-groove weld area up  
13 to the top of the head, such that eventually any  
14 leakage would put a deposit on the head. So that is  
15 one --

16 MEMBER WALLIS: They grow and swell when  
17 that heat isn't cooled down, and it puts stresses on  
18 the welds?

19 DR. HISER: That's correct.

20 MEMBER WALLIS: And they grow and swell,  
21 and constraint, and all of that?

22 DR. HISER: Yes.

23 MEMBER WALLIS: And that is yanking the  
24 welds?

25 DR. HISER: That is correct. Now, the

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1 wetted surface exam involves an examination of the  
2 entire surface of the wetted surface of the J-groove  
3 weld, and the nozzle.

4 MEMBER WALLIS: UT or what?

5 DR. HISER: No, the wetted surface would  
6 either be normally an eddy current exam, or possible  
7 a combination of eddy current and dye penetrant test,  
8 and what that exam looks for is surface breaking flaws  
9 in the J-groove weld surface or the nozzle base  
10 material.

11 So that is a little bit of orientation.  
12 Now, the order does provide explicit requirements and  
13 criteria for inspection of repaired nozzles and J-  
14 groove welds.

15 Based on the findings at Sequoyah last  
16 fall, at each refueling outage, every PWR must perform  
17 a visual inspection of the area above the head to  
18 identify potential sources of boric acid that could  
19 provide boric acid on to the surface of the head.

20 If there are any possible sources or  
21 possible leaks, then follow-up inspections or follow-  
22 up actions are required. They would require  
23 inspections of the potentially affected RPD head  
24 surface, and also the nozzles that could be affected  
25 by that source of boron.

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1 Flaw evaluation is prescribed in the order  
2 per NRC guidance. In particular, the order describes  
3 a letter from Jack Strosnider to NEI in the fall of  
4 2001. We have just recently issued a revision to that  
5 guidance that incorporates more recent crack growth  
6 rate equations.

7 And as we described earlier, the orders  
8 apply also to new RPV heads, be they the Alloy 600  
9 head used at Davis-Besse, or Alloy 690 heads. We have  
10 had extensive discussions with the industry on Alloy  
11 690 and they are beginning to provide the technical  
12 basis that would or could lead to some reduction  
13 inspections for the Alloy 690 heads.

14 At the present time, we don't have a  
15 technical basis to do that. So in lieu of that, we  
16 treat the two the same. In addition, there is a post-  
17 outage report providing the inspection findings that  
18 licensees are required to provide 60 days after they  
19 restart.

20 In response to the order, licensees had an  
21 opportunity to respond within 20 days. They could  
22 have requested a hearing, and they could have  
23 requested a time extension to respond to the order,  
24 and in no case did that occur from any license.

25 The order does provide for the Director of

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1 NRR to relax or rescind specific requirements of the  
2 order. For specific nozzles a request for relaxations  
3 will be evaluated using procedures for proposed  
4 alternatives to the ASME code in accordance with 10  
5 CFR 50.55a(a)(3).

6 And that does not mean that these are  
7 relief requests. They are relaxation requests. It is  
8 just that the overall process that we use is similar.  
9 One difference is that the NRC must issue a written  
10 approval of the relaxation prior to restart with  
11 relief requests, and we are allowed to do that through  
12 a verbal feed.

13 MEMBER WALLIS: And the subcommittee  
14 meeting, you showed us some examples of plants where  
15 they have great difficulty actually doing this because  
16 of the way that they were designed and put together.

17 DR. HISER: Right.

18 MEMBER WALLIS: And are you going to say  
19 the same thing about that --

20 DR. HISER: I have some graphics to show  
21 some of the problems.

22 MEMBER WALLIS: And what are you going to  
23 do about those? The question is not just that there  
24 is a problem, but how are you going to resolve it?

25 DR. HISER: We have evaluated the

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1 significance of the non-inspected area, and to date  
2 have found those relaxations to have merit, and to be  
3 consistent with the order.

4 MEMBER WALLIS: So you are going to let  
5 them not inspect according to the order?

6 DR. HISER: Generally, or the criteria  
7 that we have used to review those reliefs are  
8 indicated here, and the ones that have been approved  
9 within either one of these two criteria, and in  
10 particular the proposed alternative must provide an  
11 acceptable level of quality and safety, and the way  
12 that we have implemented that is that the area of non-  
13 coverage must have a minimal safety impact.

14 For example, stresses must be very low,  
15 and the likelihood of cracking must be very low.

16 MEMBER WALLIS: You just are assuming that  
17 you can evaluate all of these things, and you are  
18 operating in an area of considerable uncertainty, and  
19 you are not inspecting something which really should  
20 be inspected.

21 You are rationalizing that in some way,  
22 and it is a bit like what the problem is that caused  
23 this in the first place, and not enough attention to  
24 nozzles on top of a head.

25 DR. HISER: Well, the areas that are not

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1 being inspected generally are the bottom of the  
2 nozzle, where stresses are low. They are barely high  
3 distance from the pressure boundary, and if cracking  
4 does occur there, it would take time for that to grow  
5 into the pressure boundary.

6 In the interim time there would be  
7 examinations of that intermediate material that would  
8 identify the cracking. It is based on things like  
9 that that --

10 MEMBER WALLIS: Well, if you were wrong  
11 what would happen?

12 DR. HISER: If we are wrong --

13 MEMBER WALLIS: If you are wrong, you left  
14 them and did not inspect, and they really did have a  
15 leak up there, what would happen?

16 DR. HISER: If there would be a leak, it  
17 would be through a limited portion of the cycle, and  
18 no adverse effects would occur.

19 MEMBER WALLIS: It would be detected  
20 before it got too bad?

21 DR. HISER: Yes.

22 CHAIRMAN BONACA: Even with the low  
23 susceptibility plants that are not inspected  
24 frequently?

25 DR. HISER: For the low susceptibility

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1 plants, there are not frequent visual inspections at  
2 this point. There have been no relaxation requests or  
3 approvals for low susceptibility.

4 CHAIRMAN BONACA: Okay.

5 MR. BARRETT: If I could add that I think  
6 it is fair to say that these exceptions have in fact  
7 been exceptional in a sense that I think you would  
8 find that by and large they have been -- the  
9 exceptions have been for a limited number of tubes and  
10 have allowed for a great deal of coverage of the tubes  
11 in which there are exceptions. So I don't want to  
12 leave you with the impression that there has been  
13 wholesale exceptions made to this order. We have  
14 actually been --

15 MEMBER WALLIS: Well, I think you ought to  
16 consider what if you are wrong, and suppose that there  
17 is a leak in these inaccessible places that you could  
18 not inspect. You have to be assured that the  
19 consequences wouldn't or couldn't be something very,  
20 very undesirable.

21 MR. BARRETT: Right, and I think another  
22 think to put this in perspective is that as Allen  
23 pointed out, when we first discovered this cracking,  
24 these cracking phenomena, the bulletins that we issued  
25 were for interim compensatory type measures.

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1 Bare metal visual inspections, which at  
2 that time were a big step forward from what was  
3 required in the ASME Code, and in those cases if we  
4 were wrong, the possibility was that there was some --  
5 that there was degradation in somewhat of an advanced  
6 stage.

7 Today the order that is out there for the  
8 effort had or I think goes a long way towards  
9 restoring some of the margin that we thought was  
10 originally there.

11 So that we are looking now to prevent the  
12 type of conditions that could lead to a  
13 circumferential crack, for instance, which could in-  
14 turn grow and lead to a failure of the tube.

15 So we have taken this to a new stage of  
16 margin, I believe, with this order. And I think to  
17 answer your question, the consequences of a failure  
18 today in an inspection in compliance with the order  
19 would be far less than the consequences of a failure  
20 with regard to compliance with the bulletins that we  
21 issued in 2001 and 2002.

22 CHAIRMAN BONACA: I see you have some  
23 slides addressing some of the exemptions of the  
24 request, and so that would be interesting, too.

25 DR. HISER: I think as we go through some

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1 of the graphic examples, I think it will become clear  
2 the inconsequential nature of the relaxations.

3 CHAIRMAN BONACA: And I understand some of  
4 the repairs with new repairs also have been focusing  
5 on cracks. Will you talk about that point?

6 MEMBER FORD: That's what I asked to be  
7 included.

8 DR. HISER: Now the need for the orders is  
9 described on this slide, and really the first four  
10 bullets really lead to one specific goal, and that is  
11 consistency.

12 The orders are intended to be an interim  
13 measure until rule making can be implemented to get  
14 new inspection requirements in place, and new  
15 effective inspection requirements in place.

16 In addition the order addresses the  
17 Sequoyah degradation last fall from a source of boron  
18 above the head, and that I think is a key part of the  
19 order as well.

20 Now, one part of the order describes a  
21 flaw evaluation criteria. As I mentioned we had  
22 issued a letter that is specifically referenced in the  
23 order from 2001, and we have recently issued a revised  
24 letter.

25 In addition, the ASME Code has implemented

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1 or I guess approved a code action in this area for  
2 flaw evaluation criteria. What I wanted to do was  
3 just to highlight some of the differences in the two  
4 letters, and then one difference with the ASME code,  
5 the flaw acceptance criteria in terms of where flaws  
6 are located, the extended flaws that are acceptable,  
7 actions that must be taken, are identical in the two  
8 letters.

9 There is one difference, in that Section  
10 11 standards are not allowed in the new letter. In  
11 particular the 5 percent through wall limit that is  
12 allowable by Section 11 is not endorsed in the April  
13 11th letter.

14 The crack growth rate in the initial  
15 letter was a 9550 evaluation of the data from a  
16 preliminary database, and in particular that was a  
17 95th percentile bounding curve with 50 percent  
18 confidence.

19 The April 11th letter incorporates a more  
20 robust database analysis by the MRP, and in that case  
21 it is the 75th percentile.

22 MEMBER WALLIS: It is the 75th out of data  
23 points which are all over the paper.

24 DR. HISER: It is the 75th percentile of  
25 individual heat data.

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1 MEMBER WALLIS: But that is not the  
2 notorious figure with the points all over the paper,  
3 and someone drew a curve sort of in the middle of it,  
4 and that is the 75 percent?

5 DR. HISER: I would -- well, actually, it  
6 is really not the 75th percentile of those data, those  
7 individual data points. It is an analysis of the  
8 individual heat data in the 75th percentile based on  
9 that data.

10 MEMBER WALLIS: But it still is subject to  
11 a lot of uncertainty, a great deal?

12 DR. HISER: Yes, that's correct.

13 MEMBER POWERS: Why at 75 percent?

14 DR. HISER: The 75th percent is, if you  
15 will, the middle of the top half of the database.

16 MEMBER POWERS: The middle of the top  
17 half?

18 DR. HISER: If you --

19 MEMBER WALLIS: That's where the students  
20 get A's.

21 MEMBER POWERS: No, B's.

22 DR. HISER: It is not an upper bound, but  
23 a median curve for the top half of the data. I think  
24 that some of the thinking on that is that if you want  
25 to split the materials into high susceptibility, and

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1 low susceptibility, and so if you ignore the bottom 50  
2 percent of the data, and now focus on if you will the  
3 susceptible materials, this would be a mean curve  
4 through "susceptible" materials. That would be one  
5 interpretation.

6 MEMBER POWERS: One interpretation might  
7 well be that one out of every four things gets missed.

8 DR. HISER: I think implicit in that would  
9 be a statistical expectation that some cracks may grow  
10 faster than this analysis would indicate, that's  
11 correct.

12 MEMBER POWERS: For the life of me, it is  
13 just a mystery. I mean, if you had written 95, I  
14 would probably ask the same question. But at least 95  
15 has at least some pedigree in it, and I see it a lot.  
16 In 75, I see it only when somebody is trying to hide  
17 something from me.

18 DR. HISER: At this point this is the  
19 industry proposal, and we think that as an interim  
20 measure again that it is reasonable. We are  
21 evaluating the analysis --

22 MEMBER POWERS: I am trying to understand  
23 the reasonable behind the reasonable here

24 MEMBER WALLIS: The reason is that it is  
25 an industry proposal, and that's why it is 75 and not

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1 95.

2 DR. HISER: Well, if we thought it was  
3 necessary to use the 95 percentile as an interim  
4 measure, then we would be using that, but at the  
5 present time we don't --

6 MEMBER POWERS: Why do you think it is  
7 necessary to use 75?

8 DR. HISER: As a -- well, consistent with  
9 normal ASME code evaluations, a 50 percent curve would  
10 be used. So this is more conservative than a normal  
11 ASME code evaluation.

12 MEMBER POWERS: So it would not be grossly  
13 unfair on my part to say that it is a number pulled  
14 out of the air?

15 DR. HISER: I think there is some  
16 engineering involved in it.

17 MEMBER POWERS: A limited segment of the  
18 air. The mean value of the upper half of the air.

19 MEMBER KRESS: When you get around to  
20 making a permanent rule, which is going to have  
21 inspection frequencies in them, and inspection  
22 frequencies will probably be determined by the depth  
23 of the cracks and their growth rate, I hope that you  
24 don't use this criteria for the growth rate.

25 It would be more appropriate in a

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1 regulatory space to use something like a 95, because  
2 your objective is to have no crack penetrate the wall,  
3 and so you want to be fairly confident of that, and so  
4 it may be all right in the interim to use this, but  
5 when you get around to the final rule, you might have  
6 trouble with this committee on that particular issue.

7 Well, most of the 95, 95 is way up in  
8 growth rate. It is an order of magnitude higher. So  
9 you are not at all being conservative. There are  
10 growth rates which are way above this 75-50.

11 DR. HISER: And again the purpose of this  
12 is evaluation of flaws that are found. There have  
13 been some flaws found in the spring, and the licensee  
14 actions are generally to repair the flaws, and not  
15 perform this evaluation.

16 MEMBER KRESS: The other concept is -- you  
17 know, I am concerned about the final rule. I don't  
18 think you want to lock in something like this other  
19 than for a specific plant. I think you can use a  
20 Bayesian update as you inspect and then get more data  
21 for that particular plant, and you can end up with a  
22 plant specific type of growth rate, and I hope that  
23 kind of concept shows up in the final rule.

24 DR. HISER: Okay.

25 MEMBER FORD: Before you move on to --

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1 well, you are about to move off this?

2 DR. HISER: No, I just wanted to touch on  
3 one other part of this. The ASME code for certain  
4 configurations allows for a case-by-case evaluation  
5 and approval by the regulatory authority.

6 Both of these letters specify that certain  
7 circumferential cracks at and above the weld, and  
8 outside diameter axial cracks above the weld, must be  
9 repaired. So that is one deviation from the ASME code  
10 action.

11 MEMBER FORD: I noticed that you have got  
12 fatigue in there, which is obviously the addition of  
13 an extra degradation mode is conservative. Is there  
14 a reason or a reason for supposing that fatigue will  
15 be a major contributor to this particular --

16 DR. HISER: No, I think that is included  
17 in our letter just for consistency with the code  
18 action, and the way that the ASME code routinely  
19 treats all degradation modes.

