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on Reactor Safeguards

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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COMMISSION MEETING WITH  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
(ACRS)

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FRIDAY

MAY 11, 2001

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ROCKVILLE, MARYLAND

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The Commission met with the Advisory  
Committee on Reactor Safeguards at the Nuclear  
Regulatory Commission, One White Flint North, Room  
01F16, 11555 Rockville Pike, Dr. Richard A. Meserve,  
Chairman, presiding.

PRESENT:

- |                        |              |
|------------------------|--------------|
| RICHARD A. MESERVE     | Chairman     |
| NILS J. DIAZ           | Commissioner |
| EDWARD McGAFFIGAN, JR. | Commissioner |
| JEFFREY S. MERRIFIELD  | Commissioner |

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

(10:29 a.m.)

1  
2  
3 CHAIRMAN MESERVE: Before we get started  
4 on the formal part of our proceeding, I am pleased to  
5 announce the appointment of Dr. F. Peter Ford as the  
6 newest Member of the Advisory Committee on Reactor  
7 Safeguards.

8 Dr. Ford brings to the Committee 40 years  
9 of experience in the power generation and materials  
10 processing industries as a consultant and manager. He  
11 recently retired from General Electric Company where  
12 his contributions included development of life  
13 prediction methodologies for structures exposed to  
14 stress corrosion fatigue.

15 Dr. Ford received his Master of Science  
16 degree from Rensselaer Polytechnic Institute and his  
17 doctorate from Cambridge University in the United  
18 Kingdom. I'm sure that his experience and knowledge  
19 will be a valuable asset to the Committee and on  
20 behalf of the Commission I would like to welcome Dr.  
21 Ford.

22 There is a certain protocol associated  
23 with these events and it does include the presentation  
24 of a certificate.

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1                   Dr. Ford, if you'll come forward. Why  
2 don't my colleagues stand and join me.

3                   I have a suitably framed certificate for  
4 you.

5                   (Photographs are taken.)

6                   CHAIRMAN MESERVE: Thank you. Welcome.  
7 On behalf of the Commission, I would like to welcome  
8 all of you to today's meeting with the Advisory  
9 Committee on Reactor Safeguards. The Commission met  
10 with the ACRS in October of last year and we discussed  
11 a range of issues including, as I recall,  
12 risk-informed regulation, thermal-hydraulic codes,  
13 spent fuel safety and a variety of other subjects.  
14 After the meeting, the Commission requested that the  
15 ACRS expand this discussion on some of the problems  
16 with thermal hydraulic codes and we have received that  
17 letter and I know that's an area that we'll be dealing  
18 with later today.

19                   Since our last meeting, the Committee has  
20 continued its activities in risk-informed regulation  
21 and various aspects of license renewal and has  
22 considered a number of other issues. One of the most  
23 important was a comprehensive review of steam  
24 generator performance which will also be discussed  
25 this meeting.

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1                   So I'd like to, on behalf of the  
2 Commission, express our appreciation to you for your  
3 efforts and to indicate that we very much welcome our  
4 capacity to interact with you today.

5                   Let me say before we get started that I  
6 have recently learned that Tom Kress has recently been  
7 elected a Fellow of the American Nuclear Society. On  
8 behalf of the Commission, I'd like to express our  
9 congratulations to him for what I know is a richly  
10 deserved honor.

11                   Dr. Apostolakis, you may proceed.

12                   DR. APOSTOLAKIS: Thank you, Mr. Chairman.  
13 It's a pleasure for the Committee to be here and have  
14 the opportunity once again to discuss our  
15 recommendations and conclusions that we sent to you in  
16 writing, to discuss them with you.

17                   We have five items with you today to  
18 discuss: proposed framework for risk-informed changes  
19 to 10 CFR Part 50, the South Texas Project Exemption  
20 Request Option 2, thermal-hydraulic codes, status of  
21 steam generator issues and status of ACRS activities  
22 on license renewal.

23                   I'd like to point out that we have  
24 actually sent you letters or reports on four of these  
25 items and the fifth one, the South Texas Project

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1 Exemption Request we have not written a report, so you  
2 will hear some preliminary thoughts and maybe we can  
3 blame Mr. Sieber for some of the opinions that will be  
4 expressed.

5 I propose that since we have five issues  
6 to discuss we use a uniform distribution and spend 20  
7 minutes on each, unless, of course, you want to change  
8 it. We'll spend about 20 minutes on each subject.

9 CHAIRMAN MESERVE: Ten minutes for the  
10 presentation and then we'll --

11 DR. APOSTOLAKIS: Yes, ten and ten.

12 CHAIRMAN MESERVE: And then what we'll do  
13 is we'll go through the --

14 MR. MCGAFFIGAN: That was not risk  
15 informed.

16 DR. APOSTOLAKIS: It was very risk  
17 informed.

18 Okay, so we start with framework for risk  
19 inform changes to 10 CFR Part 50 and Dr. Shack will  
20 make the presentation.

21 [Slide change.]

22 DR. SHACK: We sent you an ACRS report  
23 dated November 20th concerning the proposed Option 3  
24 framework document and there are a number of important  
25 elements in that document that I really won't be

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1 discussing the whole document this morning. There are  
2 two elements I would like to focus on.

3 One of the important things that the  
4 framework provided was guidance for the prioritization  
5 of candidate regulations to be risk informed. The  
6 second element that I'll probably focus on is the  
7 guidance that it provided on the use of defence in  
8 depth in a risk-informed regulatory system. This has  
9 been a topic that's been of considerable interest to  
10 the ACRS.

11 Reg. Guide 1174 which has provided  
12 guidance for much of the application and development  
13 of risk-informed regulation states an intent to  
14 maintain the defense in depth philosophy and provide  
15 some helpful discussion on the role of defense in  
16 depth to its relationship to uncertainty.

17 The framework document provides further  
18 development of how defense in depth is used in a  
19 risk-informed regulatory system. The important thing  
20 for to know is that it includes some elements of  
21 defense in depth that are employed independent of risk  
22 insights which in ACRS terminology, the Commissioners  
23 don't always appreciate the structuralist point of  
24 view.

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1           But then it looks at additional assessment  
2 of defense in depth elements such as redundancy and  
3 diversity and safety margins and emphasizes that they  
4 can be qualitatively evaluated in PRAs in terms of  
5 safety functions, success probabilities and can be  
6 quantitatively assessed in terms of the degree of  
7 uncertainty one has on the prediction of safety  
8 outcomes.

9           There's also another important difference  
10 I would like to bring up that becomes important here  
11 in using Reg. Guide 1174 where you're assessing the  
12 change in risk for a particular licensee who brings in  
13 a request for a proposal change to his licensing  
14 basis. There, you have a rather good handle on the  
15 kind of changes and risk that are involved because  
16 you're dealing with a license and his plants.

17           In Option 3, you have to consider the  
18 changes and you have to, in a sense, anticipate the  
19 changes and risks that may occur in a much broader  
20 class of plants, when you're changing an overall  
21 regulation that applies to the whole regulatory  
22 system.

23           Now the framework document essentially  
24 proposes in risk informing the regulations we maintain  
25 defense in depth by maintaining a balance between

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1 prevention and mitigation and so they talk about  
2 attempts to limit the frequency of initiating events,  
3 limit the probability given initiating eventual  
4 proceed to core damage and if core damage occurs,  
5 you'll have essentially ways to mitigate that release  
6 to the public and prevent release to the public.

7 The framework provides some important, not  
8 only requests that you provide that balance, but it  
9 provides quantitative guidelines that essentially  
10 state the goal of the balance should be as you're  
11 trying to formulate the regulations, and these are  
12 described in terms of a CDF guideline of  $10^{-4}$  per  
13 reactor year, a conditional large early release  
14 frequency of .1 and a conditional probability of large  
15 late release of .1, so in a sense there are three risk  
16 matrices that are sort of introduced in the framework  
17 document.

18 I would note, for example, 1174 doesn't  
19 explicitly mention the late containment failure  
20 probability criterion, but that came an important  
21 element in discussion of the South Texas Exemption  
22 Request where one was trying to use risk information  
23 to categorize risk significant components and again,  
24 the question was whether one did that strictly on the  
25 basis of a CDF and LERF which are really the large

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1 early release, but whether you would also have to  
2 consider the large late containment failure, which  
3 again is described in the framework document.

4 I looked back over our report from  
5 November and discovered that we weren't very explicit  
6 in there, but the Committee does support the approach  
7 taken in the framework document that the regulatory  
8 system should maintain at this high level a balance  
9 between prevention and mitigation and that the  
10 quantitative guidelines suggested in the framework are  
11 reasonable and consistent with the safety goals.

12 We did have some -- again, I think as one  
13 applies this one, we'll gain some experience. We had  
14 some comments on some of the definitions of initiating  
15 events that were given in the framework document.

16 We're also concerned that although we  
17 believe the structuralist approach is appropriate at  
18 the high level that it's introduced into the framework  
19 document, we would like to emphasize that defense in  
20 depth measures at the lower levels should not be  
21 imposed except when they're significant on certainties  
22 and one should really try to address the level of  
23 defense in depth through the quantification of the  
24 uncertainties.

25 The other important activity in

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1 risk-informed regulation that's come before us is the  
2 subcommittee meeting that we held to discuss risk  
3 informing 10 CFR 50.46 concerning the emergency core  
4 cooling system.

5 As you know, industry is proposing to use  
6 leak before break and probabilistic fracture mechanics  
7 to define a new large break loss of coolant accident  
8 that would be considerably smaller than the  
9 double-ended guillotine break that is the current  
10 design basis accident for the large break LOCA. And  
11 again, the suggestions are that it could be something  
12 on the order of a 6 to 8 inch diameter.

13 I would point out that the NRC has used  
14 leak before break arguments before in assessing the  
15 dynamic effects of pipe break. It has accepted them  
16 for a certain class of systems.

17 A lot of discussion at the subcommittee  
18 meeting, I think both the staff and the industry  
19 recognized that there are substantial benefits that  
20 could be obtained by redefining the large break LOCA.  
21 Most of us agree, for example, it introduces  
22 unrealistic start up requirements for emergency diesel  
23 generator systems and in fact, these requirements may  
24 be counter productive to safety.

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1           However, although the staff has accepted  
2           the leak for break arguments in the context of dynamic  
3           loads, they made the argument in the context of the  
4           change as fundamental as 10 CFR 50.46 that one would  
5           need a much more careful assessment of the  
6           uncertainties associated with the leak before break  
7           argument, especially in light of the recent incidents  
8           of stress corrosion cracking in the primary piping  
9           system seen at Summer and Ringhals in Sweden. In the  
10          original application of leak before break, it was  
11          assumed that stress corrosion cracking would not occur  
12          in PWR primary piping systems and that the leak before  
13          break was not accepted in systems that were  
14          susceptible to stress corrosion. Because of the  
15          potential that stress corrosion cracking has for  
16          leading to large circumferential cracks in some cases  
17          that are difficult to detect by leakage before  
18          failure.