20 MEMBER FORD: Also in the guidance letter  
21 you give the form of the residual stress profile.  
22 What is your expectation when a licensee comes along  
23 with such an analysis that he has qualified that  
24 residual stress profile against data?

25 DR. HISER: Generally, plants are using

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1 plant specific stress and --

2 MEMBER FORD: Yes, but that residual  
3 stress profile through whatever LOCAs that you want to  
4 choose is by calculation or calibration.

5 DR. HISER: That is correct.

6 MEMBER FORD: What is the qualification of  
7 that calibration or that calculation against data? Is  
8 there an expectation from the NRC that they must show  
9 some reason, assuming that finite analysis is correct?  
10 What is the uncertainty of it? Do you understand what  
11 I mean or I am getting at?

12 DR. HISER: Yes. There are plans by the  
13 industry to do some benchmarking of calculations with  
14 measurements from J-groove welds.

15 MEMBER FORD: Okay.

16 DR. HISER: And at the present time, we  
17 have compared calculations from the industry with an  
18 NRC contractor and they have found good agreement  
19 between those two, but the level of benchmarking to  
20 actual physical measurements I think is limited at  
21 this point.

22 MEMBER FORD: And the final question on  
23 this particular item is that in the guidance data you  
24 give some acceptance criteria for the flaw size, is a  
25 function of position and orientation.

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1 DR. HISER: Right.

2 MEMBER FORD: And that is a mandated  
3 acceptance criteria. What is the NRC's expectation  
4 that the licensee can meet in terms of inspection,  
5 technique, and probability of detection, that they can  
6 meet that criterion?

7 Now, when you say it is a quarter wall  
8 thickness or whatever the criterion is, and they say,  
9 yes, we can meet that, how do you know that they can  
10 meet that expectation of flaw depth, size, et cetera?

11 But I think it is implicit that the  
12 inspection uncertainty is below certain levels, and  
13 that has been demonstrated through blind testing at  
14 the MRP.

15 MEMBER FORD: So the NRC has accepted  
16 those tests as being done by the MRP so far that we  
17 saw since earlier this month, or at the end of last  
18 month?

19 DR. HISER: Maybe Terrence can speak a  
20 little more specifically to how we have looked at  
21 that.

22 MR. CHAN: I am Terrence Chan with the  
23 staff. We have sent people out to look and witness  
24 the qualification and NDE demonstrations that have  
25 been performed, and they are for the most part, they

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1 have not been blind tests, in terms of the  
2 qualification of the equipment.

3 For the personnel, they are blinded and  
4 that is my understanding, and they are using  
5 performance demonstration criteria, and they are able  
6 to depth size, and they are able to link size to  
7 certain criteria, and it is that that gives us  
8 confidence that they are able to meet the criteria  
9 that is set out in the guidance.

10 MEMBER FORD: So the licensee has  
11 demonstrated each one and he comes along with this  
12 case, and he has demonstrated that inspectors have a  
13 certain probability of detection, and that goes into  
14 your evaluation; is that correct?

15 MR. CHAN: The POD does not. No, there is  
16 no -- no, the POD does not go into the evaluation.

17 MEMBER FORD: Okay. Thank you.

18 MEMBER LEITCH: I am confused by the force  
19 of regulation of these two letters. The first one, if  
20 I understood you correctly, is incorporated in the  
21 order by reference. Is the second one now the one  
22 that industry is following? That is, the April '03  
23 letter?

24 DR. HISER: We would expect that the April  
25 '03 letter would be -- the order actually references

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1 the November letter, and further updates for the  
2 revisions as they are made.

3 So we would consider the April letter to  
4 be the appropriate guidance.

5 MEMBER LEITCH: So that the order, or by  
6 the revision to the letter, the order then de facto  
7 has been modified? In other words, the order allows  
8 for subsequent revisions to the November '01 letter?

9 DR. HISER: That's correct. And within  
10 this context I think the crack growth rate is probably  
11 the most significant modification.

12 MEMBER FORD: I am just looking at the  
13 time here. It is appropriate that we spent the time  
14 on the order. Can we finish your presentation by  
15 half-past-nine?

16 DR. HISER: Let me describe what I have to  
17 present and you can tell me which you would prefer.  
18 In the next few slides, they are just a description of  
19 the relaxation requests.

20 Following that, I have a little bit of  
21 discussion of high susceptibility inspection findings,  
22 and then the remainder is South Texas findings, and  
23 then a little bit future looking outlook and  
24 industry's role.

25 MEMBER WALLIS: The only exception here

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1 that looks significant was the Millstone one. The  
2 other ones are sort of little details. But the  
3 Millstone one looks more universal, and they got this  
4 insulation plaster on the head.

5 DR. HISER: Would you like me to talk  
6 about that one?

7 MEMBER FORD: Yes, the majority of the  
8 members were present at the subcommittee meeting.  
9 Let's talk about Millstone, and then we would like at  
10 least 5 minutes on South Texas.

11 DR. HISER: Okay.

12 MEMBER FORD: And then the rest of the  
13 time on the other topics.

14 DR. HISER: The insulation configuration  
15 of Millstone is illustrated here. It looks very nice  
16 on mu slide, but not on the screen. Sort of outlined  
17 in red is the insulation, and some of it is very  
18 closely conforming to the head. We have been told  
19 that there is asbestos in parts of the insulation.

20 In lieu of doing a bare metal visual  
21 inspection of any part of the head, the licensees  
22 proposed to do thickness measurements from the  
23 underhead location to identify wastage in the head.

24 In addition to, they are performing  
25 ultrasonic testing of the nozzles themselves and the

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1 leak path evaluation to determine if there is leakage  
2 through the nozzles.

3 So that is their proposal. We have  
4 ongoing discussions with --

5 MEMBER WALLIS: Measuring the thickness of  
6 the head is way down the road after the barn door is  
7 open and the horses are gone. So how far away did it  
8 go.

9 DR. HISER: Well, there are two parts.  
10 Degradation of the head can occur from born that comes  
11 from inside the head. For example, through a nozzle  
12 leak or from sources above.

13 The order requires that they determine any  
14 sources from above the head. If the UT is sufficient  
15 to demonstrate that there is no leakage, then it may  
16 be that there is no source of boron that could cause  
17 that wastage.

18 The concern that we have with not doing  
19 any visual inspection, there is some complimentary  
20 role of the non-visual NDE in providing some assurance  
21 of no leakage, and the bare metal visual is sort of a  
22 check on that.

23 First of all, if you look at the  
24 intersection of the nozzle and the head, and you see  
25 no deposits, and the UT also indicates that there is

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1 no leakage, then you have reinforced your view of  
2 things.

3 The bare metal visual provides that  
4 assurance, and it also provides assurance that between  
5 nozzles that there is no head wastage. So the  
6 challenge for us and for the licensee is to determine  
7 if their proposed alternative is sufficient to cover  
8 th various purposes of the bare metal visual that they  
9 would not be performing in this case.

10 We are aware at this point of one other  
11 plant that has a similar configuration and will be  
12 making a similar proposal or request to us for  
13 relaxation.

14 They will be very challenging.

15 Since issuance of the order there are  
16 about nine high susceptibility plants that have  
17 outages this spring. As indicated, two of those have  
18 just started their outage, Surrey and Cook, and so we  
19 don't have findings for them at this point.

20 As indicated, Oconee 3 and North Anna 1  
21 have identified probable leaks in the plant on the  
22 upper head. In both cases the heads will be replaced,  
23 or have been replaced by the licensee.

24 So the licensee does not plan to do any  
25 additional NDE on the heads to identify the source of

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1 the cracks, or the source of the leakage. And in  
2 addition our understanding at this point is that  
3 Oconee-3 did a comprehensive bare metal inspection.

4 North Anna, because of their insulation  
5 configuration, focused on one nozzle that was at issue  
6 at their prior outage. At this refueling, they did  
7 identify a probable leak at that nozzle.

8 The good findings are indicated by Turkey  
9 Point Unit 3, Farley, and Calvert Cliffs-2, where they  
10 identified no leaks and no cracks, in spite of the  
11 fact of a fairly high EDY level in those cases.

12 Beaver Valley Unit 1 did identify four  
13 nozzles with cracks from the NDE, and did repair those  
14 nozzles. More recently, St. Lucie 2 has identified  
15 two nozzles with cracks, and plans to repair those  
16 nozzles.

17 For plants that are below 12 EDY, you  
18 know, in the moderate to low susceptibility range, no  
19 leaks and no cracks have been identified.

20 MEMBER LEITCH: Oconee Number 3, the old  
21 head, the head that is being retired. I believe that  
22 they found indications of leakage on two nozzles  
23 there, one in a previously repaired nozzle, and do we  
24 understand what went wrong there with the previous  
25 repair?

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1 MR. BARRETT: Excuse me, Allen. We were  
2 notified this morning by the licensee that they were  
3 mistaken, and that there is in fact no leakage in that  
4 repaired nozzle. That is something that we just heard  
5 this morning.

6 MEMBER LEITCH: Okay. Thank you.

7 MR. BARRETT: Allen didn't even know that.

8 DR. HISER: It is very preliminary  
9 information and that would have been my only further  
10 comment.

11 DR. HISER: The other finding this spring  
12 was in the South Texas project, Unit 1. This licensee  
13 did bare metal visual on both the upper head and the  
14 lower head.

15 The good news was that the lower head was  
16 clean, and no boron, and no indications of leakage.  
17 However, on the lower head the visual inspection  
18 identified two nozzles with whitish deposits.

19 At nozzle number one, the deposit was  
20 described as gummy in texture, and at nozzle 46, it  
21 was indicated that the deposit was hard, and maybe a  
22 little more consistent with the findings --

23 MEMBER WALLIS: Does gummy mean wet?

24 DR. HISER: I am not sure what gummy  
25 means. There has been some speculation. I think it

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1 may be related to tape residue and things like that.  
2 Their chemical analysis indicated that there is boron  
3 in that area, and the licensee is treating it as a  
4 possible leakage.

5 MEMBER SIEBER: What steps are being taken  
6 at South Texas to characterize the indication in leak  
7 to either say that it is similar to an upper head leak  
8 or different than an upper head leak?

9 And the reason why I would ask the  
10 question is that if it is determined to be similar to,  
11 and since the lower head operates maybe 50 degrees  
12 lower temperature than the upper head, then that calls  
13 into question the validity of the ranking system that  
14 we are now using, and perhaps you could address that.

15 DR. HISER: My understanding is that they  
16 intend to implement ultrasonic testing to identify  
17 flaws in the nozzles or considering ways to examine  
18 the J-groove weld in addition. At this point, no  
19 plant in the United States has done non-visual NDE on  
20 the lower head. There has been no implementation of  
21 UT or any current, and so this would be a first of a  
22 kind in the United States. There have been some  
23 examinations overseas and I think that some of that  
24 technology is trying to be applied here.

25 MEMBER SIEBER: Well, the implication of

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1 my question is characterization leaves to defining the  
2 mechanism.

3 DR. HISER: Right.

4 MEMBER SIEBER: And you need to know what  
5 the mechanism is to either say it is the same as upper  
6 head cracks or it is different than upper head cracks.

7 And if you say it is the same, then you  
8 have to question the curve that you are using to  
9 identify high susceptibility plants. I mean, it  
10 really in my mind at least puts a hooker in the whole  
11 way that we are approaching and identifying what  
12 plants ought to do what at what time.

13 And so I think that if we really need to  
14 understand what happened at South Texas in a big way,  
15 and different than understanding what is happening in  
16 the upper heads.

17 MR. MITCHELL: If I may, this is Matthew  
18 Mitchell, Materials and Chemical Engineering Branch,  
19 NRR. As of a public meeting that we had with South  
20 Texas last Thursday, they provided the staff with a  
21 great deal of information regarding their plans moving  
22 forward for non-destructive evaluation of the lower  
23 heads, and just to reinforce what Allen said, they are  
24 looking into doing ultrasonic and any current  
25 examinations from the interior of the penetrations.

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1           They are looking into doing enhanced VT-1  
2 examinations of the J-groove weld region, and for  
3 those of you who are familiar -- I think the committee  
4 is familiar with the term "enhanced VT-1" and  
5 essentially a half-mill wire resolution type visual  
6 exam of the J-groove weld.

7           They are committed to performing a root  
8 cause and extended condition evaluation, and  
9 considering both the implications not only for unit  
10 one, but for unit two.

11           The NRC, and the Materials Chemical  
12 Engineering Branch, has been in contact with the  
13 industry as well through the MRP. They are working  
14 with South Texas to try to help garner as much  
15 information as possible from the condition at South  
16 Texas Unit 1 to help everyone understand the generic  
17 or potential generic implications of what is going on  
18 at South Texas.

19           I would just caution, however that it is  
20 at this point too early to fully tell what is going on  
21 at South Texas. We are still awaiting results of the  
22 NDE and the root cause evaluation.

23           MEMBER SIEBER: I can see all of that, and  
24 I think that is about as much as you can do at this  
25 point in time. On the other hand, I hope you

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1 recognize my concern that this is a new finding, and  
2 different conditions that calls into question the  
3 conclusion that we drew earlier on the upper head.

4 And I guess I can say no more than that  
5 because none of us really knows what the mechanism is,  
6 and the flaws aren't fully characterized yet.

7 MR. MITCHELL: Absolutely, and the staff  
8 is very sensitive to those observations, including  
9 potential differences I think which have already been  
10 mentioned in residual stresses, and material  
11 properties of the lower head materials, and how they  
12 were fabricated.

13 All of those factors need to be taken into  
14 account in terms of understanding what this potential  
15 information coming out of South Texas means relative  
16 to any other penetrations within the reactor coolant  
17 pressure boundary.

18 MEMBER KRESS: Yes, and given those  
19 considerations, I wouldn't get too hung up myself on  
20 placing into question the susceptibility curve for the  
21 upper head if you could use that curve as a  
22 susceptibility curve for the upper, and maybe there is  
23 another one for the lower head.

24 And I like the thought that Texas may be  
25 the leading indicator for it, but I wouldn't go too

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1 far in saying, well, my curve is just no good because  
2 this might be intergranular stress corrosion  
3 cracking. There is different conditions down there.

4 MEMBER SIEBER: And your point is well  
5 taken, but that is why you need to know what the  
6 mechanism is, because that will tell you whether you  
7 need another curve or not.

8 MEMBER KRESS: With that intergranular  
9 and stress corrosion cracking, you may need another  
10 susceptibility curve for the lower head.

11 MEMBER SIEBER: Yes, that is a given.

12 DR. HISER: Well, the experience that we  
13 have on the upper head, even some plants have -- some  
14 of the BNW plants have thermalcouple nozzle. Now,  
15 normal CRDM, with about a 4-inch outside diameter, and  
16 the thermalcouples were about 1-inch.

17 The prevalence of cracking in the  
18 thermalcouples was much higher than the CRDMs, and so  
19 it may be that their size differences and fabrication  
20 differences from the top and the bottom, there are a  
21 lot of factors like that that really need to be  
22 considered as well.

23 And that will occur once we know where the  
24 cracks were. Are they in the nozzle base material, or  
25 the welds, or are they fabrication related possibly,

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1 and some sort of fatigue mechanism, or are they a  
2 PWSCC phenomena.

3 Now as I think has been mentioned, the EDY  
4 is much lower on this lower head, about 2.1, versus  
5 the 20 -- for example, at the Oconee units are much  
6 lower than the cutoff for high susceptibility within  
7 the order.

8 So the potential implications are clear  
9 from this; we need more information out. The only  
10 thing that we really know is that they found two  
11 deposits that have boron.

12 They have been dated through isotopic  
13 analysis at about four years old, or I think 1-to-4  
14 years old. Very small deposits. We just need  
15 information now. We are aware of the cracks and the  
16 source of them.

17 MEMBER KRESS: When you say 1-to-4 years,  
18 I mean, why isn't it just four? Why is there a range?

19 MR. MITCHELL: Let me clarify that. Based  
20 upon again what we received last Thursday, the  
21 licensee was concluding that they were 4 years, plus  
22 or minus 6 months, in terms of age. So they have  
23 narrowed it essentially to approximately 3-1/2 to 4-  
24 1/2 year type range.

25 MEMBER KRESS: Is it cesium dated? Is it

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1 cesium isotopes?

2 MR. MITCHELL: We didn't get that  
3 specific, in terms of exactly what their isotopic  
4 analysis was. They did mention that they looked at  
5 the cobalt isotopes, and so to be able to disregard it  
6 being less than a year old, and they have done the  
7 other isotopic analysis to get them to this 4 year  
8 type range.

9 MEMBER KRESS: And this is probably such  
10 a small amount of cesium in there that that gives you  
11 that uncertainly range.

12 MEMBER FORD: Allen, could I suggest,  
13 unless my colleagues don't agree, that you just go  
14 into the last two slides, please. The outlook, and  
15 then the final one.

16 DR. HISER: Yes, the other photographs and  
17 slides were presented at the subcommittee, and they  
18 are available at the NRC website. Now, overall on the  
19 upper head now, the goal is permanent requirements for  
20 inspections to ensure structural integrity of the  
21 head and the nozzles.

22 The ASME code is working to develop these  
23 requirements. At the present time the industry or the  
24 ASME code work is based on an industry report. The  
25 staff has provided comments to the industry on this

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1 report. In summary, it is not acceptable has it has  
2 been submitted, and it is not clear if it will become  
3 acceptable.

4 We have suspended our review pending  
5 revisions by the industry based on some of the  
6 findings from the fall, and now probably some of the  
7 findings of spring.

8 We expect that report to be submitted in  
9 the late summer to us. The ASME code adoption  
10 requirements may not be complete until 2004 or later.  
11 I thin that is sort of the bottom line on the ASME  
12 code activities.

13 We will implement inspection requirements  
14 in 50.55a. This would either be an endorsement of  
15 ASME code requirements if acceptable under an  
16 implemented and expedited implementation, or we would  
17 codify alternative inspection requirements in 50.55a.

18 Once acceptable requirements are  
19 identified, this again would take another one to two  
20 years before they would be effective for plants. Some  
21 of the items here are items that the industry is  
22 providing additional work. One is to complete  
23 development of and submit the revised MRP-75 report.

24 We are continuing to work with the  
25 industry on the underlying analyses, and much has been

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1 talked about that would support any inspection  
2 requirements.

3 The industry is continuing to develop and  
4 improve inspection tools to provide for more effective  
5 examinations, and the industry is continuing to look  
6 at RPD heads removed from service.

7 And in particular they have a lot of  
8 activity with North Anna Unit 2, and possibly with  
9 some of the Oconee heads. The industry does have, as  
10 the subcommittee heard, a boric acid corrosion  
11 research program to determine the conditions that can  
12 lead to accelerated corrosion, and in addition I  
13 believe we have recently issued a letter to NEI  
14 requesting that they pick up their work on other RCS  
15 areas that may be susceptible to cracking.

16 And other areas that Alloy-600 has used in  
17 the RCS.

18 MEMBER WALLIS: So accelerated corrosion  
19 rates, and you simply want to do research to figure  
20 out what the corrosion rates are?

21 DR. HISER: Well, what we want to do is  
22 have a basis for the inspection requirements again.

23 MEMBER WALLIS: When will they be high  
24 enough for you to worry about, because accelerated  
25 doesn't really mean anything.

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1 DR. HISER: Well, we want to understand  
2 the types of conditions that can occur --

3 MEMBER WALLIS: What is the momentum  
4 equation for corrosion.

5 MEMBER FORD: Could I just ask you to  
6 spend one or less than one minute addressing the  
7 question of the cracking of Alloy 52 in repair welds  
8 and what that situation is?

9 DR. HISER: The repaired nozzle that was  
10 identified as cracked at ANO Unit 1 was a localized  
11 partial cover repair, and so the repair left the  
12 original Alloy-182 weld exposed. The cracking that  
13 was identified was along the periphery, or the  
14 interface of the repair weld and the original weld.

15 And that kind of approach I do not believe  
16 has been used in any other plant at this point. The  
17 current approach is to entirely cover the original  
18 weld material with the 52-152.

19 MEMBER FORD: And is that the plant where  
20 they are doing a destruct examination to determine  
21 specific failure modes?

22 DR. HISER: No, that is still in service.  
23 What the licensee did was to implement a repair of  
24 that nozzle and then they have restarted.

25 MEMBER FORD: Thank you very much, Allen.

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1 I would now turn to Brendan Moroney and Douglas  
2 Kalinouski to talk about the LLTF action plan. I  
3 would like to finish this segment at 10 o'clock to  
4 allow some good questioning time on the research  
5 program.

6 MR. MORONEY: We will certainly do our  
7 best to accommodate you there, sir. Good morning. I  
8 am Brendan Moroney, and I am with the NRR, Division of  
9 Licensing Project Management. And this is Doug  
10 Kalinouski in Research.

11 We are here to talk about the action plans  
12 that were developed to address the Davis-Besse lessons  
13 learned task force recommendations. The  
14 recommendations were provided, and they were reviewed  
15 by a senior management committee.

16 And then the EDO tasked the directors of  
17 NRR and Research to develop and implement the plan to  
18 accomplish this. This plan was completed and  
19 delivered to the EDO at the end of February, and  
20 subsequently forwarded on to the Commission.

21 The plan included four action plans to  
22 address what were identified as the high priority  
23 items in the senior management review team report.  
24 The four plans are addressing stress corrosion  
25 cracking, operating experience, inspection assessment,

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1 and project management issues, and barrier integrity.

2 And each of them has a lead in one of the  
3 offices or departments within the agency.

4 MEMBER WALLIS: I presume that these are  
5 all interrelated, and is someone doing that and seeing  
6 how they fit together?

7 MR. MORONEY: I'm sorry, sir?

8 MEMBER WALLIS: It seems to me that all  
9 these plans are interrelated. Stress corrosion  
10 cracking is interrelated to barrier integrity and  
11 everything else, and operating experience feeds into  
12 it, and so they are not independent. Someone is in  
13 charge of the whole work.

14 MR. MORONEY: Yes, there is an overall  
15 coordination plan, and I am in charge of that, but  
16 each of the -- the review team that reviewed the  
17 lessons learned task force segmented the 49  
18 recommendations into four overriding categories, and  
19 each of those then was the subject of one of these  
20 plans.

21 We are going to discuss two of the plans  
22 today. One is the stress corrosion cracking  
23 activities, and the other one is the barrier integrity  
24 plan. I think in a later session today, you are going  
25 to be hearing about the operating experience plan.

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1           The stress corrosion cracking plan is  
2 divided into three parts basically. The first segment  
3 has to do with reactor vessel head inspection  
4 requirements. The second has to do with boric acid  
5 corrosion control requirements, and the third phase is  
6 development or improvement of the inspection program  
7 requirements on these activities.

8           The stress corrosion cracking plan in the  
9 inspection requirements for the reactor vessel heads  
10 has several steps. One of them would be to develop a  
11 database by collecting information from world-wide  
12 sources, both foreign and domestic, on Alloy 600, and  
13 690 and other nickel-based alloy, nozzle cracking  
14 information, and this would be developed from  
15 technical studies, from previous related generic  
16 communications, industry guidance, and operating  
17 experience.

18           The second phase would be to evaluate the  
19 existing stress corrosion cracking models used in the  
20 susceptibility index, and take into consideration the  
21 large uncertainties and determine whether additional  
22 analysis or testing are needed to reduce these  
23 uncertainties.

24           MEMBER FORD: Now, I noticed in the actual  
25 plan that was distributed at the last meeting that it

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1 says medium, and does that mean medium priority?

2 MR. MORONEY: Okay. There were medium and  
3 low priority items identified. There were some of  
4 those medium and lows that we felt were so closely  
5 related to the high priority items should be done in  
6 conjunction with them, that we did incorporate  
7 probably about half-a-dozen of those lows and mediums  
8 into the various action plans.

9 So the action plans are specifically  
10 designed to address the high priority items, but we  
11 did bring some of the lows and medium priority items  
12 into the action plans.

13 So that particular item might have been  
14 identified as a medium, but it was considered  
15 important to be --

16 MEMBER FORD: So not treated to high  
17 because it is in this plant. Okay.

18 MR. MORONEY: Yes. The third phase would  
19 be to evaluate the results of the inspections that are  
20 being done according to the bulletins in the order.  
21 The first complete cycle of all of the outages of the  
22 various plants will be completed in May of next year  
23 or the spring of next year.

24 So that is the reason for that  
25 implementation date there or target date there.

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1 Another phase would be to evaluate the MRP and ASME  
2 efforts, and Allen Heiser I think just went into some  
3 detail on what that effort entails.

4 We don't have specific data identified yet  
5 because we are still waiting for the revised submittal  
6 of the MRP 75 guidelines, but those dates will be  
7 targeted once we do have that in-house.

8 The ultimate goal is to establish  
9 permanent guidelines which would be codified most  
10 likely through an update of the 10 CFR 50.55a  
11 requirements, and we would be looking at what the ASME  
12 code requirements suggestions come out and decide  
13 whether or not those are to be endorsed, or to go  
14 ahead with a different set of requirements of our own.

15 The second phase of the action plan has to  
16 do with the boric acid corrosion control programs.  
17 Once again, one of the initial efforts in this  
18 particular activity is the collection of a database of  
19 information similar to what we are talking about for  
20 the cracking concern.

21 The second would be to complete the  
22 evaluations of the responses that were received in  
23 response to Bulletin 2002-01. That initial evaluation  
24 has been completed, and the technical staff is  
25 discussing its findings and recommendations with their

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1 management at this time.

2 And based on their review and those  
3 discussions, the need for any additional regulatory  
4 action will be identified, and we are targeting the  
5 end of this month to have this going forward, and it  
6 is being worked on right now.

7 Any additional activities and milestones  
8 will be added to the plan as soon as that has been  
9 determined. The ASME is also doing some code work to  
10 address boric acid corrosion, and we will be looking  
11 at those and reviewing and evaluating those activities  
12 as they become --

13 MEMBER WALLIS: Well, this is very high  
14 level, and you have all these plans, but is there  
15 anything which has resulted from number two which is  
16 of interest to this committee since you have done it?  
17 Is there anything that has happened --

18 MR. MORONEY: Well, like I said, the tech  
19 staff review has completed their initial evaluation,  
20 and I think the report right now is in draft form, and  
21 it is still preliminary and being reviewed by  
22 management.

23 MEMBER POWERS: I am at a loss to  
24 understand what exactly was accomplished. The boric  
25 acid corrosion I presume is a bad idea. What are they

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1 evaluating?

2 MR. MORONEY: They are evaluating the  
3 programs that the licensees have in place, primarily  
4 to respond to generic letter 80.05, which identified  
5 certain aspects of having a program for inspecting,  
6 identifying, and following up on indicated leakage.  
7 of the boric acid in components.

8 MEMBER FORD: Surely in relation to what  
9 Dr. Powers is saying, in the 2002-01 responses, the  
10 initial response was that there is not another Davis-  
11 Besse out there. There is not another plant which is  
12 corroding by boric acid corrosion at one inch per  
13 year, which is comforting.

14 But the underlying question behind Dr.  
15 Powers' concern is given that, why not or why is it  
16 that, or do we understand why there are not other  
17 plants out there corroding at one inch per year.

18 What are the physical phenomena, fit gaps,  
19 whatever it might be, that tells you that that  
20 particular nozzle corroded at one inch per year  
21 undetected or whatever, but it doesn't matter. The  
22 adjacent nozzle was not. Why? Until you can answer  
23 that question, you cannot just sit back and say no  
24 more problem.

25 And what I was hoping to see in this

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1 particular subset, in part two, in the boric acid  
2 control, that is what you are driving at? At the end  
3 of the day, by 1:05 or whenever the day is, you can  
4 answer that question? Is that correct?

5 MEMBER POWERS: Well, you are hitting  
6 into one of many points that comes from this. I mean,  
7 do we have a sufficient understanding now to say this  
8 kind of configuration is no good, and that other kind  
9 of configuration is just great.

10 MEMBER FORD: And can you measure that?  
11 I mean, do you understand why that nozzle is --

12 MEMBER POWERS: And this looks like a  
13 scholarly work going on, but it hardly looks like  
14 research work going on.

15 MR. BARRETT: Let me say a word about the  
16 bulletin, and this is Richard Barrett with the staff.  
17 The evaluation of the Bulletin 2002-01 responses was  
18 actually a separate part of Bulletin 2002-01 that was  
19 not related to the head degradation itself.

20 It was a question that regarded the rest  
21 of the reactor coolant system, primary coolant system,  
22 and what was being done out there. And the responses  
23 that we got, this was a 60 day request. We got the  
24 responses, and they did not contain a level of detail  
25 sufficient for us to evaluate licensee programs.

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1                   So we put out a request for additional  
2 information, and we have gotten the responses, and we  
3 have evaluated them, and we have sent a team out to do  
4 three audits of three separate utilities just to see  
5 and get a little better view of what their procedures  
6 are.

7                   And we now understand what is being done.  
8 This is not an effort to understand the basic science  
9 behind corrosion. It is really to look at what is  
10 being done with regard to the inspection of the rest  
11 of the reactor coolant system, including the bottom  
12 head.

13                   And we now fully understand that, and we  
14 are in the process of deciding what if any additional  
15 regulatory requirements we want to place on the rest  
16 of the reactor coolant system specifically for those  
17 locations where we have these nickel-based alloys  
18 interfacing with the reactor coolant system.

19                   And right now that is a very heavy  
20 activity we have going on, and as that ripens, we will  
21 certainly want to come and talk to you about it.

22                   MEMBER POWERS: I think I am supposed to  
23 derive what you just said from this view graph?

24                   MR. BARRETT: Well, this is a status  
25 briefing, you know, and I think we would certainly be

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1 happy to provide more detail of --

2 MEMBER POWERS: Well, what are you trying  
3 to accomplish with this, and where do you want to be  
4 that you are not now that I am missing from this?