19                 This is a matter of considerable  
20          discussion. Again, I would note one thing that I  
21          thought was rather interesting in the industry's  
22          proposal, as I mentioned, one of the difficulties in  
23          dealing in Option 3 is to assess the impact of all the  
24          changes that would be made in terms of a large class  
25          of plants and I thought the industry proposal to

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1 revise the large break LOCA definition, only to permit  
2 the NRC to evaluate an appropriate large break for a  
3 plant or a class of plants so in fact, one would not  
4 have to deal with all the implications at once, but  
5 once one had established a process for defining the  
6 large break systems, one could then evaluate the  
7 changes in risk on a smaller, more manageable class of  
8 plants.

9 We'll be continuing meeting in our  
10 upcoming June meeting, have further discussions on  
11 50.46 and see how that's progressing and we do plan to  
12 issue a report on the June meeting. We expect to have  
13 an Options paper from the staff describing their views  
14 on how to proceed on 50.46 and compare that with the  
15 industry proposals at that time.

16 CHAIRMAN MESERVE: Why don't we proceed  
17 and do a few more of these and then go to questions?

18 DR. APOSTOLAKIS: The next presentation is  
19 by Mr. Sieber on South Texas Project Exemption  
20 Request.

21 MR. SIEBER: Good morning. During this  
22 presentation, I plan to give you an update on the  
23 progress of Option 2 to risk-informed Title X, Part 50  
24 of the Code of Federal Regulations.

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1           Option 2 is exemplified by the application  
2 of the South Texas Project, which I will refer to as  
3 STP in the future, to be exempted from a number of  
4 regulations under Title X ranging from Part 21 which  
5 is the definition of a basic component, all the way to  
6 Part 100, but the bulk of which are in Part 50.

7           And these exemptions would apply to  
8 components at STP that are not contributors to risk  
9 for their licensed facilities.

10           The request for exemption is important to  
11 STP because they believe it could reduce their costs  
12 of operation, while not reducing safety, but as in the  
13 case of every application of risk information to the  
14 operation of the plant, the balance goes both ways.  
15 You may be able to eliminate some requirements or you  
16 may find risk-significance that were previously not  
17 treated by the current regulation in some components  
18 where then the special treatment would have to be  
19 upgraded. This was the case at STP. They were able  
20 to eliminate, recategorize some components as being  
21 not risk-significant, but other components that were  
22 not currently listed as safety related, were  
23 identified because they are risk-significant and  
24 therefore, there's two approaches that need to be  
25 taken in this instance.

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1           The nuclear industry is watching the  
2 progress of the STP exemption requests and hopes that  
3 it may be applied to other licensees. And the  
4 industry hopes that the STP exemption request will  
5 become a template for future licensing actions for the  
6 remainder of industry licensees who choose to submit  
7 requests for it.

8           The STP exemption request has been on the  
9 docket one way or another for almost two years now,  
10 and in fact, this request has a lot of complexity to  
11 it.

12           [Slide change.]

13           MR. SIEBER: In my next slide we  
14 illustrate the fact that parts of 11 regulations are  
15 affected, resulting in something on the order of 19  
16 different sections of these 11 regulations that need  
17 to be changed or modified to accommodate the exemption  
18 request.

19           That, to me, makes this process a very  
20 complex, legal process. The next slide I would like  
21 to describe a little bit about the licensees'  
22 facilities. My background is in plant operations and  
23 maintenance and therefore any time I see a nuclear  
24 power plant I like to know a little bit more about it.

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1           The STP plants are twin-unit plants. They  
2 are of recent commercial operation. They went into  
3 commercial operation in 1988 and there are four loop  
4 plants, 1250 megawatts apiece and they have large, dry  
5 containments.

6           Another feature that I would point out  
7 which I think is important from a risk standpoint is  
8 these units have three safety trains as opposed to the  
9 two normally required by the regulations. And  
10 therefore, from a risk standpoint this plant has a  
11 good posture.

12           In addition to that, another attribute of  
13 the licensee is that they have a comprehensive,  
14 up-to-date probabilistic risk assessment for that  
15 plant that is basically a state-of-the-art and  
16 probably one of the leading PRA documents and results  
17 in the industry. So that makes the use of that PRA as  
18 a reliable source of risk information.

19           [Slide change.]

20           MR. SIEBER: Slide 4, I talk a little bit  
21 about the purpose of the exemption request and  
22 basically the purpose is to identify components that  
23 are important to safety from a risk standpoint and  
24 eliminate components not important to safety from  
25 special treatment requirements including 10 CFR 50

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1 Appendix B. And then secondly, to identify non-Q and  
2 that is a colloquial term which means  
3 non-safety-related or not a basic component as defined  
4 in Part 21, but they want to identify non-Q components  
5 that are risk significant and this is the case where  
6 special treatment would be increased.

7 There are two important processes that go  
8 on in the process of implementing risk information to  
9 the exemptions that are requested by STP. The first  
10 is the categorization of components and secondly, what  
11 kind of special treatment will be provided to the  
12 various categories of components.

13 [Slide change.]

14 MR. SIEBER: In the next slide, I'd like  
15 to give you a little perspective, again, from an  
16 operating standpoint of what we're talking about in  
17 terms of numbers related to components in a nuclear  
18 power plant.

19 A two-unit plant like this one will  
20 probably have about 80,000 components that have MARK  
21 numbers in it. And they will be in roughly 65  
22 operating systems in the plant. Of the 65 systems, 29  
23 serve some safety function and in those 29 systems,  
24 you have about 44,000 components and the number of  
25 components that are on the plant's Q-List or are basic

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1 components is about 17,000, so we're actually talking  
2 about a lot of components here.

3 Now when you take the PRA and do a PRA  
4 analysis of the plant, that -- the PRA considers only  
5 those components that potentially would have risk  
6 significance and that amounts to about 2400 components  
7 in a plant this size. So we now are able to analyze  
8 2400 out of the 80,000 that are basically there.

9 That amounts to about, in the next slide,  
10 about 6 percent of the total components that are  
11 potentially risk significant and so the PRA  
12 categorization process is responsible for 6 percent  
13 and 94 percent must be done by an expert panel through  
14 a methodology.

15 The outcome of both the operation of the  
16 PRA categorization and the expert panel is shown on  
17 the next slide, which is Slide 17.

18 [Slide change.]

19 MR. SIEBER: And they have developed a  
20 two-by-two matrix into which they bin all the  
21 components in these 29 systems. And the results of  
22 that binning is that 3,810 are about 8 percent of the  
23 components that were identified as nuclear safety  
24 related are also risk significant. If you look at the  
25 two-by-two matrix, across the top, which is Boxes 1

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1 and 2, those are the ones that are either the PRA or  
2 the expert panel determined to be risk significant.  
3 Boxes 3 and 4 are the components that were determined  
4 by unit process to be not risk significant. Boxes 1  
5 and 3 vertically are nuclear safety related. Boxes 2  
6 and 4 are not nuclear safety related.

7           When you look at this matrix, you can see  
8 that Box 1 is not a regulatory concern because they  
9 previously were basic components, they're risk  
10 significant so special treatment does not change for  
11 those. Box 4 is not nuclear safety related and not  
12 risk significant, so nothing changes for those  
13 components that they can use standard commercial  
14 practice. Box 2, on the other hand, is not new  
15 classified as nuclear safety related, but those  
16 components are risk significant, so special treatment  
17 will have to be upgraded to nuclear safety related  
18 treatment to the extent practicable. And that amounts  
19 to 372 components. And the bigger question then  
20 occurs when we discuss Box 3, which by previous  
21 regulations or current regulations, they are nuclear  
22 safety related components, but their risk significance  
23 is minimal. And so the question becomes what kind of  
24 treatment in the design, purchase, operation,  
25 maintenance and all of the other 18 criterion in

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1 appendix B should be applied and to what extent to  
2 these components in that process.

3 And then, of course, the licensee would  
4 like to use what they call commercial practice and  
5 there is such a thing as commercial practice to apply  
6 to these components. My personal opinion is I've  
7 worked in nuclear plants for 40 years, including a  
8 couple of side trips into coal plants and oil-burning  
9 plants and gas plants and commercial practice to me is  
10 sort of in the eyes of the beholder. If you look at  
11 commercial standards, there are a lot of  
12 recommendations and may or should, but not very many  
13 thou shall do this or thou shall do that. And so the  
14 idea is what benefit do you get out of commercial  
15 standards when there is a wide range of application  
16 that can be provided.

17 Now the regulatory expectation for these  
18 low risk, but otherwise safety related components is  
19 that they remain functional, but perhaps not at the  
20 level of quality and reliability that a component  
21 would have if it got the full treatment. That means  
22 that the license just can't abandon all together or  
23 fail to maintain these components because the  
24 expectation is that they remain functional.

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1                   Therefore, it's the staff's opinion and  
2 mine that there has to be some description of what  
3 commercial practice really means and the best place to  
4 put it is in the FSAR and two approaches can be taken.  
5 One is very prescriptive which basically freezes in  
6 stone what this licensee and every other licensee  
7 could or must do, or another way to do it is to  
8 performance-base the expectation and the staff leans  
9 to using the performance based method at this point.

10                   [Slide change.]

11                   MR. SIEBER: Now I consider in the next  
12 slide three important elements related to risk  
13 informing Part 50 under Option 2. The first is you  
14 need to have a robust probabilistic risk assessment  
15 and South Texas Project certainly has that. To me,  
16 that means comprehensive at a Level 3 to be able to  
17 answer all the questions that are involved in decision  
18 making and also up to date. And so that exists in  
19 this case.

20                   The second thing that is the proof of the  
21 pudding as far as categorization is concerned is some  
22 sensitivity studies. And the sensitivity studies  
23 basically take those components that are not risk  
24 significant, according to the categorization process

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1 and multiply their failure probabilities by a factor  
2 of 10.

3 Now they chose a factor of 10 to simulate  
4 the degradation that could possibly occur when they  
5 moved from nuclear safety related treatment to  
6 commercial practice treatment. And then once they do  
7 that, then they reanalyze using the probabilistic risk  
8 assessment and compare the results and change in CDF  
9 to Reg. Guide 1.174. And if, in fact, this reanalysis  
10 of this sensitivity study shows that there is minimal  
11 change in risk, then the categorization is reliable.

12 Now obviously, 94 percent of the  
13 components aren't even in the PRA. They aren't  
14 modeled that way and so how can you evaluate those?  
15 Well, the reason why they aren't in the PRA is that  
16 they aren't risk significant because PRA represents  
17 all the reasonable success paths to prevention and  
18 mitigation of accident scenarios. And so they almost  
19 by definition are not risk significant. And  
20 therefore, it's possible to categorize them that way  
21 without further work.

22 Lastly, the third important element that  
23 I think should be in this process is a documented  
24 treatment process. Whether it's proscriptive or  
25 performance based, there has to be some measure to

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1 provide a reasonable assurance that the components in  
2 Box 3 will remain functional.

3 Now the question is where do we go from  
4 here?

5 [Slide change.]

6 MR. SIEBER: In my last slide, I can say  
7 that this process and the work by the staff and the  
8 licensee is nearly completed. The ACRS has not  
9 written a letter on it yet because there's some  
10 documents that need to be finalized, including the  
11 safety evaluation report, final resolution of some  
12 open items and the documentation that will be included  
13 in the FSAR on commercial treatment. Once that's done  
14 which we expect will occur in perhaps July, then the  
15 ACRS will write a letter on this whole process and  
16 these specific exemption requests.