5 MR. BARRETT: With respect to the reactor  
6 coolant system, we know a few things. One is that we  
7 have some operational experience. We have the summer  
8 cracking, through wall cracking. We have or we now  
9 have South Texas, which we don't fully understand.

10 I think there is reason to believe that  
11 the operational experience is not as dire as it is for  
12 the upper head. Nevertheless, we don't want to be in  
13 the position that we got into with the upper head,  
14 where we were trying to catch up.

15 We had a surprise, and we tried -- and we  
16 had another response, and we tried to respond to it.  
17 The idea here is to say what can we do to get out  
18 ahead of that knowing that these plants are aging, and  
19 knowing that these phenomena are out there.

20 What do we want to do in terms of getting  
21 ahead of that, in terms of new requirements possibly,  
22 new rules, or other regulatory vehicles. That is what  
23 we are trying to accomplish.

24 MEMBER WALLIS: But you may find that you  
25 don't get ahead of the game with what you have been

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1 doing here.

2 MR. BARRETT: That is very possible. This  
3 was all initiated and this is on its tract long before  
4 we found out about South Texas. We don't fully  
5 understand South Texas, but we may have to adjust our  
6 plans based on what we have learned at South Texas.

7 MEMBER WALLIS: Okay.

8 MR. MORONEY: The third part of the SCC  
9 action plan is to develop new guidance or improve  
10 existing guidance for various activities. The first  
11 one is related to the review, the periodic review of  
12 ISI activities by the licensees.

13 This is on-site review of the activities  
14 that go on during an outage, and it involves  
15 monitoring and evaluating those activities as they are  
16 in progress, and follow-up on any identified issues  
17 that are resolved and reports that are generated.

18 Currently to track the bulletins, we do  
19 have a temporary instruction issued to the inspectors  
20 to follow up on the bulletin activities. The intent  
21 is to provide permanent guidance in the future, and  
22 that is targeted for early next year.

23 The second issue has to do with providing  
24 guidance for the inspection of boric acid control  
25 programs at the licensee sites. Currently there is no

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1 specific guidance within our oversight program that  
2 specifically talks about boric acid control  
3 inspections.

4 The Davis-Besse task force identified the  
5 fact that the previous guidance was somewhat  
6 discretionary and it was associated with corrective  
7 action program follow-up, problem and identification,  
8 and corrective action program follow-up.

9 So the intent once we have completed or  
10 substantially completed the activities in the Phase II  
11 activities on the boric acid and corrosion control  
12 program would be to provide detailed guidance for  
13 inspection and follow-up.

14 And part of that or associated with that  
15 would be what to look for in evaluating boric acid  
16 control programs; implementation effectiveness at the  
17 sites, and the ability and the processes for  
18 identification of leakage, and the process for  
19 adequate follow-up on identified leakage.

20 MEMBER POWERS: But this guidance -- is  
21 the function here is to communicate to the inspection  
22 staff the things that experts within the agency and  
23 elsewhere have on these corrosion issues as of today?

24 MR. MORONEY: Or ongoing in the future,  
25 too. These things --

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1 MEMBER POWERS: Well, you can't be too far  
2 away. It is only March of 2004.

3 MR. MORONEY: Yes, sir.

4 MEMBER POWERS: Okay. It is an  
5 information transfer function, and there is nothing  
6 new being discovered here?

7 MR. MORONEY: Not in these. These are the  
8 results from the other activities primarily.

9 MEMBER FORD: In other words, you are  
10 going to be giving guidance of the expectations for  
11 the licensees ISI program as to when, how often, and  
12 by what technique they should be inspecting, and the  
13 expectation of probabilities, and all of these  
14 inspection technical details?

15 MR. MORONEY: Yes, that would be part of  
16 the development of whatever regulations we ultimately  
17 come up with, or the inspection. The inspection  
18 guidelines are instructions to our inspectors to  
19 follow up and go out, and then when they are doing  
20 their on-site inspections, what to look for and what  
21 to follow up on.

22 MEMBER FORD: Okay.

23 MEMBER LEITCH: I am a little confused.  
24 Inspectors must now have guidance as to what to look  
25 for in the licensee boric acid corrosion control?

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1 MR. MORONEY: Not specifically.

2 MEMBER LEITCH: Not specifically?

3 MR. MORONEY: No, sir.

4 MEMBER LEITCH: Okay. I would have  
5 thought that there would have, because that is a  
6 generic letter 15 years old, right?

7 MR. MORONEY: Yes. There was at one time  
8 a set of instructions, which I believe that is no  
9 longer effective after the conversion over to the new  
10 ROP program. And this action would be to come up with  
11 new guidance.

12 MEMBER LEITCH: That is very interesting.  
13 It opens up a broader subject to me that we won't  
14 pursue right now, but I am just wondering are there  
15 other things, inspections that were routinely  
16 conducted that are no longer conducted because we are  
17 in an ROP program?

18 MR. MORONEY: I believe that is a true  
19 statement.

20 MEMBER LEITCH: Okay. Well, we will need  
21 to pursue that at another time. I was not fully aware  
22 of that.

23 MEMBER FORD: Could we spent just 10  
24 minutes at the very most on this particular item.

25 MR. KALINOUSKI: It shouldn't take that

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1 long.

2 MEMBER FORD: Okay. Thank you.

3 MR. KALINOUSKI: Okay. My name is Doug  
4 Kalinouski, and I am with Research, Fuel Engineering  
5 Branch. I will go over the Barrier Integrity Action  
6 Plan. Right now it is broken down into two parts.  
7 The first one is leakage detection and monitoring  
8 requirements, and the second is improved performance  
9 indicators.

10 All right. The first part is we will  
11 begin with the review of the plant tech specs to  
12 identify their leakage requirements, and also identify  
13 the plant alarm response procedures for leakage  
14 monitoring systems. Based on those two, and in  
15 conjunction with, we will develop a basis for a new  
16 reactor coolant system leakage requirements is the  
17 first high priority task.

18 And it consists of a review of the current  
19 leakage basis, and we want to look back and see how  
20 they came up with the current requirements basically,  
21 and see if it is appropriate still, or how or what we  
22 can improve upon what.

23 We also review the experience capabilities  
24 of the currently used leakage detection systems, and  
25 we want to particularly find out how accurate they

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1 are, and how sensitive they are, and how reliable they  
2 are.

3 And based on that, we also review or  
4 evaluate the capabilities of the state-of-the-art, or  
5 more up to date systems that may or may not be in use.  
6 This includes foreign, as well as domestic, plants.  
7 We also expanded the scope of the actual plan to  
8 include detecting degradation in addition to just  
9 leakage.

10 And the idea here was that some cracks,  
11 like SSC cracks would be so tight that they might not  
12 be leaking very much and detectable. And finally the  
13 last bullet there is evaluate leak rates -- it should  
14 say arising from degradation, as in leak rates from  
15 cracks in the various components in the RCS.

16 Now, based on those items in the first  
17 slide, the next major section is to develop  
18 recommendations for improved leakage requirements.  
19 Now these can include and won't be limited to tech  
20 spec changes, and make standardized tech specs  
21 throughout the plants, improved inspection guidance  
22 dealing with unidentified leakage.

23 And possibly updating Reg Guide 1.45,  
24 leakage detection systems. And then based on the  
25 recommendations, they will be evaluated, and if they

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1 are appropriate, they will be changed into  
2 requirements.

3 And the last bullet here is to examine  
4 other improvements that won't rely just on leakage  
5 monitoring. Again, this goes to the bullet of the  
6 degradation, and try to get some kind of on-line  
7 degradation system if we can to monitor or improve  
8 inspection to catch the degradation before it becomes  
9 a leak. And to ensure barrier integrity.

10 And the second part of the plan is to  
11 performance indicators. The first being implement  
12 improved performance indicators based on current  
13 requirements and capabilities, and look at what they  
14 have now.

15 This is all currently being worked on by  
16 NRR, and they are trying to improve it based on total  
17 leakage, including unidentified and primary to  
18 secondary leakage.

19 This is basically to develop more robust  
20 performance indicators. Based on our part one, we  
21 hope to develop advanced performance indicators, and  
22 this was a recommendation in the lessons learned task  
23 force that they would like to possibly track a number  
24 duration and rate of primary system leaks.

25 And we will take a look at that and see if

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1 it is feasible, and if so, try to implement some kind  
2 of performance indicator based on that. And the last  
3 --

4 MEMBER LEITCH: I am having trouble  
5 understanding what we are really discussing here.  
6 Total leakage identified or unidentified. It seems to  
7 me that in order to -- I mean, the kind of leaks that  
8 we are talking about here are very, very small.

9 And by the classical means of just knowing  
10 what is the total leakage for the identified versus  
11 the unidentified leakage, the kind of leaks that are  
12 talking about here would be lost in the noise.

13 You know, you could have a little valve  
14 packing drip here or there. It is going to be very  
15 difficult to measure these kinds of leakage by  
16 classical methods.

17 Now, are you talking about some different  
18 kind of method perhaps for detecting leakage above the  
19 head, for example, rather than just the total system  
20 leakage? I just don't quite understand how we are  
21 going to get anything of significance other than just  
22 noise data here. These leaks are so small.

23 MR. KALINOUSKI: That's right. One idea  
24 is to try and separate out the leakage based from  
25 pumps and seals if you can collect it separately, so

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1 that you can count more accurately.

2 But like you said, this is the -- if you  
3 look at its feasibility, and you're right, and it  
4 might not be feasible to do stuff that accurate based  
5 on the systems that we have.

6 And right now it is very up in the air on  
7 which way we will go with it. If we can do it, we  
8 will try, and we will take a look at it and see if we  
9 can be more accurate. But like you were saying, there  
10 are small amounts and it is hard to do.

11 MEMBER LEITCH: Well, I was just wondering  
12 if there is a totally different concept that you have  
13 in mind? That is, perhaps some way to measure or  
14 identify leakage in the upper head area, or is that  
15 part of this thinking?

16 MEMBER APOSTOLAKIS: The thrust of your  
17 question, Graham, is that knowing that there is a  
18 leakage doesn't really tell you very much. You would  
19 like to see more geographical dispersion and  
20 information where it is.

21 MEMBER LEITCH: Exactly.

22 MEMBER APOSTOLAKIS: Or otherwise you just  
23 have data that by and large would be useless.

24 MEMBER LEITCH: Right.

25 MEMBER APOSTOLAKIS: Okay.

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1 MR. KALINOUSKI: And it would change it  
2 from unidentified to identified leakage at that point  
3 is what you are saying.

4 MEMBER APOSTOLAKIS: Yes.

5 MR. KALINOUSKI: And I have no answer for  
6 that.

7 MR. CHAN: I guess there are some things  
8 to recognize. Some plants do have supplemental leak  
9 collection systems.

10 MR. KALINOUSKI: Right.

11 MEMBER SIEBER: They are expensive to  
12 build because they have a lot of catch basins, and  
13 they have a tendency to plug up with age because  
14 generally here is no flow in them.

15 On the other hand in the Davis-Besse  
16 situation, if you looked at those graphs that they  
17 had, which they should have been plotting every day,  
18 because that is a generally accepted practice, you can  
19 actually see the start of the leak on the head there.

20 It's just that as several have stated,  
21 that you don't know where it is. It is a leak in the  
22 plant someplace. It could be an intersystem valve,  
23 and it could be packing, and it could be a pump leak.  
24 It could be anything.

25 On the other hand, usually when you see a

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1 change in the RCS leak rate, that alerts people to  
2 start looking and make a trip into containment to  
3 generally look around, and where you may have  
4 television or other ways to do this.

5 One thing that should not be ignored is  
6 the fact that there acoustic systems out there that  
7 not only can tell you that you have got changed  
8 leakage, but that it can tell you roughly where it is.

9 And they are quite elaborate systems, and  
10 it takes a lot of transducers to make them work. On  
11 the other hand, they do work, and they have been used.

12 I am not sure what the sensitivity of them  
13 is, but some folks tell me that they are pretty  
14 sensitive. And they are used frequently for  
15 hydrostatic tests.

16 MEMBER APOSTOLAKIS: Could you give me an  
17 example of an advanced PI that would have caught  
18 Davis-Besse?

19 MR. KALINOUSKI: I can't, no.

20 MEMBER APOSTOLAKIS: Now, the PIs will be  
21 used in the oversight process, the reactor oversight  
22 process?

23 MR. KALINOUSKI: Yes.

24 MEMBER APOSTOLAKIS: So let's say the PI  
25 goes from green to yellow, as I recall the action

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1 matrix requires a conference between the licensee and  
2 the NRC staff, and the licensee will propose a course  
3 of action on what to do, and the staff will look over  
4 their shoulder. I mean, that level of interaction.

5 Now, if they during that conference they  
6 dismiss the significance of what they see, how good is  
7 the PI? What good is it? I mean, they interpret the  
8 findings in a way that is -- well, it is not a big  
9 deal. But then what?

10 MR. BARRETT: Let me -- this is Rich  
11 Barrett, with the staff. If a drip indicator, and  
12 this indicator as you recall, we have seven  
13 cornerstones, and this indicator would be in the  
14 barrier integrity cornerstone, I presume.

15 If you had a non-green, and say in your  
16 case a yellow finding, that would go into the process,  
17 and if you had a licensee that had -- and  
18 coincidentally a yellow finding in mitigating systems,  
19 and a white finding someplace else in initiating  
20 events, that would trigger further actions.

21 So without going into a great deal of  
22 detail about the action matrix, which I have not  
23 looked at in quite some time, that would be the  
24 significance of it.

25 MEMBER APOSTOLAKIS: Well, I guess the

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1 point that I am trying to make clear in my mind us  
2 what is it in this new structure that would make  
3 people go look at the vessel head that there is a leak  
4 of boric acid, versus what they actually did?

5 I mean, by declaring something a  
6 performance indicator, and something happens that  
7 didn't happen before, you still have to interpret it  
8 don't you?

9 MR. BARRETT: I think -- I am not sure.

10 MEMBER APOSTOLAKIS: Or you have to bring  
11 it back to green, and that is probably what would be  
12 the action. Somehow you have to bring it back to  
13 green.

14 MR. BARRETT: Again, this action plan is -  
15 - we are moving into areas where we have some  
16 possibility that these investigations may not be  
17 successful, and that we may not be able to make  
18 improvements, but the oversight process is -- I don't  
19 think we depend on the oversight process, and the use  
20 of performance indicators, and the assessment of  
21 yellow and white findings, and all that.

22 I don't know that we want to depend on  
23 that to find problems in the plant, such as the Davis-  
24 Besse problem. I think we would want this kind of  
25 activity to look for or to be an aid in looking at

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1 more systemic problems in the organization of the  
2 plant, and overall performance problems that could be  
3 remedied over time.

4 I don't know that we would want to use a  
5 performance indicator to find or to preclude, let's  
6 say, another Davis Bessie. We would want to have  
7 other things do that.

8 MEMBER APOSTOLAKIS: I thought that was  
9 the whole idea of the oversight process, to do just  
10 that.

11 MEMBER FORD: Could I just make a  
12 suggestion, George? I think maybe this particular  
13 topic can come up in the next talks, which will be in  
14 Jack's area, because I have got a time crunch here.  
15 I have to finish at 25 to, and we have one more  
16 presentation.