17 In my personal opinion right now, I see no  
18 show stoppers that the ACRS would report, even though  
19 there has been plenty of discussion among us and so  
20 there are things to talk about. So that, in  
21 conclusion is my presentation on the South Texas  
22 Project.

23 DR. APOSTOLAKIS: Would you like to  
24 proceed, Mr. Chairman?

25 CHAIRMAN MESERVE: Yes.

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1 DR. APOSTOLAKIS: The next presentation is  
2 on thermal-hydraulic codes by Dr. Wallis.

3 DR. WALLIS: As the Chairman mentioned  
4 earlier in his introduction, this topic was one of our  
5 topics at the last meeting we had. Since then we've  
6 written three letters. We've met with three code  
7 owners and we've also had extensive discussions with  
8 the staff.

9  
10 The thermal-hydraulic codes have been  
11 around for a long time. They have proved very useful  
12 for regulatory requirements and in the past they've  
13 required that the staff carefully examine each code  
14 for each application, use professional judgment and be  
15 assured that the positions of the code were  
16 sufficiently conservative, that safety was preserved.

17 With the move toward the use of codes for  
18 a more realistic sense and less conservatism that we  
19 take the code as predicting what really happens, not  
20 some extreme case. There are greater demands on the  
21 codes. How the code originates is to show that the  
22 codes are good. And this requires, in many cases that  
23 the documentation be improved to justify what is in  
24 the code and also that a measure of this goodness be  
25 provided. Then the rational measure of goodness is

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1       how accurately do the predictions represent reality  
2       and the measure of this is a measure of uncertainty  
3       and therefore, the realistic codes, the evaluation of  
4       realistic codes requires that we have definitive  
5       criteria for assessing this uncertainty.

6                 One of the things that has happened in the  
7       last few months that the ACRS strongly supports is  
8       that the NRC staff has obtained and exercised the  
9       applicants thermal-hydraulic codes themselves so they  
10      don't have to rely on extensive give and take with the  
11      applicant.  There's less of the -- figure out which  
12      question to ask, waiting until it's answered and then  
13      going back and ask another question.  We see this as  
14      being much more efficient process and also adding  
15      confidence and that the staff can use the code itself  
16      rather than relying on what's supplied by an  
17      applicant.

18                I'd like to point out to the Commission  
19      that we have met with Westinghouse on the important  
20      issue of AP1000, but we have not yet got to the point  
21      of examining the codes and Westinghouse has not yet  
22      agreed to supply them to the staff for exercising by  
23      the staff.

24                In one of our letters to you, we addressed  
25      the question of the impact of codes on the performance

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1 goals. I'll just a little bit about that and in terms  
2 of maintaining safety, we pointed out that we don't  
3 have a good measure of code uncertainties, then there  
4 may be safety questions raised, for instance, if the  
5 code is predicting that the core is covered in some  
6 accident sequence, but because of uncertainties,  
7 there's a probability which is not insignificant, that  
8 the core may be covered, then the questions are raised  
9 about does this have an impact on safety. So we have  
10 to have a good understanding of these uncertainties.

11 In the area of public confidence, these  
12 codes, even if proprietary, eventually are seen by  
13 practicing engineers, by researchers in universities  
14 and essentially it informs the technical public and  
15 when this informed technical public sees what's in  
16 these codes, they should get a feeling that the  
17 quality is good, that there are not errors or  
18 assumptions which they would be led to question.

19 In the area of efficiency and  
20 effectiveness, it's quite clear that if the  
21 documentation is poor, the validation is not extensive  
22 and the assessment is insufficient, then there's a lot  
23 more work for the staff and the applicant to go  
24 through before the staff can be assured that the code

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1 is good enough. And in the extreme case, there may be  
2 a requirement for additional experiments.

3 Another aspect of this is that if the  
4 staff is not comfortable with the code they will tend  
5 to impose a lot of restrictions on its use and this  
6 imposes additional burden on licensees. Licensees  
7 have to do a lot more work to justify why the code  
8 should be used for their particular application and  
9 this could perhaps be alleviated if the documentation  
10 and assessment were better in the first place.

11 And to continue this discussion of burden,  
12 if there are too many uncertainties in the code, then  
13 the staff will err on the side of making conservative  
14 decisions which will mean that margins have to be  
15 bigger and this essentially enforces a further burden  
16 on industry.

17 Some of the things we've been doing, we  
18 reviewed Siemens S-RELAP5 code, specifically for  
19 Appendix K small-break loss-of-coolant analysis. This  
20 is not a best estimate or a realistic code assessment.  
21 This is the Appendix K conservative regulation.

22 And we concluded the code is adequate for  
23 this application. This was mostly based on the fact  
24 that codes of this type have been used for this  
25 application before. The staff is very familiar with

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1       them and this code meets the requirements of those  
2       regulations.

3               But at the same time, we looked at the  
4       code in the light of its eventual development for  
5       realistic applications and as we told in this letter,  
6       there are some aspects of the documentation which need  
7       to be approved.

8               We also considered the EPRI RETRAN-3D  
9       code, the Thermal-Hydraulic Phenomena Subcommittee had  
10      concerns which you're probably familiar with by now,  
11      with the momentum equations. Now we raised these in  
12      our last meeting with EPRI and EPRI conceded that our  
13      concerns had merit and at the moment, we are awaiting  
14      EPRI's response.

15              Meanwhile, the NRC staff has been active.  
16      For some time they've been developing what is very  
17      much needed in this area, a regulatory guide and a  
18      sounder review plan. We have been interacting with  
19      the staff along the way and these two documents have  
20      been out for public comment. The public comments have  
21      been received and a workshop was held last month. The  
22      resolution of these public comments, we are told, may  
23      take some time and it will probably be at the end of  
24      the year or so before these documents actually see the  
25      light of day in their final form.

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1           And meanwhile, the Office of Nuclear  
2           Regulatory Research has also been developing a  
3           consolidated thermal-hydraulic code to put the  
4           Agency's codes into one code instead of several. We  
5           are pleased with the progress they have made. We  
6           strongly support the Agency having its own code to  
7           make independent assessments as well as to create  
8           expertise within the Agency which gives a competence  
9           to review vendor codes.

10           That's all I have to say. Thank you.

11           CHAIRMAN MESERVE: Thank you. Why don't  
12           we go through them all.

13           DR. APOSTOLAKIS: Steam generator issues,  
14           Dr. Powers.

15           DR. POWERS: What I'm going to try to do  
16           is give you a whirlwind tour and thumbnail sketch of  
17           the fascinating world of steam generators.

18           MR. MCGAFFIGAN: Is this at 80,000 feet?

19           (Laughter.)

20           DR. POWERS: No, we're going to get  
21           quickly back into the sludge of this one.

22           As the Commission is aware, steam  
23           generators constitute a little over 50 percent of the  
24           pressure boundary for the reactor coolant system at a  
25           pressure water reactor. Should there be a rupture of

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1 this portion of the pressure boundary, you can release  
2 radioactivity into the environment because it's not  
3 backed by the containment.

4 This is a known vulnerability to the  
5 pressurized water reactor design and consequently  
6 since the design has been conceived, plants have been  
7 required to be able to cope with a steam generators  
8 tube rupture itself and with the leakage through steam  
9 generators in the event of a rupture in the main  
10 steamline break.

11  
12 What's important to recognize is steam  
13 generator tube ruptures are not hypothetical accidents  
14 and on your next slide, I've listed the steam  
15 generator tube ruptures that have occurred.

16 [Slide change.]

17 DR. POWERS: It first took place in 1975.  
18 The most recent that I think is familiar to you is the  
19 Year 2000 at Indian Point.

20 This slide has room for at least another  
21 entry on it. It's simply a matter of numbers.  
22 There's something over one million steam generator  
23 tubes in use today and even if the regulations were to  
24 provide an unreliability of some like  $10^{-7}$  you would

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1 expect that once in a while there would be a steam  
2 generator tube rupture.

3 You can look at this slide in a couple of  
4 ways. It certainly tells you that steam generator  
5 tube ruptures occur. It also tells you that the  
6 plants cope successfully with these steam generator  
7 tube rupture events. If they were not, or if the  
8 events of a tube rupture were propagated to overwhelm  
9 the coping capacity, you do enter into a severe  
10 accident space to a class of accidents the PRA refers  
11 to as bypass accidents because the radioactivity  
12 bypasses the containment. Those class of accidents  
13 have the peculiarity of being risk-dominant at some  
14 plants, even though the frequency isn't especially  
15 high.

16 Consequently, as I've indicated on the  
17 next slide, the steam generators continue to receive  
18 attention both from the industry and the NRC.  
19 Industry attention is taking the form of continuing to  
20 develop guidelines for the monitoring of the tubes and  
21 the on-going process of replacing and monitoring steam  
22 generator tubes.

23 On the next slide I show you what the  
24 problem is.

25 [Slide change.]

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1 DR. POWERS: The problem is one of  
2 corrosion and this is a cartoon of a steam generator.  
3 Please understand they are good deal more complex than  
4 this cartoon. It illustrates what types of corrosion  
5 that we have encountered within the tubes. You'll see  
6 that there was in the past conventional corrosion  
7 which involved the wastage away of material. The  
8 industry went through fairly heroic efforts to  
9 eliminate that from concern and perhaps a testimony to  
10 Mr. Murphy and his laws, promptly a new type of  
11 corrosion appeared which is stress corrosion cracking.  
12 We observe that cracking certainly in the high stress  
13 regions up in the U-bend. We also see it from  
14 residual stresses on the free span. The more  
15 interesting and novel stress corrosion cracking occurs  
16 in the visually inaccessible regions within the tube  
17 sheets that support the tubes and the tube support  
18 plates themselves.

19 [Slide change.]

20 DR. POWERS: Turning to the next slide,  
21 the corrosion is prompting the replacement of -- well,  
22 in the next slide I want to show you some examples of  
23 the stress corrosion cracks to indicate that these  
24 cracks are small and they're relatively difficult to  
25 detect.

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1           That kind of corrosion is prompting the  
2 industry to consider the replacement of steam  
3 generators and on the next slide I show you a slide  
4 that I just love.

5           [Slide change.]

6           DR. POWERS: It's a photograph of the  
7 process of changing -- of moving a steam generator and  
8 it will remind you what a tremendously heroic job that  
9 must be to change out a steam generator tube.

10           The objection in replacing a steam  
11 generator tube, of course, is to replace it with  
12 alloys that are less susceptible to the steam  
13 generator, to the corrosion processes. In general,  
14 the alloy 690 is being used. We are seeing, however,  
15 in laboratory experiments that even the 690 allow may  
16 be susceptible to stress corrosion cracking although  
17 we haven't observed that in situ.

18           That gives us pause about relieving any of  
19 the extensive monitoring processes that are imposed on  
20 steam generator tubes.

21           As I indicated to you, the corrosion  
22 processes afflicting steam generator tubes have  
23 evolved over the years. When the regulations were  
24 originally written, the concern was over the uniform  
25 wastage of a tube, especially in visually accessible

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1 areas and so regulations were imposed on the amount of  
2 thinning of the tube that could take place. Now we  
3 have evolved into the point where stress corrosion  
4 cracking is the issue. And it's that cracking takes  
5 place certainly in visually accessible areas such as  
6 the free span. It also occurs inside the tubes.  
7 They're not visually accessible and in this tube  
8 sheet, tube support plate, they're not visually  
9 accessible.

10 [Slide change.]

11 DR. POWERS: We have, as I've indicated on  
12 the next slide, an adequate technology for crack  
13 detection. What we're not so good at is actually  
14 sizing the cracks, that is, determining how deep the  
15 end of the tubes they go.

16 Consequently, the staff has had to evolve  
17 its approach toward the repair or replacement of  
18 defective tubes from using crack size, individually in  
19 accessible areas of the tube support plates to one of  
20 using the voltage in the detection device.

21 The ACRS has spent some time this fall  
22 going through a rather thorough examination of some of  
23 the features of this alternate repair criteria, the  
24 staff has come up with and in the course of doing that  
25 review, we did identify some areas that I've listed on

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1 the next slide of where the technical basis for the  
2 alternative repair criteria could be strengthened.  
3 These include studies on the forces and the effects on  
4 tubes during accidents such as the depressurization on  
5 a main steamline break, the data base --

6 DR. DIAZ: Excuse me, I'm sorry. I  
7 believe you're currently on Slide 41?

8 DR. POWERS: Yes sir. Depressurization of  
9 main steamline -- the database that we have for the  
10 7/8th inch tubes relating to crack size and voltage,  
11 monitoring of the -- for systematic deviation from the  
12 hypothesized bounding crack growth rates and  
13 understanding of the iodine release that would be  
14 associated with a steam generator tube rupture.

15 [Slide change.]

16 DR. POWERS: The real question that you  
17 have with steam generator tubes is not the failure of  
18 a single tube, but can the tube failures propagate and  
19 they will overwhelm the ability of the plant to cope  
20 with them. Such propagating failures could be  
21 hypothesized.

22 DR. DIAZ: Excuse me, that's not what your  
23 slide says. Your slide says "can degraded tubes fail"  
24 --

25 DR. POWERS: Yes.

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1 DR. DIAZ: And the answer to that is?

2 DR. POWERS: Tubes certainly can fail and  
3 they do. The real question is can you propagate the  
4 failures and get multiple tube failures that overwhelm  
5 the ability of the plant coping system.

6 One possibility, of course, is that the  
7 forces imposed on a main steamline break that caused  
8 this propagation, the staff has recognized that  
9 considering this is a potential area for generic  
10 research.

11 The other question is can tubes fail  
12 during severe accidents as a result of the heat and  
13 pressure loads that are imposed on them. That would  
14 have the effect of turning a severe accident into a  
15 containment bypass accident. That would occur only if  
16 the primary coolant system remained pressurized and I  
17 hasten to add that licensees have developed accident  
18 management processes that endeavor to depressurize the  
19 reactor coolant system and to the extent that those  
20 processors are successful they moot this issue.

21 [Slide change.]

22 DR. POWERS: Nevertheless, it does appear  
23 that we need to have a better understanding of the  
24 behavior of degraded steam generator tubes under  
25 severe accident conditions. It comes about for a

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1 practical purpose. The licensees are requesting  
2 relief from some of the requirements for monitoring  
3 steam generator systems and they are casting these  
4 requests in the language of risk and indeed the staff  
5 is reviewing those questions in the language of risk.

6 Consequently, the staff certainly feels it  
7 needs a better understanding of the analytic tools  
8 that the licensees are using to formulate their  
9 requests and that includes tools like the MAAP code.

10 [Slide change.]

11 DR. POWERS: Right now, our approach to  
12 monitoring steam generator tubes is an empirical  
13 approach. And is there ever going to come a time when  
14 we have a really mechanistic understanding of stress  
15 corrosion cracking and the prediction of leakage from  
16 degraded steam generator tubes that is commensurate  
17 with our ability to predict the bursting of degraded  
18 tubes.

19 My answer to this is not any time soon,  
20 this entire process of stress corrosion cracking is  
21 one where we do not have the kind of comprehensive  
22 mechanistic understanding that we have for convention  
23 corrosion. It is obviously a much more complicated  
24 technical issue.

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1           If we are to get a better understanding of  
2 stress corrosion cracking, this certainly is going to  
3 require much better data on the cracks themselves.  
4 Until we have that, the inspection and empirical  
5 prognostication of how tubes behave, will be the  
6 prevailing approach for some time to continue.

7           That's what is my promised thumbnail  
8 sketch of the issue.

9           DR. APOSTOLAKIS: Thank you. And the  
10 final presentation is on our activities of license  
11 renewal by Dr. Bonaca.

12           DR. BONACA: Yes, good morning.

13           [Slide change.]

14           DR. BONACA: The purpose of my  
15 presentation is to update on the status of ACRS  
16 activities on license renewal. Recently, we have been  
17 quite involved in these activities in two ways. One,  
18 reviewing the generic guidance documents that have  
19 been developed by the staff and the industry, and  
20 second, specifically reviewing two applications in  
21 front of us, at this time, the one for Arkansas One  
22 and the one for Hatch.

23           First of all, I'll talk about the license  
24 renewal guidance documents. You are familiar with the  
25 standard review plan which, of course, is in front of

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1 you and Reg. Guide 1.188, Standard Format and Content,  
2 and the NEI 95-10 document, 1.188 references and  
3 endorses.

4 And finally, you're familiar with Generic  
5 Aging Lessons Learned report. We find that report to  
6 be a remarkable compendium of information assembled  
7 that is very significant to the industry and to the  
8 NRC. It provides really a fundamental baseline and it  
9 defines acceptable programs. That compendium of  
10 information would be very useful both to applicants  
11 because it provides an acceptable baseline and to the  
12 NRC.

13 And because of the volume of these  
14 documents, we felt very strongly that the documents  
15 should be approved at this time, although there is  
16 still some procedural debate going on between the  
17 staff and the industry on some issues. The timing is  
18 right for approving these documents because we believe  
19 their approval will facilitate future applications and  
20 reviews.

21 We do feel that the staff has developed an  
22 effective set of guidance documents. These documents  
23 are effective. In our letter to you, we have  
24 recommended that although we recognize that the  
25 adherence to the rule means that all you have to

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1 identify in the application is the way you're going  
2 about identifying the components subject to the rule,  
3 the end results of the process, the inclusion, for  
4 example, of the results of the scoping portion of the  
5 study facilitates the review to the point that we  
6 encourage all the licensees to include that  
7 information.

8 One of our concerns has been scrutability  
9 of the documents to interested members of the  
10 documents. The documents should be clear. This is  
11 not a very obtuse technology. This is just a  
12 painstaking effort to identify the components, screen  
13 them to put them on a list and then to identify the  
14 aging mechanism, then the programs as they go forth  
15 there should be clarity in this process and the  
16 documents can do that.

17 Now I want to point out, for example, that  
18 Arkansas One has provided us with an application that  
19 is, in fact, one of the smallest in volume and yet is  
20 very clear. You can really walk through it and  
21 understand what it is. And so, in fact, proper  
22 information doesn't mean that you have to have  
23 necessarily a burden. You can really work very  
24 effectively as long as you have a clear process  
25 through the documentation.

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1 [Slide change.]

2 DR. BONACA: I'm now referring to Slide  
3 48. We have recommended, as you know, and the staff  
4 has agreed to update the GALL Report periodically.  
5 There is still information we are getting from new  
6 applications. For example, just a review of Arkansas  
7 we have right now brings significant insight on  
8 inaccessible cables as well as susceptibility of  
9 small-bore piping and this kind of information needs  
10 to be put back into GALL as the opportunity comes. So  
11 frequent updates or periodic updates of GALL will give  
12 an opportunity to improve the database and the  
13 baseline of the recent license renewal. With the  
14 updates of GALL, this should also be updates of SRP  
15 and Regulatory Guide 1.188.

16 [Slide change.]

17 DR. BONACA: The Subcommittee on Plant  
18 License Renewal reviewed the application of Arkansas  
19 One on February 22, 2001. This is an interesting  
20 application, as I mentioned before, because the work  
21 documentation is not voluminous. But the lessons  
22 learned from previous applications were clearly  
23 realized in this application.

24 The standard format was pursued consistent  
25 with the guidance of NEI and the staff. As a result

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1 of this, there were fewer RAIs, requests for  
2 additional information, and only six open items to the  
3 point where the Subcommittee on License Renewal  
4 recommended to the Committee that we would not have an  
5 interim letter because there was nothing to comment  
6 on, that we could add to the review. So this is an  
7 example of a successful way of an applicant to  
8 expedite the process.

9 [Slide change.]

10 DR. BONACA: The result of that, and I'm  
11 jumping a slide here, I guess, to -- well, the result  
12 of that is we have reviewed the Arkansas application  
13 during this meeting, in fact, and with five months  
14 ahead of schedule. It was possible for us to support  
15 that kind of timing and schedule.

16 [Slide change.]

17 DR. BONACA: With reference to Slide 50,  
18 we reviewed the Hatch license renewal application SER  
19 with open items on April 13, 2001. And with that also  
20 we reviewed the Boiling Water Reactor Vessel and  
21 Internals Project Topical Reports. We didn't review  
22 them all. That's not the purpose, but we reviewed  
23 four of them and we find to be this project as defined  
24 in excess of 20 topical reports a significant  
25 investment that provides very sound baseline for

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1 supporting accident management, aging management  
2 programs for boiling water reactors.

3 We support the perspective of the staff  
4 that these generic documents did indeed support the  
5 application of BWRs.

6 [Slide change.]

7 DR. BONACA: We found the staff review of  
8 the Hatch license renewal application was extensive  
9 and thorough. We found the processes implemented by  
10 the applicant adequate, although there are still open  
11 issues to be resolved and we agreed with the staff  
12 with most of them although some of them are open and  
13 there is an appeal process going on. We chose not to  
14 interfere with the appeal process until a decision is  
15 made.

16 And finally again the BWR guidelines  
17 effectively support license renewal.

18 [Slide change.]

19 DR. BONACA: As I mentioned before here on  
20 Slide 52 we supported a staff request for an ACRS  
21 review of the Arkansas application and I just say that  
22 we could do that because of the characteristics of the  
23 application I described to you before that facilitated  
24 the review. And there was already on the basis of the  
25 application, there was a baseline already that we had

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1 seen before in previous applications that facilitated  
2 the whole process.

3 [Slide change.]

4 DR. BONACA: We are planning to review our  
5 first Westinghouse design, BWR, Turkey Point, October  
6 2001 and we plan to complete a review of the Hatch  
7 application in November 2001.

8 We plan to discuss among ourselves, if in  
9 fact, there are needs to revise the rule and we will  
10 have the discussion in June and plan to provide you  
11 with any comments that may result in discussion in  
12 July.

13 [Slide change.]

14 DR. BONACA: As we announced before we  
15 will form two subcommittees next year to handle the  
16 volume of applications that will come our way.