17 MEMBER APOSTOLAKIS: What is in Jack's  
18 area?

19 MEMBER FORD: Pardon?

20 MEMBER SIEBER: On 3 of the 4 task forces,  
21 and one is this afternoon, which is operating  
22 experience.

23 MEMBER APOSTOLAKIS: Okay.

24 MEMBER FORD: So thank you very much  
25 indeed. I am sorry that we have pushed you, but I

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1 would like to ask Bill Cullen to come and give the  
2 final one.

3 MEMBER APOSTOLAKIS: If you call that  
4 pushed, I don't know.

5 MEMBER SIEBER: While everybody is  
6 changing places, I would like to address a little bit  
7 of George's question. The problem from a regulator  
8 standpoint is that you have to set a threshold for  
9 performance indicator in order to be able to have a  
10 basis for doing something with the licensee.

11 The issue is setting the threshold,  
12 because there are so many things that can occur in RCS  
13 leakage that that threshold is certainly not a  
14 definite sure thing. It becomes just an invitation  
15 just to start an argument about what it is, and what  
16 you are going to do about it.

17 So I think that there is a true challenge  
18 in coming up with a performance indicator that has  
19 more.

20 MEMBER FORD: Bill. I have asked Bill to  
21 concentrate just on Items 1 and 2, and to not discuss  
22 3. All of these items were discussed at the  
23 subcommittee meeting.

24 Bill, we have heard some of the questions  
25 so far today on both the nickel-base alloy cracking

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1 and the boric acid corrosion to some of our concerns.  
2 So if you could -- and I apologize for the timing, and  
3 if you could try and concentrate on addressing those.

4 MR. CULLEN: Thank you. I will. For the  
5 record, I am Bill Cullen, from the Materials  
6 Engineering Branch of the NRC's Office of Research.  
7 As Peter indicated, there is a few topics to be talked  
8 about today. I wanted to go over very briefly the  
9 currently funded NRC Office of Research Programs  
10 dealing with the issues that we have on the agenda  
11 today. I will point out a little bit about some other  
12 programs that are going on elsewhere in the world that  
13 feed into these areas of interest.

14 And talk a little bit about where I think  
15 we can go with some of the materials that are  
16 available from the discarded heads here in the United  
17 States, and a little bit about stress analysis of CRDM  
18 penetrations.

19 That issue was raised this morning with  
20 respect to the South Texas issue, versus or as  
21 compared to the head issue, and I will delete or have  
22 in this presentation a little bit on what the exposed  
23 clad analysis does mean to this industry.

24 Okay. We do have programs currently  
25 ongoing, and some of them have been going for 5 or 6

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1 years to do stress corrosion cracking growth rate  
2 measurements on nickel-based alloys that are of  
3 interest in this vessel head penetration and bottom  
4 mounted instrumentation penetrations.

5 There are some reports that are currently  
6 out and currently available, and have been available  
7 for some time. And other reports that are coming  
8 available in the reasonably short term.

9 Most of this information is from our  
10 program at Argonne National Laboratory, and Dr. Shack,  
11 a member of the committee, is of course the head of  
12 that group that is working on these sorts of things.  
13 There are reports out dealing with the results on  
14 Alloy-600, which that work does continue.

15 But there is also work on Alloy-182 under  
16 way that will be reported out late next year. I also  
17 want to point out that we have salvaged materials from  
18 the Davis-Besse reactor head, and those materials are  
19 at Argonne right at the moment.

20 They are being turned into specimens for  
21 testing of both the Alloy-600 from nozzle 3, and the  
22 Alloy-182 for nozzle 11, which was next door to nozzle  
23 3. Those materials will go into the test program  
24 about mid-summer, and I expect that we will have  
25 results by the early fall, stress corrosion growth

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1 rates on those materials.

2 Also, you have heard just ahead of this  
3 presentation the information from the LLTF, and so we  
4 don't need to go through that again. Also, I want to  
5 point out that all of us, we as a collective group,  
6 are going to be getting a good more data from other  
7 agencies, from other countries, that will feed into  
8 this program.

9 And I think will be very, very helpful in  
10 our overall understanding of Alloy-600, and Alloy-182,  
11 and 690, and 152, and the microstructural effects that  
12 result in the -- you might call it the dispersion of  
13 crack growth rates. I am going to touch on that a  
14 little more later on.

15 But I want to point out particularly that  
16 there are two very, very large programs currently  
17 ongoing in Japan, and those results will be fed out in  
18 due time, but they will be providing a lot of data on  
19 these alloys of interest, including Alloys 690 and  
20 152.

21 Quite frankly, here in the United States  
22 we are not currently doing that much work to trying to  
23 determine the crack growth rates of Alloys-690 or 152,  
24 the alloys of interest for both repair and for the  
25 replacement heads.

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1 MEMBER POWERS: When you say we, who is  
2 we? Is that the Nation as a whole, or --

3 MR. CULLEN: Yes. That is exactly what I  
4 meant. Neither the industry nor the Office of  
5 Research at the present time are engaged in any  
6 significant amount of work.

7 Now, we do have that in our Office of  
8 Research program, but that work will not be starting  
9 up until either late this year or more likely next  
10 year, when we sort of finish with the matrices on  
11 Alloys 600 and 152, and we obtain materials of  
12 reasonable interest on Alloys 600 and 190, and 152  
13 materials of interest.

14 So we do have that in our programming, and  
15 it has not started yet, and I am not aware of any  
16 industry work in 690. Well, I shouldn't quite say  
17 that. There is a little bit going on at Westinghouse,  
18 but there is no data that is coming out. They cannot  
19 get cracks to grow in the stuff fundamentally.

20 So I am going to stick with my comment and  
21 say that I am not aware of any data, any useful data.  
22 All right. As it turns out, next week there is a  
23 meeting of this group on the ICGEAC, the International  
24 Cooperative Group on Environmentally Assisted Cracking  
25 up in Ottawa.

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1           That group is currently engaged in a  
2 round-robin. I expect to see some of the first crack  
3 growth rate data on Alloy-600 to be presented at that  
4 meeting.

5           Also as part of that same round-robin, we  
6 will be going on and doing some testing in Alloy-182,  
7 and our contractor, again Argonne Labs, is  
8 participating in this round-robin, and will be  
9 generating data, along with a wide spectrum of other  
10 laboratories around the world,

11           You can see what the expectations are for  
12 that, and collecting the info meant collecting the  
13 information on how these tests are to be conducted in  
14 coming up with a test plan, or a set of specifications  
15 for doing the tests that was agreeable to all and  
16 would produce the kind of data in which we have the  
17 interest that we need to have.

18           MEMBER POWERS: Is there a comparable  
19 activity around the world on Alloy-800?

20           MR. CULLEN: No, there is not. As far as  
21 I know the use of Alloy-800 is confined to a handful  
22 of European countries, and largely as far as I know  
23 and somebody tell me if I am wrong, most as steam  
24 generator tubing.

25           I am not aware of much use of Alloy 800 in

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1 thick sections. If anyone knows differently, please  
2 offer that assistance, but I am not aware of that.

3 MEMBER POWERS: Well, steam generator  
4 tubing, of course, is of substantial interest in and  
5 of itself.

6 MR. CULLEN: Of course.

7 MEMBER POWERS: And I just wonder why. I  
8 am asking you to dissect the material.

9 MR. CULLEN: That is a little bit out of  
10 the scope of my basic knowledge at the moment, but I  
11 understand your question and I will do what I can to  
12 get you a reasonable answer to that.

13 MEMBER POWERS: I would appreciate it.  
14 That would be of interest.

15 MR. CULLEN: Okay. I will do that. Also  
16 just to note that we are working with the industry and  
17 with the licensees to obtain some of the materials of  
18 the heads that are coming off these reactors to be  
19 replaced.

20 And we are making very good progress along  
21 that line. We have some of the materials from Davis-  
22 Besse, and we are going to get some of the materials  
23 from North Anna, and there are other discarded heads  
24 that are under discussion at the present time.

25 Okay. What can we do with the materials

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1 from the discarded heads? This is an example as it  
2 turns out, listing the heats that were in the David-  
3 Bessie reactor over here on the right-hand side.

4 These are the heats of Alloy-600 that were  
5 in the head of the Davis-Besse reactor, and the other  
6 plants in which these same heats of material are  
7 currently found.

8 Now, as it turns out, since I put this  
9 slide together most of these heads over here are going  
10 to be replaced or are scheduled for replacement  
11 somewhat soon. So it is almost a moot point as to  
12 whether or not we could really use any of these  
13 materials to assist with flaw evaluation of a crack  
14 that might or might not be found in one of these other  
15 heads.

16 The point is that it is a moot point.  
17 However, in the next slide, it is a slightly different  
18 situation with the materials that are in the North  
19 Anna head. Here are all of the heats of the Alloy-600  
20 that were found in the North Anna head. The North  
21 Anna-2 head, several different heats.

22 And the cross-correlation with where they  
23 are found elsewhere. Again as you know, North Anna 1  
24 is going to have the head replaced on it, and some of  
25 these others as well, but there are plants down here

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1 that currently do not have any plans for head  
2 replacement.

3 So conceivably if a licensee chose to do  
4 so, and chose to perform a flaw evaluation, they know  
5 where they could get the precise heated material that  
6 they would need in order to do crack growth rate  
7 tests, and to perform that sort of a flaw evaluation.

8 Whether or not that would be specifically  
9 done, that is not really the point that I am trying to  
10 make here. The point that I am trying to make is that  
11 as these heads come off, we are going to accumulate a  
12 kind of inventory of materials that might possibly be  
13 very, very useful in flaw evaluation should a licensee  
14 choose to do that.

15 MEMBER SIEBER: It is a fact though that -  
16 - I think, and you can tell me yes or no -- that for  
17 all the reactor vessel heads that are out there, there  
18 are insufficient records to identify the heat for  
19 every one of the 5,000 or so nozzles that are there;  
20 is that correct? I would like to just refine that very,  
21 very slightly.

22 We do know that for each and every head,  
23 we do know what heats of material are in that head.  
24 And for at least some heads, we know which heated  
25 material are in a specific nozzle. Give me a nozzle

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1 number and I can give you the heated material.

2 I do not know for certain that that is  
3 known for all heads of all PWRs in the United States.  
4 There is some hearsay evidence that probably the  
5 licensees, the individual licensees, do have that  
6 specific information.

7 Also, I have heard some hearsay that in  
8 some cases they may not. So I am hope I am refining  
9 that slightly. That it is not quite that dismal that  
10 we don't know. I mean, we do know in a great many  
11 cases.

12 MEMBER SIEBER: That is my understanding  
13 also. Thank you.

14 MR. CULLEN: I had planned to have a  
15 conference on this issue at the end of March, but the  
16 geopolitical events of the world served to conspire  
17 against that possibility when travel restrictions were  
18 placed on a number of attendees to that conference.

19 We did expect about 140 people to attend.  
20 It was going to be March 24th to 26th. There were  
21 participants from around the world. We just started  
22 talking this week about rescheduling that conference  
23 for very late in September.

24 It looks as of this morning that that  
25 might happen, and we will know more about that in a

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1 week or so. A little bit on stress analysis, and I am  
2 leading up to something here as you might guess.

3 Remember that the words stress corrosion  
4 cracking, we have been dwelling on corrosion as it may  
5 apply to materials susceptibility. The other part of  
6 that equation, and the other very important part of  
7 that equation is stress.

8 And we do have programs within the Office  
9 of Research to put together the finite element models  
10 to compute the levels of stress in these nozzle  
11 assemblies. And just to review now, all of these  
12 finite element programs, whether they are the ones  
13 that we are sponsoring in the Office of Research, or  
14 in the industry, they all work the same way.

15 You model the deposition of the welds that  
16 are combined to produce the J-weld assembly in a  
17 vessel. So you basically in a mathematical or  
18 computational sense, you deposit a weld at a very high  
19 temperature and you allow that weld bead to solidify,  
20 cool, contract, and that contraction provides the  
21 stress that we all know about now.

22 And you would then repeat that process for  
23 the number of beads that are normally used to create  
24 the total J-weld assembly, and when you are all done,  
25 what you get is a stress block that looks something

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1     like this, and this is for the hoops stresses that  
2     would obtain under normal operating pressures, and  
3     normal operating temperature, and you can see that red  
4     is bad and green is good.

5             So the hoop stresses are distributed well  
6     throughout the nozzle and throughout the J-weld, and  
7     of course it is the hoop stresses that would tend to  
8     open an axial crack in an assembly.

9             And I just wanted to show you an example  
10    of how this all works, because this is the hot-button  
11    slide that we talked about some this morning. Again,  
12    I want to combine the information here with the  
13    information on the previous slide about consideration  
14    of stress in the susceptibility model, and that is  
15    where I am headed with all of this on the next couple  
16    of slides.

17            I would like to make a couple of points  
18    about this particular graph, which is taken from the  
19    industry's document, MRP-55, which is their evaluation  
20    of crack growth rates in Alloy-600 in PWR conditions.

21            First off, there are very, very good and  
22    well understood reasons for why Alloy-600 exhibits  
23    such a wide range of crack growth rates under  
24    essentially similar conditions, the same PWR  
25    conditions.

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1           And the reasons have to do with the  
2           microstructure of the material and that relates to the  
3           way that the material was heat treated in the first  
4           place. There are some very good heat treatments,  
5           thermal treatments, of Alloy-600, that render this  
6           stuff very, very resistant to crack growth rates, or  
7           to crack growth in PWR environments, and presumably  
8           these data points at very low crack growth rates are  
9           materials that would exhibit if you look at them  
10          carefully that kind of resistant microstructure.

11           MEMBER WALLIS: I am very surprised that  
12          quality control is such that you can get this stuff so  
13          good. How do you allow it to get so bad?

14           MR. CULLEN: I think I would share your  
15          surprise, but we now know that many of these  
16          materials, particularly those that were product in the  
17          late 1960s, early 1970s, when the industry was running  
18          at full bore, they just did not look at their  
19          performance indicators quite as carefully as they  
20          might have.

21           And we now recognize that some of that  
22          material got out of the plant, and it was just not  
23          optimally produced.

24           MEMBER WALLIS: But at that time, they  
25          knew how to make it better or they were just ignorant?

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1 MR. CULLEN: Well, we certainly have  
2 learned something in the last 30 years, but I think  
3 even in the 1970s they knew the fundamentals of what  
4 should be required.

5 I mean, we had heat treatment  
6 specifications that we do know produce good quality  
7 material, and do today if you were to do that today.  
8 So your point is well made. Quality control was not  
9 as thorough or as careful as it ought to be.

10 And some of the materials that we see  
11 tested here, while not -- and I don't want to give you  
12 the impression that all of these are domestic  
13 materials. This data was gathered from worldwide  
14 sources, and represents that sort of spectrum.

15 MEMBER WALLIS: is the foreign material  
16 better?

17 MR. CULLEN: No, generally not, and there  
18 is a bias in this graph that is impossible to see from  
19 this particular approach that kicks things up into the  
20 higher range because of the more susceptible non-  
21 American materials.

22 There are susceptible American material.  
23 I don't want to give that impression either. Without  
24 getting into a lot of details and trying to reprise  
25 the discussion that we had about an hour or so ago --

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1           CHAIRMAN BONACA: Just a question. The  
2 heat treatment is not sufficient I guess? I mean,  
3 people are going to 690 of materials, and I am  
4 intrigued by your statement, where you are saying that  
5 heat treated materials, Alloy 600, that behave very  
6 well and have low susceptibility.

7           MR. CULLEN: There is no question that  
8 Alloy 690 is better. Well treated, carefully treated  
9 Alloy-600 is darn good. I feel very strongly about  
10 that.

11           Alloy-600 is fundamentally a good  
12 material, but it got goofed up along the way.

13           CHAIRMAN BONACA: All right.

14           MR. CULLEN: And the other part of the  
15 equation -- and I am going to come back to this in a  
16 minute, too -- is the assembly of these things, and  
17 the J-welding procedures, and that has also improved  
18 a heck of a lot over the last 30 years.

19           And I do believe that at least the  
20 replacement head procedures that I am aware of are far  
21 better than they were again 30 years ago. Lastly, I  
22 just want to point out that we do have a number of  
23 programs going on within the Office of Research that  
24 we hope will lead to a better model.

25           We are currently using the susceptibility

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1 model, and I will show that in a minute or so. But we  
2 hope through some of the efforts of our programs  
3 within the Office of Research that we are working  
4 towards a model that will be more accurate, more  
5 useful, more encompassing, than the current  
6 susceptibility model.

7 And the models that we are working on will  
8 attempt to include a wider range of the inputs,  
9 including inputs from the inspection, as well as the  
10 crack growth rate, the stress analysis, all these  
11 sorts of things, we hope we will be able to combine  
12 and feed into an improved model for risk analysis.

13 I also want to point out that because of  
14 the worldwide interest in this interest, some of my  
15 colleagues in the Office of Research are getting  
16 together fostering the development or the assembly of  
17 an international cooperative group, which would meet  
18 I presume annually or biannually to keep these issues  
19 in the forefront, and to gather together the research  
20 information from around the world in a more efficient  
21 and effective way.

22 MEMBER APOSTOLAKIS: Now, when you say  
23 this analysis model, you don't mean PRAs? PRAs are --

24 MR. CULLEN: No, this would be a  
25 probablistic model used to compute times between

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1 inspections that would be optimal on a plant to plant  
2 basis in the ideal sense.

3 So some plants would have to inspect more  
4 often if they had susceptible materials, higher  
5 stress, less high probability of detection, and so on.

6 Okay. I would like to talk a little bit  
7 also about this susceptibility plot. First of all,  
8 what we are looking at here now is a plot of the --  
9 basically the time at temperature for American plants,  
10 domestic plants now, ranked from number one, up to 67  
11 or 69. 69, thank you. Now, this plot simply ranks  
12 the plants.

13 The one with the most EDY is down here at  
14 the bottom, and what we have plotted here is the EDY  
15 as of January of 2003. So just at the beginning of  
16 this year. So the EDY for each of the 69 American  
17 plants was calculated in January of 2003 based on the  
18 best information that we had about the temperatures  
19 that they had.

20 This information is strung or provided to  
21 me from the industry by the way, and some of the  
22 plants do have multiple data points, where there was  
23 an inspection for a plant some years ago at an earlier  
24 EDY, and you will see that data point and its results  
25 on the same horizontal line as you will see some of

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1 the other data.

2 So that's why the plot looks a little bit  
3 ragged. The point was made in an earlier presentation  
4 before the ACRS subcommittee that things just did not  
5 really look right, and quite frankly I didn't do a  
6 great job of explaining why they didn't look right.

7 But if you just reduce this to just the  
8 one most recent data point in plants, this would be at  
9 least a monatomically increase in plot, rather than  
10 having the raggedness.

11 The raggedness is simply due to the fact  
12 that some plants had earlier inspections and the  
13 results for those earlier inspections are also  
14 presented here. Allen made the point this morning  
15 very accurately that the rankings do appear to work,  
16 and there was some mention made about these boundaries  
17 being, quote, somewhat arbitrary.

18 Well, that may be the case. Pragmatic is  
19 certainly a better word than arbitrary, but the point  
20 was made this morning that all of the heads that are  
21 shown to leak are accurately described or positioned  
22 on this graph. They are all in the high  
23 susceptibility range.

24 Now, there are plants that have had cracks  
25 that have not leaked that are down here in the medium

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1 susceptibility range. But that is not the issue with  
2 this particular plot and the coloration of it. We are  
3 looking for leakers here, and the boundaries were  
4 established to separate low, medium, and high  
5 susceptibility with respect to leakage.

6 MEMBER POWERS: Could you one more time  
7 try to explain to me what the vertical axis is?

8 MR. CULLEN: The vertical axis simply goes  
9 from the number 1 to the number 69, and ranks the --  
10 if you just do a simple, straight ahead calculation of  
11 the EDY for each American plant.

12 And then you sort through that from  
13 highest to lowest, or lowest to highest, in this  
14 particular case. And then just plot the result. So  
15 the 10th plant is going to have some EDY, and the 11th  
16 plant is going to have something a little less, and  
17 the 12th, a little less than that, and all the way up.

18 MEMBER FORD: William, I apologize, but  
19 the Chairman has told me that I have got 3 more  
20 minutes.

21 MR. CULLEN: We are really at the point  
22 where --

23 CHAIRMAN BONACA: I just had a question on  
24 that previous curve. Could you go back to the  
25 previous curve.

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1 MR. CULLEN: I certainly can.

2 CHAIRMAN BONACA: That doesn't mean that  
3 all the green spots don't all have cracks?

4 MR. CULLEN: No, the green spots are  
5 either green NDEs --

6 CHAIRMAN BONACA: Well, well you have two  
7 triangles there that are red.

8 MR. CULLEN: And the orange, okay.

9 CHAIRMAN BONACA: Those were performing  
10 ultrasonic testing, and found they had cracks, but no  
11 leaks?

12 MR. CULLEN: I don't know that it was  
13 ultrasonic. Maybe some of my colleagues would know,  
14 but some detection methodology found a crack that did  
15 not leak and the crack was repaired at this particular  
16 EDY value.

17 CHAIRMAN BONACA: My question was how many  
18 of those greens may be in the same situation, where  
19 there is no -- you know, visually you don't see any  
20 leakage, but there may be some cracks?

21 MR. CULLEN: Well, I think as of today  
22 that we really don't know that, but my understanding  
23 of the results of the bulletins, and the new  
24 inspections is, is that we are going to be able to  
25 cover all of these within the next couple of years.

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1 CHAIRMAN BONACA: Okay.

2 MEMBER FORD: Thank you, Bill. I do  
3 apologize for cutting you short, Bill. I would like  
4 to thank all the presenters and I hand it back to you,  
5 Mario.

6 CHAIRMAN BONACA: That was fast.

7 MEMBER FORD: That was a fast 3 minutes.

8 CHAIRMAN BONACA: Thank you, and any  
9 additional questions from the members? I think that  
10 Dr. apostolakis is anxious to know. Well, no, let's  
11 take a 20 minute recess, and we will get back at 5 of  
12 11:00 for the next presentation.

13 (Whereupon, at 10:36 a.m., the meeting was  
14 recessed and resumed at 10:56 a.m.)

15 CHAIRMAN BONACA: Okay. We will resume  
16 the meeting now, and the next item on the agenda is  
17 Proposed Revisions to Regulatory Guide 1.178, and  
18 Standard Review Plan Section 3.9.8 for Risk Informed  
19 In-Service Inspections of Piping, and Dr. Shack will  
20 take us through this presentation

21 MEMBER SHACK: Okay. Risk-informed  
22 inspections have been one of the success stories of  
23 risk-informed regulation, and I think that most people  
24 would agree that we have been able to focus  
25 inspections, which were originally set up by ASME,

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1 assuming the fatigue and weldments were the primary  
2 cause of failure, and focusing on piping segments that  
3 are risk significant and more subject to failure under  
4 the realistic set of degradations that we found in the  
5 reactor systems.

6 And we are looking at an update of the Reg  
7 Guide 1.178, which essentially provides standards and  
8 criteria for the risk-informed inspections.

9 MR. ALI: Okay. I will start with  
10 introducing ourselves. I am Syed Ali from the Office  
11 of Research.

12 MS. KEIM: I am Andrea Keim, from NRR,  
13 Division of Engineering.

14 MR. DINSMORE: Stephen Dinsmore, from NRR,  
15 PRA Branch.

16 MR. ALI: Okay. I am going to start by  
17 giving the background of the risk-informed ISI reg  
18 guide and SRP, and then Steve will go into the actual  
19 changes.

20 Back in 1996, the PRA implementation plan  
21 established a plan to develop a general reg guide, and  
22 that was Reg Guide 1.174, and the corresponding  
23 Standard Review Plan, and that was Chapter 19, and  
24 four application specific for reg guides and standard  
25 review plans.

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1           And these four pilot applications were  
2           technical specifications, tech spec, IST, graded QA,  
3           and ISI. For ISI, that was Reg Guide 1.178, and the  
4           Standard Review Plan 3.9.8; and both were the  
5           application of risk-informed in-service inspection  
6           methodologies to piping.

7           As Bill has mentioned the application of  
8           the risk-informed ISI for individual plants has been  
9           one of the most successful applications of the risk-  
10          informed pilot applications. We will talk a little  
11          later about how many plants have submitted  
12          applications and what is the status of the review and  
13          all of that.

14          Quickly going over the background again,  
15          most of the U.S. plants are designed and constructed  
16          to the ASME boiler and pressure vessel code. The ASME  
17          Code inspection locations are typically focused on  
18          locations with high mechanical stress, or fatigue  
19          usage factors.

20          The industry experience has been that  
21          flaws have not been typically found at such locations,  
22          but rather at locations with specific degradation  
23          mechanisms. Next slide, please.

24          The purpose of in-service inspection very  
25          quickly is to of course prevent pipe leaks and pipe

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1 failures by finding flaws and repairing them if  
2 necessary before leaks and failures occur.

3 The regulatory requirements for ISI are  
4 given and specified in 10 CFR 50.55a(g), which in turn  
5 references ASME Code Section XI for in-service  
6 inspection requirements.

7 Now, once again the ASME code basically  
8 requires different levels of volumetric or surface  
9 examinations, depending upon the class of the piping.  
10 For Class I piping. the code requires essentially 25  
11 percent sample of in-service inspection of butt welds,  
12 and 7.5 percent inspection for glass tubes.

13 The regulation also provides that the  
14 applicant may use an alternative methodology for in-  
15 service inspection as long as the alternative provides  
16 an acceptable level of quality and safety. So that is  
17 the provision under which the risk informed ISI  
18 inspection has been implemented for the plants.

19 The current status of the risk-informed  
20 ISI applications and reviews is that approximately  
21 current information that we have from NEI is that  
22 approximately 99 plants have indicated that they would  
23 be implementing risk-informed ISI programs.

24 To date, we have received 71 applications  
25 and 28 are still anticipated.



1 MEMBER WALLIS: And so 99 is essentially  
2 everything?

3 MR. ALI: Pardon me?

4 MEMBER WALLIS: 99 leaves very few.

5 MR. ALI: Yes, the others may not have  
6 indicated that, but we think they might do that.

7 MEMBER WALLIS: They all will. They all  
8 will?

9 MR. ALI: Essentially, yes.

10 MEMBER APOSTOLAKIS: But the anticipated  
11 submittals, plus the submittals received, is a  
12 hundred. That may need a correction. That second  
13 number should be 28.

14 MS. KEIM: Which is in the handouts. The  
15 handouts have 28.

16 MEMBER WALLIS: Which is deterministic.

17 MR. ALI: We did catch that.

18 MEMBER APOSTOLAKIS: So you are saying  
19 that there will be no plants that will not do this?

20 MR. ALI: Essentially, yes.

21 MEMBER LEITCH: Now, what is the scope for  
22 those plants by and large?

23 MR. ALI: The scope in the beginning, some  
24 of the plants in the beginning did full plant, as well  
25 as Class I, II, and III. The trend after that has

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1       been for the plants to do -- more of the plants are  
2       doing Class I only. So that has been the trend.

3               But still there are some that are doing  
4       Class I and II. We have a detailed spread sheet on  
5       which plants have --

6               MEMBER LEITCH: Is that because they get  
7       caught up with alternate requirements like FAC  
8       inspections that sort of --

9               MR. ALI: Well, FACT, they cannot change  
10       FAC. It is our understanding that they will continue  
11       to do that. The IGSCC, only Category A can be  
12       subsumed in this program, and B through G, they still  
13       have to do the augmented program.

14               So why the industry is doing Class I?  
15       Only because that is probably that is where they get  
16       the biggest benefit, in terms of ALARA, and also the  
17       economic benefit.

18               And as you can see from this slide, this  
19       also shows that there are two methodologies that the  
20       staff has reviewed and approved, and this gives a  
21       breakdown of the submittals with respect to the  
22       methodology.

23               MEMBER APOSTOLAKIS: Do the two approaches  
24       yield the same results?

25               MR. ALI: Similar results. We have not

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1 had the opportunity to apply the two methodologies to  
2 the same plant.

3 MEMBER APOSTOLAKIS: But wouldn't that be  
4 something that you would like to do?

5 MR. ALI: That was something that we had  
6 proposed to the industry to do it. They have not done  
7 it, and we just do not have the resources to do it,  
8 but you are right. We agreed that that would have  
9 been something that would have been beneficial to do.

10 But we know from the application of the  
11 two methodologies to similar plants that the results  
12 are similar, although we find that the Westinghouse  
13 methodology in general results in somewhat less  
14 inspections than the EPRI methodology, and that has  
15 been our general experience.

16 MEMBER APOSTOLAKIS: What would it take to  
17 do it? I mean, is it a major undertaking? Maybe take  
18 a plant for which the EPRI methodology has been  
19 applied, and ask somebody to apply the Westinghouse  
20 methodology, and vice versa.

21 I mean, we should have a better  
22 understanding of these things.

23 MR. DINSMORE: This is Steve Dinsmore. I  
24 think part of the problem is that you need to really  
25 go to the plant and do it at the plant, because it is

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1 very plant specific. It is not something that we  
2 could do here.

3 So that creates some difficulty and so it  
4 would be difficult for us, the NRC, to do it. We  
5 would have to ask industry, and there is really  
6 limited incentive for them to do it.

7 MEMBER WALLIS: Let's go back to your  
8 first bullet here. Is it successful because people  
9 like it, or is it successful because it is more  
10 successful at finding incipient faults or preventing  
11 things which could be risky for happening?

12 MR. ALI: Well, we don't have enough  
13 experience to say that it is actually successful in  
14 actually finding the flaws. So this bullet, really  
15 the first two, are successful in the sense that  
16 industry has adopted it.