17 That completes my presentation.

18 DR. APOSTOLAKIS: Back to you, Mr.  
19 Chairman.

20 CHAIRMAN MESERVE: Good, I'd like to thank  
21 you all for a very helpful presentation.

22 I have a few questions.

23 Dr. Shack, on Slide 7, one of your  
24 comments that you wanted to clarify, the defense in  
25 depth measures should not be imposed at -- lower tiers

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1 is the word that it uses in the slide, lower levels is  
2 the word you used in your presentation. As I read the  
3 framework document, they're talking about using the  
4 structuralist approach at a very high level, at  
5 accident prevention you have  $10^{-4}$  core damage  
6 frequency and accident mitigation at 0.1 frequency.  
7 That could be what you mean at a high level?

8 DR. SHACK: Yes.

9 CHAIRMAN MESERVE: It could also be that  
10 you're talking about systems rather than components?  
11 What do you mean by -- what guidance are you giving us  
12 when you use the reference to lower tiers?

13 DR. SHACK: Everything below that top  
14 level that we've identified as the structuralist point  
15 of view. From there on down, you should be assessing  
16 the need for defense in depth.

17 CHAIRMAN MESERVE: So it would be  
18 rationalist approach below that?

19 DR. SHACK: Below that.

20 CHAIRMAN MESERVE: And you fold in  
21 uncertainty in your analysis for the redundancy.

22 DR. SHACK: And again, I think the  
23 framework does have that. We were looking for a  
24 slightly stronger commitment to that.

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1           One of the important things I think they  
2 did in there was to identify, for example, the  
3 contributions of the safety margins and the ways that  
4 you quantify those is an element of defense in depth.  
5 So the framework, I think, was on the mark. Our  
6 letter was just looking for a somewhat stronger  
7 commitment.

8           CHAIRMAN MESERVE: Okay, Mr. Sieber, on  
9 your Slide 17, you made the point that categorization  
10 process has to rely on an expert panel for -- you have  
11 the over 94 percent of components because this small  
12 number of them are covered by the PRA.

13           MR. SIEBER: That's correct.

14           CHAIRMAN MESERVE: Are you satisfied that  
15 the process of categorization is sufficiently  
16 scrutable, that people can have confidence that the  
17 categorization decisions are ones that are ones that  
18 deserve credence or are appropriate?

19           MR. SIEBER: Yes, I am and for a couple of  
20 reasons. First of all, the expert panel uses a  
21 rigorous process of asking a series of five questions  
22 which relate to how each component functions with  
23 regard to its safety role and there are several  
24 methods of weighting and scoring these as an initial  
25 screening process.

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1           Some of these questions might be would  
2           the failure of this component create an initiating  
3           event in the PRA. Another question would be does it  
4           appear in the emergency operating procedures or their  
5           emergency response guidelines. That could be, for  
6           example, a pressure instrument or a control or at the  
7           other end of the control the operator or valve or pump  
8           or motor. So for that reason I think that the  
9           methodology that the Panel uses was rigorous.

10           The second reason that I think is  
11           important is, as I stated before, the PRA actually  
12           models all of the success past, regarding the  
13           prevention or mitigation of events or accidents. And  
14           because the process is structured that way, those  
15           components that are -- how shall I say it, not worth  
16           modeling because their risk significance is so low,  
17           can truly be stated to be of low safety significance.  
18           And I feel comfortable about the categorization  
19           process, both by the PRA process and the expert panel.

20           Now an interesting thing that they did is they  
21           took the components that were evaluated using PRA and  
22           gave those components to the expert panel to rate the  
23           same components and to care the results of that and  
24           the results of the expert panel were virtually the  
25           same as the results obtained through the PRA

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1 processing procedure. And in fact, the expert panel  
2 was slightly more conservative. They found and  
3 declared more elements, components to be risk  
4 significant than the PRA had indicated.

5 And so with those kinds of tests and the  
6 process that they used, I feel comfortable that they  
7 have done a good job on categorization.

8 DR. APOSTOLAKIS: I would like to repeat  
9 that we have not written a letter on this subject and  
10 I am not necessarily disagreeing with my colleague.

11 MR. MCGAFFIGAN: He's not necessarily  
12 agreeing either.

13 DR. APOSTOLAKIS: But I'm not necessarily  
14 agreeing either. The words in the final letter may be  
15 a little different, but at this point, let's leave it  
16 at that.

17 CHAIRMAN MESERVE: Your Slide 18 indicates  
18 that they're about, oh, I guess, 4200 components that  
19 are determined to be risk significant?

20 MR. SIEBER: That's right.

21 CHAIRMAN MESERVE: In your presentation  
22 and actually in your response there you said well most  
23 of the risk significant components are in the PRA.  
24 And there are only 2400, you said, are in the PRA --

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1           MR. SIEBER: Some were determined solely  
2 by expert panel, as far as risk significance.

3           CHAIRMAN MESERVE: I appreciate that, but  
4 it's almost a factor of two that are coming in from  
5 the expert panels.

6           MR. SIEBER: That's correct.

7           CHAIRMAN MESERVE: I guess the question is  
8 that is there something we're missing in the PRAs that  
9 there are so many components that aren't captured by  
10 it that end up being risk significant? How do you  
11 explain -- I'm reflecting perhaps my ignorance of  
12 PRAs. I would have thought if they were significant,  
13 by definition they are ones that should have been  
14 captured in the analysis.

15           MR. SIEBER: That's correct. I think the  
16 criteria between PRA and its use of CDF and LERF as  
17 basically the success criteria and the expert panel  
18 were different. For example, if a component, perhaps  
19 a pressure instrument or a flow instrument were  
20 important because an operating relied upon that  
21 instrument as part of the procedure for recovering  
22 from or mitigating some accident situation and that  
23 was a significant instrument that the operator would  
24 use, the expert panel would rate that high and call it

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1 that, but it may not have achieved the same rating  
2 through the PRA process.

3 And so the combination of the two makes  
4 this whole process a little more comprehensive than  
5 just using PRA by itself.

6 CHAIRMAN MESERVE: Mr. Wallis, I think you  
7 know we're confronted with the possibility we may see  
8 some new designs in new kinds of plants and I wonder  
9 if you could comment on or speculate perhaps on the  
10 adequacy of the codes for dealing with things like a  
11 pebble-bed module reactor or an IRIS integral  
12 pressurized water reactor. Are we going to -- are we  
13 in significantly new and uncertain territory in  
14 dealing with some hydraulic issues associated with  
15 advanced designs?

16 DR. WALLIS: I think the phenomena are the  
17 same. I don't think there are new phenomena. The  
18 range may be extended and that's where there may be a  
19 problem with the water type reactors. If there is a  
20 proposal to work it if the pressure is not seen  
21 before, but I don't think we anticipate new phenomena,  
22 so the code essentially has the ingredients to do the  
23 job by water reactors. I think there's more concern  
24 with designs which are not water reactors from

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1 something else, which is not modeled in these codes.  
2 It requires a different code.

3 CHAIRMAN MESERVE: Sure. Are there codes  
4 that are of sufficient robustness that you could use  
5 with a helium as the working fluid? Where are we in  
6 terms of --

7 DR. WALLIS: It should be simpler to model  
8 helium cooled than two-phase thermal-hydraulics.  
9 That's one of the attractions of those designs,  
10 frankly. You should be on firmer ground.

11 CHAIRMAN MESERVE: But do the codes exist  
12 or do we have to have codes that are going to be  
13 validated for that purpose. I understand they should  
14 be simpler.

15 DR. WALLIS: I don't know. I think there  
16 are codes there, but there are codes which are  
17 specifically designed for nuclear purposes. There are  
18 codes which can do this sort of thing, they're out  
19 there. Commercial codes can do this sort of thing.

20 CHAIRMAN MESERVE: Is this a long lead  
21 time item for us to have, if we were to have such an  
22 application in front of us?

23 DR. WALLIS: When we're talking about  
24 nuclear safety --

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1 CHAIRMAN MESERVE: It's a long lead time  
2 by definition.

3 DR. WALLIS: There tend to be long lead  
4 times for reasons which has to do with the way the  
5 person has worked. In principle, there shouldn't be.  
6 It's not complicated.

7 CHAIRMAN MESERVE: On your Slide 28, you  
8 made reference to a series of the staff documents  
9 indicated they were subject to comment, but you did  
10 not provide any indication of the general sense of the  
11 ACRS on these documents.

12 DR. WALLIS: We have been over the  
13 documents with the staff and we are pleased with the  
14 way they evolved.

15 I think what's happened in their comments  
16 that industry has said they're a bit too severe if  
17 they're applied across the board and I think we will  
18 across that there are certain issues which are not so  
19 important and therefore one doesn't have to require  
20 everything, that there are certain cases where one can  
21 say yes, we're not going to require as thorough an  
22 evaluation because this is a less significant thing or  
23 we know that we're well bounded by some conservative  
24 technology or some limiting knowledge or limiting  
25 process.

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1           The thrust of the comments was to qualify  
2 these requirements so that they're appropriate to the  
3 purpose and to the importance which is, I think we  
4 would tend to agree with.

5           CHAIRMAN MESERVE: Dr. Powers, there have  
6 been concerns expressed by a former NRC employee about  
7 the Agency's approach to steam generator integrity  
8 issues. I recently sent a memorandum to the ACRS to  
9 request the reviews on one such important issue,  
10 namely whether there are serious issues related to  
11 steam generator integrity that require immediate  
12 actions beyond those now being undertaken by the  
13 Agency. Although the Commission, I'm sure, would  
14 appreciate and would expect a written response, this  
15 meetings provides me an opportunity to get your  
16 preliminary views.

17           DR. POWERS: Well, the concerns you spoke  
18 of, particularly expressed by former staff member  
19 which addressed a couple of things, addressed an issue  
20 on the voltage limit for a particular plant. That's  
21 an area we haven't touched upon. Also expressed  
22 concerns about the response of our examination of the  
23 alternate criteria for the repair or replacement of  
24 steam generator tubes that we had provided to the  
25 Executive Director of Operations.

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1           My view is that the Executive Director has  
2 responded appropriately and consistently with our  
3 expectations, that we see technical -- the need to  
4 technically strengthen that alternate repair criteria  
5 via a research program that is carefully considered,  
6 carefully executed consistent with the kind of  
7 in-depth thought the alternate repair criteria  
8 obviously received in its development.

9           Had we identified anything that we thought  
10 was particularly urgent to do about steam generators,  
11 I think the Committee would have been obligated to say  
12 so explicitly and I think we did not.

13           CHAIRMAN MESERVE: Thank you. As I think  
14 you know, EDO is developing an action plan to respond  
15 to the various longer lead items and that's not  
16 available yet, but I understand that that is something  
17 that's being pushed forward.

18           DR. POWERS: It's in the offing as I  
19 understand and I think we're anxious to see some  
20 elaboration on what the plans are.

21           CHAIRMAN MESERVE: Thank you.  
22 Commissioner Diaz?

23           DR. DIAZ: Thank you, Mr. Chairman. My  
24 first comment is of course is it's something that  
25 we're all going to understand, but because I think we

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1 need to be accountable to the public. Sometimes I  
2 think we get into these issues of semantics. So let  
3 me just start at a level here that I think we should  
4 always be conscious of.

5 There are questions and answers in  
6 practically everything and the questions could be  
7 purely scientific or purely technical or the questions  
8 could be scientific and technical and have specific  
9 value to the regulatory arena which is the ones we're  
10 interested in and the ones we always want the  
11 Committee to narrow them down. It is important  
12 because we all could extrapolate any type of issue to  
13 its noncompletion very, very easy.

14 Having said that I got a particular  
15 problem with the issue of uncertainty. I might look  
16 forward to some time in the fall to sit down with some  
17 of you on the issue of uncertainty because it really  
18 bothers me, but let me make a statement for our  
19 stakeholders.

20 If any measurement or any calculation  
21 would come down with a zero uncertainty, it would be  
22 unacceptable.

23 Is that correct? Do we have unanimity on  
24 that on the ACRS? Madam Secretary, would you like to  
25 record that?

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1 (Laughter.)

2 CHAIRMAN MESERVE: You may want to write  
3 a letter.

4 DR. APOSTOLAKIS: I don't understand the  
5 statement.

6 DR. DIAZ: It's very simple. Since there  
7 is nothing like zero uncertainty in any measurement of  
8 zero uncertainty in any calculation, the calculation  
9 itself is based on a series of assumptions and zero is  
10 not there, it could be very small. But since all the  
11 calculations are based on our present state of  
12 knowledge --

13 DR. APOSTOLAKIS: I'll go along with that.

14 DR. DIAZ: Very good. Thank you, sir.

15 MR. McGAFFIGAN: What is the probability  
16 that Dr. Diaz exists?

17 (Laughter.)

18 You get into philosophy classes here.

19 DR. DIAZ: And the point is that we all  
20 want to reduce uncertainties that have value to the  
21 safety issues, but how much a reduction is needs to be  
22 put in regulatory terms and not in scientific terms.  
23 It is very easy to question uncertainties in purely  
24 scientific terms because we would all like to reduce  
25 them.

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1                   Now that Dr. Apostolakis has challenged,  
2 maybe I'll go back at him.

3                   DR. APOSTOLAKIS: I didn't challenge. I  
4 just want to understand.

5                   DR. DIAZ: Good. For example, some  
6 people, I sometime made a joke that no two PRAs give  
7 the same result. If two PRAs were giving exactly the  
8 same result, they would be frauds. They cannot give  
9 the same exact result unless they actually put exactly  
10 the same assumptions, the same body, the same things.

11                   So the issue of uncertainty is a major  
12 issue that needs to be reduced to what is valuable to  
13 the safety issue at hand, not only put it in terms of  
14 scientific concern. I think it's very important  
15 because when we talk about uncertainty, people might  
16 take the idea that we don't know and I think we know  
17 enough to make judgments on the safety of issues and  
18 even the uncertainty is not zero or might not be as  
19 low as we wanted, we still are capable of making those  
20 judgments and that's the point that I wanted to make.

21                   All right, now having said that, let me go  
22 to Dr. Shack in risk informing and Part 50 and of  
23 course, uncertainties came out of there. But I have  
24 a particular concern that it almost comes out every  
25 time on the issue of risk inform in Part 50 or risk

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1 information and that is the perception of many of our  
2 colleagues abroad and inside, sometimes even inside  
3 the NRC is that risk information is a probabilistic  
4 methodology and the Commission is very clear that this  
5 is a very balanced approach, that includes  
6 deterministic, probabilistic and experiential. It's  
7 a combination of these things. And what we're doing  
8 is we're trying to get conservatively the best use of  
9 these three factors to allow us to make proper  
10 decision makings.

11 Sometimes it doesn't come across and  
12 sometimes I think in the ACRS presentations it doesn't  
13 come across. It comes across as over valuing the PRA  
14 because that's a drive that gives us quantitative  
15 information. But from the standpoint of how it is  
16 perceived by informed people, I mean regulators  
17 outside of this country, I think it's important that  
18 we in our documents provided a balance that clearly  
19 says that we are taking as our famous white paper said  
20 risk inform approaches, this is a balance technique  
21 and it needs to be valuable. The issue of  
22 probabilistic versus defense in depth is a kind of a  
23 tug of war that you describe. The more we know about  
24 something, the more we know is risk, the less maybe  
25 defense in depth we're going to need about it. So it

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1 is not a defined process, but it is a wholesome  
2 process and I think that needs to be emphasized and I  
3 sometimes get concerned that in the effort to maybe  
4 simplify it and put the value on it, we do not get  
5 this balance expressed in terms that other people,  
6 including people inside the NRC realize that there is  
7 a balance with these techniques.

8 Would you like to comment on that, Dr.  
9 Shack?

10 DR. SHACK: I fully agree. I do not  
11 believe that we are ready and I'm not -- I'm sort of  
12 a conservative person as to whether we're ready for a  
13 risk-based regulatory system. I'm a firm believer in  
14 a risk-informed regulatory system that uses many of  
15 the deterministic arguments to balance what we do now  
16 have as uncertainties in the probabilistic system, so  
17 I think there is a strong difference between a risk  
18 based decision and a risk-informed decision.

19 DR. DIAZ: Would you say that it is  
20 important for the ACRS when they are dealing with  
21 risk-informed approach to clearly express that this  
22 technique includes all of these components, right up  
23 front and use, you know, the PRA as the technique that  
24 is coming to support, aid, clarify and quantify the

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1 issues that they can better do that within reasonable  
2 uncertainties?

3 DR. SHACK: Yes. I think we tried to do  
4 that. Perhaps that emphasis doesn't always come  
5 across, but I believe we tried to keep that.

6 DR. DIAZ: Thank you, sir. Let's see, Mr.  
7 Sieber, on the issue of the STP exemption request, I  
8 guess we, you know, it seems to be and I haven't  
9 really seen an issue with categorization, the issue  
10 always becomes the issue of treatment. The  
11 categorization, with some minor things, I think  
12 everybody agrees that we can converge if we have not  
13 already converged on the process of categorization, so  
14 it comes down to the treatment and of course, there  
15 are two ways of doing with this. It's tell me all the  
16 details of the treatment methodology or go ahead and  
17 you develop the details and we deal with the  
18 problematic aspects, and of course, it goes down to  
19 commercial components.

20 I was a little bit concerned about your  
21 characterization of commercial components as being  
22 kind of loose and I agreed that I've been in fossil  
23 plants and I've been in many type -- I've been in  
24 airplanes. Sometimes I one time tried to get in a  
25 rocket, but did not succeed.

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1 (Laughter.)

2 MR. McGAFFIGAN: If you have \$20 million.

3 DR. DIAZ: The issue is that as you very  
4 well know, the distributions for failures that come  
5 from the standard plans are really not applicable to  
6 nuclear power plants because we do have, even in our  
7 commercial components the higher grade of scrutiny and  
8 of course I believe that in present day with the  
9 civility, the need for power, the emphasis on  
10 consolidation and deregulation and competitiveness, I  
11 am for believing that these are going to make these  
12 people do things better, rather than the other way.  
13 I'm convinced that these plans are getting better  
14 because there is competition. They know that if they  
15 do something that is wrong, they're going to be shut  
16 down and that will make them not competitive.

17 And so having that, commercial grade  
18 components that have some specified functionality  
19 requirements through programmatic means, do you think  
20 that would suffice given the fact that they can  
21 actually be conceived to be in nuclear power plants.  
22 We think all of the other aspects of QA that might not  
23 be Q-grade, but they're already there?

24 MR. SIEBER: I guess the best way for me  
25 to address that is there was a study that the NRC

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1 contracted for that was done by Idaho National  
2 Engineering and Environmental Laboratory which is a  
3 good study that looked in pretty good depth at what  
4 the commercial practice really consisted of. And if  
5 you read that, even though they show that the  
6 distinction that I discussed a little bit about the  
7 commercial codes as not being quite as rigorous, the  
8 essential elements, if they're followed, are there.  
9 As I mentioned, I talked about having worked in a  
10 number of plants. If you take a plant that's  
11 economically distressed and you choose and you're  
12 faced with choosing which of ten components am I going  
13 to repair, all the safety related ones or the ones  
14 that are downgraded and you end up with an automatic  
15 priority list that says I'm going to do all the safety  
16 related ones first and then the ones that I don't have  
17 a firm commitment or requirement to do, I'll do them  
18 as I can. And I agree with you that under today's  
19 industry situation with the demand for power very  
20 high, that utilities and plant operators are putting  
21 extensive effort into making sure that all of these  
22 factors function. Now I talked about documented  
23 treatment process, but I do think that we are better  
24 off allowing the licensees to develop their concept of  
25 what commercial practice is and what regulations or

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1 commitments we impose upon them should be described in  
2 terms of performance measures that lead them and us to  
3 match the regulatory expectation of functionality.  
4 And I think that if you take that flexibility away  
5 from licensees, you inhibit their ability to develop  
6 the optimum method that maintains that functionality.  
7 So I would be more inclined to go to a performance  
8 based specification of treatment than a deterministic  
9 based expression.

10 DR. DIAZ: Thank you, sir. Dr. Wallis,  
11 you said something regarding uncertainty that I kind  
12 of like, sir, and I want to congratulate that on  
13 saying that we need to understand the uncertainty.  
14 That doesn't mean that at any one time we're capable  
15 of reducing the uncertainty to a value that is made,  
16 but understanding the uncertainty is really very, very  
17 important. So I thank you for those comments.

18 I looked at your documents and looked at  
19 some of the background regarding the codes and it  
20 seems to me that the bottom line of what you know you  
21 are really asking is for better documentation. You're  
22 not really questioning the validity of the codes to  
23 perform in an adequate fashion within reasonable  
24 assurance of a protection of public health and safety.  
25 You have not found major things, you have found I

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1 think wonderful corrections that make the codes  
2 better, but you are insisting on and I think it's a  
3 good thing on better documentation and there are  
4 errors that are factual that those need to be  
5 corrected. Is that correct, sir?

6 DR. WALLIS: Well, we have found errors  
7 which should be correct. I would go back to your  
8 earlier statement about uncertainty. I think we wrote  
9 you a letter in which we said that quality is  
10 determined by the degree of uncertainty. The quality  
11 of the code is determined by the degree of uncertainty  
12 and prediction within the context of the regulatory  
13 use of the code and for certain regulatory uses,  
14 certain regulators are more tolerant of uncertainty or  
15 tolerate of bigger uncertainties and the concern we  
16 have is that as margins are reduced, the decisions may  
17 be tolerant of less uncertainty, so that in a sense  
18 the codes that were adequate in the past may have  
19 trouble reaching the degree of uncertainty which may  
20 be needed to support certain decisions. It provides  
21 uncertainties are reduced, getting closer to some  
22 limit. You have to be more certain about the  
23 possibility of going over that limit, the accuracy --  
24 the requirements are more stringent. So whether or  
25 not -- the codes have been okay in the past. I think

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1 we can be very sure there, but we can't make --  
2 reassure you that they'll always be so because the  
3 regulatory requirements are evolving and if we reduce  
4 the burden and get closer -- wish to reduce the  
5 margins, then the quality may have to be improved to  
6 something which looked like a tolerable error or an  
7 assumption which led to uncertainty in the past may  
8 not be so tolerable in the future. Is that adequate  
9 answer?