17 MEMBER WALLIS: Sort of a ritualistic way.  
18 I mean, it is a nicer ritual for them to go through,  
19 but it has not gotten any results yet; is that what  
20 you mean?

21 MR. ALI: We have not had the experience  
22 yet to be able to say that it is --

23 MEMBER WALLIS: So it is successful only  
24 in the sense that people like it?

25 MR. ALI: And people have adopted it, yes.

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1 MEMBER SIEBER: Actually, I think it is  
2 true that you end up doing fewer inspections.

3 MR. ALI: Right.

4 MEMBER SIEBER: And I think that is why  
5 people like it.

6 MR. ALI: Right.

7 MEMBER WALLIS: People agree that it makes  
8 sense, but you need a lot of experience to show that  
9 it is successful, in terms of enhancing public safety  
10 in any way.

11 MR. ALI: Well, your characterization of  
12 what is meant by successful is correct.

13 MEMBER LEITCH: The word methodology here  
14 refers to the method for determining the scope of the  
15 program. There is no difference in the inspection  
16 techniques is there?

17 MR. ALI: Not much, that is correct. The  
18 methodology is in terms of when it is applied to a  
19 plant, and let's say to a Class One piping, then what  
20 do you come up with as far as the required  
21 inspections.

22 The inspection methods are essentially the  
23 same, and a lot of other things, such as how to  
24 evaluate flaws, and what is the acceptable flaws, and  
25 the ASME periods, versus intervals, and all of those

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1 things are unchanged.

2 So the methodologies are similar in that  
3 respect.

4 CHAIRMAN BONACA: So the big difference is  
5 the locations?

6 MR. ALI: The differences could be  
7 locations and the number of inspections.

8 MEMBER APOSTOLAKIS: And the  
9 categorization is significant.

10 MR. ALI: Yes.

11 CHAIRMAN BONACA: But the result insofar  
12 as --

13 MEMBER SHACK: The result is the number of  
14 inspections.

15 CHAIRMAN BONACA: The number of  
16 inspections and the frequency of those inspections,  
17 and the location.

18 MR. ALI: And the locations.

19 MEMBER LEITCH: Could you refresh me on  
20 what the phrase "super pipe" means in this connotation?

21 MR. ALI: Well, maybe we will come to  
22 that. That is one of the areas in which originally  
23 the methodology was not -- was exempted or was  
24 excluded to be applied to that piping, but since then  
25 it has been, and it is --

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1 MEMBER LEITCH: So you are coming to that  
2 then?

3 MR. ALI: Yes, we are coming to that.

4 MEMBER LEITCH: Okay. Thank you.

5 MR. ALI: Okay. This is basically just  
6 stating that we issued the trial regulatory guide in  
7 September of 1998, as well as the standard review  
8 plan. You see also the second bullet that the safety  
9 evaluation report on WOG methodology, and SCR  
10 methodologies were issued later on.

11 So at the time that we issued the reg  
12 guide and the standard review plan, industry was  
13 developing generic methodologies at the same time.  
14 The industry was applying those methodologies to pilot  
15 plans, as well as the ASME was developing code cases.  
16 So a lot of those activities were going on  
17 simultaneously, and so that was the time frame.

18 The next slide, based on the lessons  
19 learned, and meetings, and discussions the staff had  
20 with industry, the staff and industry adopted the  
21 template submittals, which specified the contents of  
22 the request to implement this methodology.

23 And basically these were the submittals  
24 that included the description of the evaluation, the  
25 results, and any deviations from the methodology. The

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1 purpose was to have an efficient way of submittals and  
2 review, and then the industry or the utility to have  
3 the detailed results available at the site in case the  
4 staff wanted to audit, which was done in a few cases.

5 Some of the questions that the staff asked  
6 in the beginning eventually became part of these  
7 template submittals, and so the templates, although  
8 initially evolved, but then became stable.

9 MEMBER SHACK: What fraction of these do  
10 you actually audit in some detail?

11 MR. ALI: Well, I think we have audited  
12 about 4 or 5 plants if I am correct out of all of the  
13 ones that we have approved for this.

14 MR. DINSMORE: We usually have to have a  
15 reason to go audit. The last one we went to audit, we  
16 noticed, for example, that the CDF and the LERF values  
17 had changed substantially from the IPE to the  
18 submittal, and so we went down to see why that  
19 happened.

20 But if there is nothing that catches our  
21 attention, then we don't go audit.

22 MR. ALI: Part of the program is the  
23 updates to the risk informed ISI programs. So the  
24 program, once it has been implemented, is a living  
25 program which would be changed if there is new

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1 information to reflect a need for change, and that  
2 could include major updates to the PRA models.

3 MEMBER APOSTOLAKIS: What is a major  
4 update?

5 MR. ALI: These are --

6 MR. DINSMORE: These are kind of the long  
7 term processes, and we have not quite settled out on  
8 the long term processes. So we don't have a real  
9 specific answer to that.

10 MR. ALI: But we have some specific  
11 guidelines for updating, and one of them is at least  
12 on a periodic basis, and on a periodic basis, which is  
13 for most of the programs that the industry has, the  
14 program is typically a 10 year program, and it is  
15 called an interval, and that 10 year program is  
16 divided into three periods; 3 years, 4 years, and 3  
17 years.

18 So there is an agreement to update the  
19 program at least on a periodic basis.

20 MEMBER APOSTOLAKIS: And I guess from now  
21 on that you will demand PRAs that would comply with  
22 the standard and upcoming regulatory guide, which is  
23 now in draft form, DG-1122.

24 MR. ALI: Well, when we talk about the  
25 actual changes, Steve is going to talk about one of

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1 the areas, or one of the only areas in which there is  
2 actually what we call more than minor or editorial  
3 change, is in the PRA, and the incorporation of not  
4 only the staff who use IEEE, but also the peer  
5 reviews, but I think Steve will talk about that when  
6 he talks.

7 MEMBER APOSTOLAKIS: Okay.

8 MR. ALI: But the actual changes in the  
9 Reg Guide.

10 MEMBER WALLIS: But you are not really  
11 interested in the whole PRA are you? You are just  
12 interested in the part of it which is influenced by  
13 how you treat the piping systems?

14 MR. DINSMORE: That's correct. It is  
15 easier for Class One, because it is mostly just LOCAs.  
16 And one of the -- and when we questioned them about  
17 previously identified weaknesses, or that we have  
18 learned from the review process, and their PRA, they  
19 always have the option of saying that they can  
20 evaluate the weakness and say that it doesn't impact  
21 the submittal, and that is one of the two answers that  
22 we accept.

23 MR. ALI: Let's go to the next slide.  
24 Application to BER Piping, and that is the  
25 modification of inspections within the break exclusion

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1 region, and that is your question about the super  
2 pipe, and just to give a quick background on that, in  
3 order to implement the requirements of GDC-4, the  
4 staff had required that all plants postulate breaks in  
5 high energy piping when they met certain conditions,  
6 and the effect of postulate breaks and design for the  
7 effects of those breaks.

8 The effects could be things like pipe  
9 missiles, or jet impingement, pipe breaks. As a  
10 result of that, the plants were required to have a  
11 significant number of pipe (inaudible) restraints, jet  
12 shields, things like that, and since that was  
13 extremely difficult in the region which is between the  
14 first isolation valve inside, to the fast isolation  
15 valve outside the containment, in that region the  
16 staff in the branch position, MEB 3.1, came up with a  
17 different criteria.

18 That if certain conditions are met for  
19 that pipe, and that is the pipe that was called the  
20 super pipe, then the breaks do not have to be  
21 postulated. There are about seven requirements  
22 relating to the stresses in that piping, the fatigue  
23 usage factors, construction, such as welding of that  
24 piping to the supports, and minimizing the welding.

25 One of the requirements for that piping

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1 was a 100 percent examination of in-service inspection  
2 of that piping, in order for the utility not to have  
3 postulate breaks in that region.

4 And so that is a program that is really  
5 not an ASME-11 program, and that was sort of an  
6 augmented program that was implemented to avoid  
7 designing and constructing jet impingement shields and  
8 pipe restraints in that region.

9 So what this line indicates is that since  
10 that requirement or since the implementation of all  
11 those requirements, the industry has done a study that  
12 there have not been a lot of flaws found in that  
13 region.

14 So it would be more appropriate to apply  
15 the risk-informed methodology in that region also. So  
16 in 2001, EPRI, as well as WOG, submitted their  
17 extension or their division to the topical reports to  
18 apply the risk-informed methodology to the super pipe  
19 of the BER region piping also.

20 The EPRI methodology for this region has  
21 been approved and the WOG methodology is still under  
22 review and the staff is having discussions, and it has  
23 not been reviewed and approved yet.

24 MEMBER LEITCH: So is it possible to say  
25 as compared with previously requiring a hundred

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1 percent inspection, is there -- what percentage of  
2 inspections --

3 MR. ALI: They might end up doing  
4 something like 10 percent, a significant reduction.

5 MEMBER LEITCH: A significant reduction.

6 MR. ALI: Yes.

7 MEMBER LEITCH: And the risk basis for  
8 that is -- relates to core damage frequency?

9 MR. ALI: Right.

10 MEMBER LEITCH: Is there any credit taken  
11 for dose saving, or is that --

12 MR. ALI: No, that is not -- I mean, there  
13 is obviously a significant dose saving, but that is  
14 not the criteria for the review of the acceptability  
15 of the methodology.

16 It is basically the Reg Guide 1.174  
17 criteria for the CDF and LERF.

18 MEMBER LEITCH: Okay. So the dose saving  
19 is just an added benefit, but it is not particularly  
20 evaluated?

21 MR. ALI: Yes. Well, we had a -- and I  
22 forgot to mention this, but before coming here, we had  
23 a public meeting on the revision to the Reg Guide and  
24 Standard Review Plan in March.

25 And one of the comments, and we made a

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1 similar presentation in that public meeting, and one  
2 of the comments that was made by NEI was that this --  
3 that the application of this methodology has resulted  
4 in a significant radiation reduction.

5 I think maybe that could be part of the  
6 statement that you made, that it is successful in the  
7 sense that it has resulted in savings in radiation  
8 exposure.

9 MEMBER SHACK: Just while we are talking  
10 about the conclusion of this thing, there is a letter  
11 from Westinghouse that is in our package that makes a  
12 statement about another risk-informed ISI methodology  
13 approved later by the NRC was not required to address  
14 small bore piping.

15 Is there some difference in the way the  
16 two methodologies or the approvals treat the problem  
17 of having to inspect small bore piping?

18 MR. ALI: I think that was -- was that  
19 part of your presentation?

20 MR. DINSMORE: Actually, those are two  
21 different issues. I don't know if you are trying to  
22 talk about the break --

23 MR. ALI: No.

24 MEMBER SHACK: No, I looked through your  
25 presentation and I didn't see it being addressed. And

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1 since we were talking about scope here, I figured that  
2 this was another scope issue.

3 MR. DINSMORE: Right. These basic  
4 presentations are about the risk informed reg guide  
5 and SRP. The letter I think -- and we are prepared to  
6 talk about it, but it is not directly in the  
7 presentations.

8 And as far as that specific comment, with  
9 Westinghouse in their topical, they suggested  
10 including piping one inch or greater, and EPRI, I  
11 think, suggested including piping 2 inches or greater.

12 And we approved both, and if Westinghouse  
13 would come in and want to change from 1 to 2 inches,  
14 they could obviously come in with a submittal and a  
15 request to change the --

16 MR. ALI: Well, I think that is an issue  
17 which is -- which the staff is still discussing with  
18 Westinghouse. As a matter of fact, there is a meeting  
19 next week. So what will be the final outcome has not  
20 been determined yet.

21 MEMBER APOSTOLAKIS: Doesn't that again  
22 bring up again the issue of comparing the two  
23 methodologies? I mean, it should be done at some  
24 point to understand whether there are any differences,  
25 or assumptions, or methods for processing information?

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1           It would seem to me to be an important --  
2 we have had it now since 1998, and this is something  
3 that I would expect to see, because there may be other  
4 issues in the future where one or the other, and EPRI  
5 might say, well, gee, you are not asking the other guy  
6 to do this, and you have to be prepared for that.

7           I think that I have to agree with you that  
8 that would have to be something that would be useful  
9 and helpful to do. What I can do is take this back to  
10 my manager and division director, and say that that is  
11 what you are recommending now, and requesting, and now  
12 that I am in research maybe the NRR, their  
13 responsibilities are a little bit different now.

14           MEMBER APOSTOLAKIS: Careful now. Careful  
15 what you say. Are you freer now?

16           MR. ALI: No, I am not saying that. I  
17 wish I could say that.

18           MEMBER APOSTOLAKIS: No, I understand.

19           MR. ALI: All right. Okay. I think this  
20 is the last slide that we need to get into, which is  
21 getting into the actual changes.

22           Just basically, it states that our long  
23 term activity in this area have been to update the Reg  
24 Guide and the Standard Review Plan, and the first  
25 bullet is part of what we are doing.

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1           Also, the staff has been working with the  
2 committees and groups to incorporate the lessons  
3 learned from the reviews into these cases that are  
4 relevant to the risk informed ISI.

5           I think that Appendix X, which includes  
6 both methodologies, is something that has been worked  
7 out to the staff's satisfaction. So that the Reg  
8 Guide 1.147, if that is still the mechanism to  
9 endorse, would endorse the appendix, and then once the  
10 appendix has been endorsed, then the methodology can  
11 be implemented without actually asking for exemptions  
12 from the staff.

13           And I think that is all that I have now,  
14 and Steve will go through the actual changes in the  
15 Reg Guide.

16           MEMBER LEITCH: I guess I just have a  
17 question about the risk informed part of this. It  
18 seems to me that in all cases we are reducing the  
19 number of inspections. Is there another side to that  
20 coin in looking at the risk information? Did we find  
21 that there were some areas where perhaps we should be  
22 doing additional inspections?

23           MR. ALI: Yes, especially for the plants  
24 that have applied this methodology, or this program,  
25 to the full scope. In other words, one, two, three,

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1 and maybe even beyond that, they have found that there  
2 were some additional inspections required.

3 When you reduce the inspections, that also  
4 means that you may be reducing in one particular  
5 system, but increasing in some other systems. So  
6 reducing does not mean that it is an across-the-board  
7 reduction.

8 Sometimes the inspections are moved to  
9 locations which are not considered to be susceptible,  
10 and to locations in a different system which might  
11 become susceptible.

12 MEMBER LEITCH: So we believe then that he  
13 overall impact of this program would be to increase  
14 safety?

15 MR. ALI: Increase safety and reduce risk.

16 MEMBER LEITCH: Well, I understand the  
17 increase safety and reduce risk, but not just reduce  
18 work.

19 MR. ALI: Right.

20 MEMBER APOSTOLAKIS: Don't they go  
21 together?

22 MEMBER LEITCH: Not just reduce work, and  
23 reduce exposure, but also increase safety and reduce  
24 risk?

25 MR. ALI: Yes.

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1 MEMBER APOSTOLAKIS: When You increase  
2 safety, don't you reduce risk?