10 DR. DIAZ: Are we converging to an  
11 acceptable level? You think the efforts that have  
12 been made?

13 DR. WALLIS: I think the staff is doing a  
14 very good job of realizing that this is true, that the  
15 qualities of the code have to match the regulatory  
16 decisions to be made and I think we're converging in  
17 the sense that the documentation being prepared by the  
18 staff to ensure adequate quality is converging on what  
19 we think is a good quality document.

20 DR. DIAZ: All right.

21 DR. WALLIS: Whether or not industry will  
22 always rise to the challenge I think has to be  
23 assessed by what they subject.

24 DR. DIAZ: Dr. Powers, on your steam  
25 generator, I guess when you said risk dominant, you

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1 are really referring to the essential bypass of the  
2 containment. Is that what --

3 DR. POWERS: That's what gets you into  
4 risk dominance, you have less risk mitigation along  
5 the flow pathway. With NUREG 1150, they showed that  
6 to us.

7 I will comment that some of that dominance  
8 may come because the way we calculate the mitigation  
9 along the alternate flow paths is not as well  
10 developed as it probably ought to be. So we may over  
11 emphasize the importance of bypass accidents, but even  
12 without a detailed code calculation you know that if  
13 you're venting without benefit of the containment you  
14 are probably incurring more risk than you would  
15 otherwise.

16 DR. DIAZ: Sure, but you know, going back  
17 to the definition of risk-informed regulation where we  
18 have deterministic, probabilistic and experiential  
19 components to it and looking at your figure, the table  
20 on page 31, and you made a comment that these plants  
21 were able to cope with it, I asked that question of  
22 the staff, the fact that I have asked the question  
23 three times, just to make sure that the answer is  
24 correct. You probably know the answer, but I think  
25 for the record, I'd like for you to know that in these

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1 11 incidents, the NRC or the licensee, they have not  
2 been able to measure -- they have not been able to  
3 measure any off-site releases. Only on-site. Only  
4 inside of the protected area of the plant area.

5 DR. POWERS: These are mitigated design  
6 basis accidents and quite frankly, one would expect  
7 releases certainly below the Part 100 limit.

8 DR. DIAZ: They were not measured of the  
9 site.

10 DR. POWERS: Nonmeasurable.

11 DR. DIAZ: Of the site. So the plants  
12 were able to cope --

13 DR. POWERS: Quite well with the  
14 accidents.

15 DR. DIAZ: So the concern is for accidents  
16 that are much larger than this whose frequency will be  
17 lower than the ones that we're considering in here?

18 DR. POWERS: I think ipso facto because of  
19 the database that you have there. Those are all  
20 single to accidents. We have not seen instances of  
21 multi-tube accidents.

22 The question, of course, that's raised is  
23 that if you are allowing tubes that have some level of  
24 degradation to continue to operate, are you more  
25 likely to have a multi-tube accident or not? That's

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1 the question that's being posed. And of course, the  
2 staff is imposing requirements on the industry to keep  
3 that increase in risk below an acceptable level and  
4 where I'm using the term risk in the more qualitative  
5 sense, not the PRA calculated sense. And as I  
6 indicated to you, the real concern you have is the  
7 propagating accident and whether we're getting more  
8 likely to have those or not.

9 DR. DIAZ: And do you see that the NRC is  
10 in a path where we should be able to provide a  
11 reasonable answer to the issue of the potential for  
12 propagating failure and how can the plant cope with it  
13 because things can happen. The issue is can we cope  
14 with it to minimize a release that will impact on  
15 public health?

16 DR. POWERS: Let me answer several  
17 questions here. Let me say that I don't think you  
18 want to ask for the staff to be able to do a  
19 calculation of some sort to go from soup to nuts on  
20 this. This is a very difficult area. Had they done  
21 things to try to keep this risk of a propagating  
22 accident down to manageable levels, what we would call  
23 a reasonable level of risk, here? Absolutely. That's  
24 the whole point of their alternate repair criteria.  
25 It's been very well considered and conservatively done

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1 because there are limiting calculational tools that  
2 you have to apply in this area. It's empirical in its  
3 nature and conservatively interpreted and maybe as an  
4 anecdote to give you some feeling for the level of  
5 conservatism that I think that if you look at voltage  
6 signals indicative of flaws in tubes and compare that  
7 with the leakage that might occur you would say gee,  
8 I very well might accept as high as 20 volts here  
9 would be a reasonable amount.

10 The staff has said yes, that might be  
11 true, but we also know you have some limited  
12 capability to detect these. You may miss some. You  
13 may mis-size them. The correlation between voltage  
14 and size is not precise and so they impose powerable  
15 detection kinds of limits and they impose  
16 detectability limits. They set that voltage limit at  
17 2 volts. So they've imposed a conservatism to keep  
18 things low, as long as our information base is as  
19 restrictive as it is. I think they've done that.

20 The other thing to recognize is the staff  
21 has done more quantitative analysis to say well, how  
22 many tubes can rupture and we can handle it. Is it  
23 one? And if it happens to go two, is the ball game  
24 over there? No. It's quite clear that the existing  
25 processes are quite capable of handling three or four

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1 ruptured tubes, perhaps as many as 12. Beyond that,  
2 the leak rate depletes water supply so you don't have  
3 coping capability there.

4 DR. DIAZ: I understand. Thank you, sir.  
5 And very quickly, Dr. Bonaca, on the issue of license  
6 renewal, do you see from your perspective any  
7 additional improvements that could be made to the  
8 process to that we can be really on a path to say this  
9 is an acceptable process? Is there anything that has  
10 been shown to you as a weakness or a strength that we  
11 should actually utilize?

12 DR. BONACA: I think that the experience  
13 is getting significant enough for individuals for type  
14 of plants that if the licensees can endorse pretty  
15 well the initiatives proposed by the previous  
16 applicants so on and so forth, the process can be --  
17 again, the baseline for acceptance already exists.  
18 Examples of acceptable processes already exist. I  
19 still believe that each of one of the applications  
20 will have to be a plant-specific one just because the  
21 plants are different, even when they're system plants  
22 and they have significant balance of plant  
23 characteristics which differ, so there will have to be  
24 a need for application.

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1           But I believe that the Arkansas example is  
2 a good one where we came down to close to a year plus  
3 of time for reviewing the application and that's  
4 significantly shorter than the one we have experienced  
5 just a year and a half ago.

6           DR. DIAZ: Thank you, sir. Thank you, Mr.  
7 Chairman.

8           CHAIRMAN       MESERVE:           Commissioner  
9 McGaffigan?

10          MR. MCGAFFIGAN: I'll start with Dr.  
11 Shack. I may still be a structuralist at levels below  
12 where you evolved and I think that Commissioner Diaz  
13 may have been saying the same thing, below this very,  
14 very high level of where you would like us to be  
15 structuralists and from there below rationalists.

16          But for me, it's partly the quality of PRA  
17 that we've talked about. Do you really believe that  
18 -- I guess you do, but I might as well get you on the  
19 record, you really believe that PRAs out there today  
20 are such that we can afford to be structuralists,  
21 rationalists at all levels below this very high level?

22          DR. APOSTOLAKIS: I appreciate that, Dr.  
23 Shack. No, I don't believe that anyone who really has  
24 done any PRA will claim that there are areas where we  
25 feel that the models perhaps are not as good as they

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1 should be or are not as good as other parts of the  
2 PRA, so there -- people are talking about unquantified  
3 uncertainties which sometimes makes other people  
4 unhappy, but I really think that the people have  
5 uncertainties in their mind that they have not  
6 quantified. They don't feel that PRAs can help them  
7 quantify those, so they resort to traditional measures  
8 so I think that is inevitable.

9 MR. MCGAFFIGAN: It may be semantic. You  
10 may be showing us a path for the long range future and  
11 I'm stuck in the current mud, but I continue to be --  
12 I'm not an unrepentant structuralist at all levels,  
13 but I probably am a structuralist a little bit below  
14 where you guys are. And you may be too.

15 DR. APOSTOLAKIS: Let me phrase it in a  
16 slightly different way, if I may. If one proposes an  
17 additional defense in depth measure of some lower  
18 level, I think it would be wise before we accept it to  
19 try to do a risk evaluation.

20 MR. MCGAFFIGAN: If you can, right. Let  
21 me turn now to Dr. Wallis. I've read your letters and  
22 the staff's responses and part of my question is how  
23 are you reacting to the staff responses you got on the  
24 15th of April? One of them is with regard to the  
25 RETRAN-3D letter that you had sent and the staff

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1 basically says they have considered the recommendation  
2 that the sensitivity test be run, but they believe the  
3 limitations placed on the use of the codes which, I  
4 guess, you're just talking to Dr. Diaz about, as  
5 described in the SER and the need for future uses to  
6 justify the code application will compensate for any  
7 potential inaccuracies and the individual  
8 coefficients, so therefore we do not believe that  
9 further sensitivity studies of the code are itself or  
10 its structure are necessary.

11 Do you agree with the staff on that or is  
12 that a place --

13 DR. WALLIS: I think we're going to accept  
14 that. It's a bit unfortunate because it means now  
15 that the -- because of the restrictions, the licensees  
16 have more burden to justify using these codes and it  
17 means essentially that some of these issues will be  
18 revisited.

19 MR. MCGAFFIGAN: That's my reaction.

20 DR. WALLIS: If it's coming back again, we  
21 don't need to decide now.

22 MR. MCGAFFIGAN: But you are predicting as  
23 I would they will be back because --

24 DR. WALLIS: Well, if they want to use  
25 them they have to --

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1                   MR. MCGAFFIGAN: Okay. This may get to  
2 this issue of structural versus rationalist, but in  
3 the other letter they sent you on April 12th towards  
4 the back of it they talk about the Reg. Guide 1.174,  
5 you would recommend that they consider measures of  
6 code quality such as bias and uncertainty, the staff  
7 should investigate and recommend how uncertainties and  
8 code predictions can be best quantified, etcetera and  
9 they're basically begging off again here and they fall  
10 back to Reg. Guide 1.174 where they say it discusses  
11 in some detail the comparison of PRA results with  
12 acceptance guidelines and treatment of uncertainty.  
13 Reg. Guide 1.174 recognizes that many sources of  
14 uncertainty are not readily quantifiable and the focus  
15 is on identifying sources of uncertainty that are. If  
16 the NRC were to pursue a risk-based regulatory  
17 approach, treatment of uncertainty would be essential,  
18 but there's a lot of flog there, but basically, they  
19 are saying not right now.

20                   Are you predicting again that at some  
21 point in the future they're going to -- if these codes  
22 are going to be real, used for things like 50.46  
23 analyses that this will all be back before us and  
24 they'll have to do this sort of --

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1 DR. WALLIS: The question of how to  
2 respond to this letter is before this Committee right  
3 now and we haven't decided.