3 MEMBER SIEBER: Yes.

4 MR. ALI: Yes.

5 MEMBER WALLIS: Well, there is no such  
6 thing as increasing safety, because you can't measure  
7 it, but you can measure reduced risk.

8 MR. ALI: Reduced risk.

9 MEMBER APOSTOLAKIS: Boy, stunned silence.

10 MEMBER SIEBER: We are considering.

11 MR. DINSMORE: Okay. Well, I guess I will  
12 start. Again, my name is Steve Dinsmore, and I am the  
13 PRA Branch at NRR. I am going to go over the actual  
14 changes to the Reg Guide that we -- the Reg Guide and  
15 the SRP.

16 As I had said, we issued this Reg Guide  
17 and SRP for trial use, and we did that because of the  
18 three pilot applications weren't complete and the  
19 review of the two industry methodologies were also not  
20 complete. So we didn't feel confident enough  
21 to --

22 MEMBER APOSTOLAKIS: We had this issue  
23 here a month or two ago in the context of another  
24 regulatory guide. If you had called this RG Rev.  
25 Zero, and this what we are doing as Rev. 1, what would

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1 have been different?

2 The committee is trying to understand what  
3 the trial use is.y

4 MR. DINSMORE: I can answer that to some  
5 extent for this specific reg guide.

6 MEMBER APOSTOLAKIS: Yes.

7 MR. DINSMORE: Essentially the difference  
8 between the draft, or between a real reg guide and the  
9 trial use reg guide, for our reg guide, it was that  
10 the trial use reg guide, it actually states in the reg  
11 guide that the trial use means that it does not  
12 establish any final staff positions, and may be  
13 revised without having to consider the back fit rule.

14 So we could add requirements if we thought  
15 that there wasn't enough requirements in the original  
16 trial use version.

17 MEMBER APOSTOLAKIS: And if it is a  
18 regular regulatory guide, the --

19 MR. ALI: If it was at zero, then it may  
20 have just stayed like that; whereas, this flagged that  
21 it has to be revised.

22 MEMBER APOSTOLAKIS: No, I mean, if  
23 something had been approved under Rev. Zero, and then  
24 you decide to go to Rev. 1 with additional  
25 requirements, then it would have required a regulatory

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1 analysis?

2 MR. DINSMORE: That is what it implies  
3 from reading the text in the Reg Guide, especially if  
4 you added requirements. For example, if we said 2  
5 inches was good enough, and then we said, oh, you have  
6 to go down to one inch, we might have to have done --  
7 or at least my understanding is --

8 MEMBER APOSTOLAKIS: But is that what  
9 happens every time we increase the requirements with  
10 a regulatory guide?

11 MEMBER SIEBER: Yeah.

12 MEMBER SHACK: Increased requirements,  
13 yes.

14 MR. ALI: That's correct.

15 MEMBER APOSTOLAKIS: And so in the  
16 preparation of Rev. 1, they would have to do this, and  
17 not the licensees? I mean, these guys would have to  
18 go back and say we want to add this requirement, and  
19 now we have to do a regulatory analysis.

20 Whereas, if it is trial use, you don't  
21 have to do it.

22 MR. DINSMORE: That's correct. And the  
23 difference between the trial use and the draft, I am  
24 pretty sure has to do with the concurrence chain, and  
25 who has to agree to it.

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1           The drafts are relatively easy to put out,  
2           and when we put out this one for trial use, it ended  
3           up going to the Commission under a memo from the EDO.  
4           So I think that is the difference between the draft  
5           and the trial use.

6           MEMBER WALLIS: I think that trial use  
7           would imply some measures of success which you want to  
8           evaluate after the trial.

9           MR. ALI: Right. And I think it was also  
10          to flag that it would be revised. If it said Rev.  
11          Zero, it could just stay like that.

12          MEMBER WALLIS: Yes.

13          MR. ALI: But there was an intention that  
14          we knew that it was going to be revised.

15          MEMBER WALLIS: Not only revised, but it  
16          is going to be evaluated. That you try it, and then  
17          you see how well did it work.

18          MR. ALI: Right.

19          MEMBER APOSTOLAKIS: And also the pilot  
20          organizations are aware that they may be asked to do  
21          more later. Otherwise, they are not even pilots.  
22          Just do it.

23          MEMBER SIEBER: Is there any limit to how  
24          you can apply for trial use? For example, you could  
25          eliminate the back fit rule by making everything for

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1 trial use, right?

2 MR. DINSMORE: I have no idea.

3 MEMBER SIEBER: Is there a time limit on  
4 how long the trial lasts?

5 MR. ALI: What we are saying is that it is  
6 not that when we issue something for trial use that  
7 you don't have to do back fit at that time. It is  
8 when you go from trial to the next revision, that's  
9 when you don't need --

10 MEMBER SIEBER: Right. So you put out an  
11 easy one, and change it, and --

12 MEMBER APOSTOLAKIS: But that is a good  
13 question. Why aren't all the regulatory guides for  
14 trial use? That is a clever way of defeating the  
15 regulatory analysis.

16 MEMBER SIEBER: There you go.

17 MEMBER APOSTOLAKIS: Is there in fact a  
18 time limit that you cannot do this for 20 years? Is  
19 there a regulatory guide for trial use for 20 years?

20 MR. DINSMORE: We have had draft reg  
21 guides for 20 years. We didn't get any pressure based  
22 on the fact that it was trial use to update it. We  
23 got pressure to update it with 1.174. So I don't  
24 think there is any --

25 MEMBER APOSTOLAKIS: Does the Office of

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1 the General Counsel know these things? Maybe we  
2 should ask somebody there.

3 MEMBER SIEBER: It is probably their words  
4 that are in there.

5 MEMBER WALLIS: Do they need to know,  
6 George? I mean, there is room to maneuver, and just  
7 leave it to you have room to maneuver.

8 MEMBER APOSTOLAKIS: But for how long?

9 CHAIRMAN BONACA: For 20 years.

10 MR. ALI: Well, you see, we came back  
11 within 5 years.

12 MR. DINSMORE: Well, the proposed changes  
13 are minor that we have suggested. We held a public  
14 workshop on March 13th, 2003, to discuss the proposed  
15 changes with industry.

16 In general, they were fairly positive, and  
17 there was no major comments on the proposed changes.

18 MEMBER WALLIS: Are you saying there was  
19 a public workshop for the purposes of discussing  
20 changes with industry?

21 MR. DINSMORE: Okay. It was to discuss  
22 changes with any of the public who wished to attend.

23 MEMBER APOSTOLAKIS: Now, Steve, would you  
24 say that since the proposed changes were minor after  
25 five years, the decision to go with a trial use guide

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1 was wrong?

2 MR. DINSMORE: No. Well, we didn't know.  
3 Again, these two methodology are both pretty  
4 complicated methodologies, and we were right in the  
5 middle of trying to figure out all the implications of  
6 using them.

7 So that was the -- and then there was a  
8 certain desire to put these reg guides out on the  
9 street. In other words, not to keep just pushing it  
10 off and off. And so the solution --

11 MEMBER APOSTOLAKIS: So there was a lot of  
12 concern, but it turns out that you were right on most  
13 major elements?

14 MR. DINSMORE: Yes.

15 MEMBER APOSTOLAKIS: Which is okay.

16 MR. ALI: Also, I think that the reg  
17 guides are -- you know, since we had in this case  
18 specific methodologies which are very detailed  
19 implementations of how the program is to be developed,  
20 and so the reg guide and standard review plan are at  
21 the higher level.

22 And so we feel that at that level that  
23 there has not been any significant change.

24 MR. DINSMORE: We have three types of  
25 changes. We have one here called incorporate lessons

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1 learned from review of submittals, and we called those  
2 clarification changes.

3 And essentially what that was is those are  
4 changes which we made to the reg guide and the SRP to  
5 make them better conform to the actual practices that  
6 we are using to review the ISI submittals.

7 Then we have this update and simplified  
8 text, which is a bunch of editorial changes. Then we  
9 have this one proposed content change, which adds  
10 guidance which is not yet been applied to the risk-  
11 informed ISI submittals.

12 And the content change is PRA quality.  
13 When we started these ISI reviews, there was really  
14 very few licensees that had a peer review on their  
15 PRA, and so I think our belief, and one of the reasons  
16 that why ISI has done fairly well is that it is a  
17 pretty easy and straightforward application.

18 You just need to relocate your inspections  
19 to places that have the highest risks. So we were  
20 somewhat flexible about the quality of the PRAs that  
21 we were supposed to use, because they are only being  
22 used to support putting things into two bins, and then  
23 we thought that most of the reviews that had been  
24 performed would have identified the major errors which  
25 could have impacted those of putting stuff in bins,

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1 and that the minor errors would have relatively minor  
2 impact.

3 But as time goes on, we would like to take  
4 advantage of all of the information that was  
5 available, and so we have added this requirement.  
6 Some licensees lately have been including this  
7 requirement.

8 The PRA qualities documentation  
9 requirement was expanded to include the observations  
10 from industry peer reviews, and a resolution of  
11 significant comments applicable to the ISI evaluation,  
12 which is what we have been asking them to do for the  
13 weaknesses and deficiencies that were identified by  
14 the research staff evaluation reviews of the IPEs. So  
15 we have pretty much just raised the bar a little bit.

16 MEMBER APOSTOLAKIS: Both methodologies  
17 use performance measures? I don't remember whether  
18 EPRI does.

19 MR. ALI: Only Westinghouse.

20 MR. DINSMORE: EPRI uses an absolute value  
21 dividing line based on the conditional core damage  
22 probability.

23 MEMBER APOSTOLAKIS: I would really like  
24 to see a comparison now between the two methodologies.  
25 Now, Westinghouse, they are categorizing system

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1 structures and components, right? And then they go to  
2 the piping to see how --

3 MR. DINSMORE: No.

4 MEMBER APOSTOLAKIS: They categorize the  
5 pipes themselves?

6 MR. DINSMORE: Yes.

7 MEMBER APOSTOLAKIS: Through the systems  
8 affected?

9 MR. DINSMORE: Yes, they look at the pipe  
10 that is going to rupture, and they look at the  
11 equipment which is going to fail if you rupture that  
12 pipe, and then they fail that equipment in the PRA.

13 MEMBER APOSTOLAKIS: Right. So it is  
14 through the equipment?

15 MR. DINSMORE: Right.

16 MEMBER LEITCH: It is a surrogate again.

17 MEMBER APOSTOLAKIS: Yes.

18 MR. DINSMORE: And EPRI does the same  
19 thing at that point.

20 MEMBER APOSTOLAKIS: Now, that kind of  
21 categorization is also done in 50-69?

22 MR. DINSMORE: That's right.

23 MEMBER APOSTOLAKIS: And the two are the  
24 same?

25 MR. DINSMORE: Well, for the ISI stuff,

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1 because the pipe, or the consequences of pipe ruptures  
2 are not directly in the PRA, there is an extra step.

3 MEMBER APOSTOLAKIS: I understand that,  
4 but if I look at the components, the categorization,  
5 I will not find one component being non-safety  
6 significant in the ISI context in the safety  
7 significance in the 69 context? I hope not.

8 MR. DINSMORE: They are different sets of  
9 components.

10 MEMBER APOSTOLAKIS: Who makes sure that  
11 those happen or doesn't happen?

12 MR. DINSMORE: Well, we have a general  
13 statement in 1.174 that the categorization, that the  
14 importance might well depend on what you are going to  
15 do with it. So what we are doing here is we are  
16 changing the inspection requirements on piping welds,  
17 which is a relatively benign change. We are talking  
18 about --

19 MEMBER APOSTOLAKIS: Well, the  
20 categorization depends on the PRA, and it doesn't  
21 depend on what we intend to do. It just says find  
22 Fossell-Vasely and if it is greater than this number,  
23 then we will do this.

24 So the intended action is not part of the  
25 categorization. What I am driving at is the plant,

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1 since a lot of these activities now rely on this  
2 categorization, the plants have one categorization,  
3 and then in your case, you have to go this extra step  
4 that you mentioned, because the pipes themselves are  
5 not in the PRA.

6 But if I go back to the component or  
7 system, I should be able to say, well, this is the  
8 categorization for this system at this plant. That is  
9 the coherence of the regulations isn't it?

10 MR. ALI: Isn't the 50-69 classification  
11 based more on the conditional core damage frequency?

12 MEMBER APOSTOLAKIS: No, it is importance  
13 measures.

14 MR. DINSMORE: We have two classification  
15 systems. One of them is used for ISI, and the other  
16 one is used for repair and replacement. The repair  
17 and replacement one is more stringent.

18 But if you had a valve and the valve  
19 failed to open, you would have a certain consequence.  
20 If the valve ruptured, it could have a much greater  
21 consequence. So it is not entirely clear that the  
22 importance of this valve would be the same if it  
23 failed to open, as opposed to rupture and spit water  
24 all over.

25 MEMBER APOSTOLAKIS: But wouldn't the PRA

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1 include those failure modes? I mean, we hope that it  
2 would.

3 MR. DINSMORE: Well, it --

4 MEMBER APOSTOLAKIS: Because the PRA finds  
5 -- the way it is done now, it finds the importance of  
6 the events. So these events have to be there to begin  
7 with.

8 I mean, I can't imagine that in one  
9 categorization we say that this valve we consider only  
10 the failure to open failure mode, and it is  
11 characterized as a risk significant, or non-risk  
12 significant, safety significant.

13 And then if you consider that it can fail  
14 in another way, then what kind of PRA is that?

15 MR. DINSMORE: Well, I do think that if  
16 you are talking about changing test intervals on that  
17 value, and the thing is locked close -- well, that  
18 doesn't quite make sense, but if you change test  
19 intervals on the valve, you would evaluate it based on  
20 it not being able to open.

21 But if you change the material properties  
22 of the valve body, you might be more interested in  
23 what happens if it ruptures.

24 MEMBER APOSTOLAKIS: Absolutely.  
25 Absolutely, yes.

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1 MR. DINSMORE: But then if you added those  
2 two together, then it would make it high safety  
3 significant. Then you would have to test it, even  
4 though the testing didn't maybe contribute much to the  
5 failure mode, which is causing it to be high. And  
6 which would be the rupture of the valve body.

7 MEMBER APOSTOLAKIS: Well, you know, when  
8 we reviewed the Draft Guide 11.22, it was supposed to  
9 set the standard for a good quality PRA, high quality  
10 PRA, that could be in all regulatory applications.

11 And in some instances, you may have to do  
12 more. Like in your case, I think you have to do more.  
13 But in fundamental failure modes, they are presumed to  
14 be already in that model.

15 So maybe somebody has to worry about that  
16 consistently. Mary Drouin made a presentation to us,  
17 what, 2 or 3 months ago, on regulatory coherence.  
18 Maybe this is an issue for that problem, is to make  
19 sure that there is consistency in categorizing SSEs.

20 MR. DINSMORE: Well, there is  
21 categorization of piping which can be done in 50.69.  
22 So we will take a look and make sure that it is  
23 consistent.

24 MEMBER APOSTOLAKIS: I don't remember the  
25 50.69, but that's fine. Okay.