4 I think we may respond to some of those  
5 points.

6 MR. MCGAFFIGAN: Okay.

7 DR. WALLIS: Regarding that one I think  
8 also they refer to CSAU, I think will give us a little  
9 bit of reassurance there as it isn't all qualitative.  
10 CSAU is a pretty strict procedure which requires a  
11 quantitative evaluation of uncertainty.

12 MR. MCGAFFIGAN: Okay.

13 DR. WALLIS: I think also since we're  
14 going to have a go at this Reg. Guide again when it  
15 finally appears, that's where we will probably try to  
16 resolve this issue.

17 MR. MCGAFFIGAN: There's one issue that  
18 you mention in your slides and you mentioned it in a  
19 letter here and the staff, this notion that people  
20 should submit their codes when they want us to approve  
21 them. And the staff points out the current  
22 regulations do not require working versions be  
23 submitted. It's sort of hortatory process to which  
24 you all are adding your collective voice. But should  
25 we consider a rule change? Would it pass backfit for

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1 us to say that we would like to have as a matter of  
2 not requesting and begging, but it just is part of our  
3 process that these codes will be submitted to the  
4 staff so that they can get used to them?

5 DR. WALLIS: Well, maybe to consider. I  
6 think it's too big a question to give you a right  
7 answer to.

8 Certainly, from the point of view of this  
9 Committee, the fact that the staff has the code and  
10 can exercise it makes the review process very much  
11 easier.

12 MR. MCGAFFIGAN: Right. That might be a  
13 -- if somebody wants to do backfit analysis on this  
14 conversation, I suppose it may take you 14 years to  
15 read something that isn't it and two months if it is.  
16 That could be a de facto rule change, I suppose, so it  
17 probably shouldn't get there. Lawyers will counsel  
18 me, but I hope they're listening, whatever.

19 There's another rule change, I'll switch  
20 over to Mr. Bonaca, that you're essentially  
21 recommending in another letter in the license renewal  
22 space, the staff and that's this issue of again we're  
23 encouraging applicants to include the results of their  
24 scoping process and their applications, just like  
25 we're encouraging them to submit codes. Should we do

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1 a rule change? In sort of two slides you mention the  
2 encouragement, and then a little bit later you say  
3 you're going to give us your views as to need to  
4 revise the license renewal rule. Is this a likely  
5 coming attraction that you're going to stick by your  
6 guns?

7 DR. BONACA: I don't know. I have not  
8 polled, but I think the Committee, in general, agrees  
9 on the necessity of having what we call a scrutable  
10 application, something we can understand and trace  
11 through. That may be part of recommendation on  
12 improvement.

13 MR. McGAFFIGAN: Okay. It's sort of  
14 implicit. You mention it on one page, but then the  
15 staff says it needs a rule change and so if you're  
16 going to stick by your guns you probably have to  
17 recommend a rule change and then there's always this  
18 famous backfit rule that we have to deal with.

19 DR. BONACA: Even if we didn't have a rule  
20 change, I mean it seems to me that maybe the industry  
21 wanted to establish somewhere the minimum requirements  
22 and I understand that that may be re-established. But  
23 I think we all want to strive for a process that is  
24 clear and supports the interested members of the

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1 public to be able to look at them and understand  
2 what's in scope and what is not in scope.

3 I don't think it's a hard spot or should  
4 be a hard spot on the part of an applicant. They do  
5 go through all these components. They develop a list.

6 MR. McGAFFIGAN: Right.

7 DR. BONACA: And there's nothing to hide.

8 MR. McGAFFIGAN: I think it's a fairly  
9 powerful argument you made in your letter and I look  
10 forward to seeing what you say in July as well.

11 Dr. Apostolakis, you've had a relatively  
12 modest role here today, other than when asked to help  
13 on structuralist versus rationalist and all that. But  
14 it's not necessarily on the agenda, but I wanted to  
15 give you a chance to talk a little bit about  
16 risk-based performance indicators. You said some  
17 things back in April that were reported in Inside NRC  
18 and Nuclear News Flashes about the staff putting costs  
19 before benefit or -- I don't have the thing right in  
20 front of me here. I'll tell you, my reaction on  
21 risk-based performance indicators is that they're  
22 still a ways off and that the comments that the staff  
23 made or the NRR staff, Bill Dean made to Tom King back  
24 in December were quite appropriate given the state of  
25 play. I continue to think they're sort of a gleam in

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1 somebody's eye and they'll be very hard to pass a  
2 backfit test, the risk-based performance indicators.  
3 So I just want to get a sense whether you want to  
4 clarify any of these comments you made back in that  
5 April meeting or have a little bit of a dialogue with  
6 you about it?

7 DR. APOSTOLAKIS: Well, first of all, as  
8 it turns out, I was not supposed to have seen that  
9 document. That was already a mistake there.

10 MR. MCGAFFIGAN: You were not supposed to  
11 have seen it?

12 DR. APOSTOLAKIS: The memorandum, no. But  
13 I wasn't aware of that. I had seen it.

14 MR. MCGAFFIGAN: Okay.

15 DR. APOSTOLAKIS: And the general sense I  
16 got from reading it was that it was cool towards  
17 introducing risk-based --

18 MR. MCGAFFIGAN: I think that's a totally  
19 fair comment to say that that document was cool  
20 towards introducing risk-based -- but the question is  
21 the motivation for why it's cool.

22 DR. APOSTOLAKIS: I don't believe that an  
23 argument that says the licensees will react negatively  
24 because this will introduce additional burden. That  
25 argument by itself is not valid for me. And I will go

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1 back to what Commissioner Diaz said. This is an  
2 integrated decision making process. If there is a  
3 need to introduce a performance indicator because  
4 we're not monitoring something, let it be. If we are  
5 duplicating something, then we should know about it.

6 MR. McGAFFIGAN: We have to understand the  
7 benefits of these indicators.

8 DR. APOSTOLAKIS: Exactly.

9 MR. McGAFFIGAN: And I think the staff was  
10 also going in its questioning at whether some of these  
11 indicators would really have benefits attached to  
12 them. It wasn't just cost. It was substantial  
13 arguments as to whether benefits were --

14 DR. APOSTOLAKIS: I believe what's missing  
15 from all this approach which would have prevented some  
16 of these problems is a clear approach to establishing  
17 a balance between the baseline inspections and the  
18 performance indicators. And I don't think we have  
19 that yet.

20 When someone introduces the possibility of  
21 a new performance indicator, I think in the same  
22 document there should be an argument that either we  
23 are not covered in this area, or we're replacing  
24 another indicator or we will introduce this because

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1 it's a more objective indicator and we will reduce the  
2 baseline inspections appropriately.

3 As long as we don't -- for example, if I  
4 were a licensee myself and all I see is a discussion  
5 of new indicators without any discussion of change in  
6 the baseline inspections, then I would be upset too.  
7 So I don't know, some of the arguments there, they  
8 just struck me as being inappropriate. Obviously, you  
9 don't feel the same way.

10 MR. MCGAFFIGAN: No, well, we'll continue  
11 to --

12 DR. APOSTOLAKIS: The tradeoff, I think,  
13 is an essential part of the process.

14 MR. MCGAFFIGAN: I would predict that if  
15 I'm in my fourth term here, which I'm not planning to  
16 be, we will still not have risk-based performance  
17 indicators that are functioning at 103 plants or  
18 whatever number of plants we have at that point, but  
19 that's a bet we can make.

20 CHAIRMAN MESERVE: Commissioner  
21 Merrifield?

22 MR. MERRIFIELD: Thank you, Mr. Chairman.  
23 First, I wanted to add my congratulations of the  
24 Chairman to Dr. Apostolakis for assuming the  
25 chairmanship of the ACRS. You've got a lot ahead of

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1 you and there's a lot of history with some excellent  
2 chairmen and I wish you well in that regard.

3 I would also in similar context want to  
4 thank Dana Powers, Dr. Powers, for an exceedingly good  
5 job as the chairman. You put in an extraordinary  
6 amount of not only what we expect of you, but more, of  
7 your own time and that's recognized and I certainly  
8 want to recognize that.

9 In particular, I would say that I think  
10 your chairmanship has significantly enhanced the  
11 communication between the ACRS and the Commission and  
12 certainly as you assume the chairmanship, I hope you  
13 continue in the direction that Dr. Powers took us in  
14 that regard.

15 The first question I have is for Dr.  
16 Shack. I want to talk a little bit about 50.46.  
17 Clearly, as I think your slides indicate, risk  
18 informing 50.46 is going to be a complex initiative  
19 and one that's going to require some rigorous  
20 technical evaluation on our part. It's going to have  
21 far-reaching effects in Appendix K and elsewhere. In  
22 your Slide 8, you indicated that you met on the first  
23 bullet, you met, the subcommittee met on March 16th of  
24 2001. Can you give an initial impression of how you

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1 think the staff was proceeding in its efforts relative  
2 to 50.46?

3 DR. SHACK: My impression at the  
4 subcommittee meeting was that I thought there was a  
5 good discussion going on. The industry, I think, has  
6 a strong argument that the large break is an unlikely  
7 event. We've accepted that argument in the past for  
8 dynamic effects. We've used probabilistic risk  
9 assessments for risk-informing piping inspections and  
10 there's a reasonable experience base that shows that  
11 large double ended breaks are unlikely. I think the  
12 staff quite properly looks at and says how low does  
13 that probability have to be and it turns out it has to  
14 be pretty low and it's past your experience base, so  
15 that you really are depending on your analytical tools  
16 and there are just lots of things to consider, you  
17 know, phenomena like stress corrosion cracking that  
18 are difficult to address and so I think they're  
19 cautious about that.

20 My initial reaction was that they were  
21 overly cautious, going into the subcommittee meeting  
22 and listening to their arguments, I found myself much  
23 more sympathetic. I sort of appreciated their  
24 attempt. When I listen to the industry arguments, as  
25 I said, there were general agreements over things that

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1 were dealing with, for example, the start-up time  
2 requirements for the diesel generators and I thought  
3 the staff was making some attempts that they realized  
4 that and we're looking for ways that would be quicker  
5 and faster, perhaps, to get some relief, if not  
6 everything that the industry was looking for.

7 I came out of the subcommittee meeting  
8 with the feeling that the industry appreciated the  
9 staff's difficulty. They were willing to work with  
10 them. They understood that the level of rigor that  
11 would be required would be high and would require  
12 substantial investment and I appreciated the staff's  
13 identification of the difficulties that were  
14 associated with that. So I came out of that  
15 subcommittee meeting feeling that everybody realized  
16 we had a difficult problem, but they were working on  
17 the problem. I'm not sure that that follows from all  
18 subsequent meetings that I've heard, but that was my  
19 impression then.

20 MR. MERRIFIELD: Thank you. Mr. Sieber,  
21 how much involvement does ACRS seem to have relative  
22 to the review of some of the NEI guidance documents?  
23 Specifically, I'm interested in knowing where you guys  
24 are going relative to the review of NEI-00-002 which  
25 is the PRA peer-review process guidelines and 004

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1 which is the option 2 implementation guideline. To  
2 what extent, if all, are you going to participate in  
3 that?

4 MR. SIEBER: Well, we have received, as I  
5 recall, a presentation on 002. And a copy of the  
6 document. I do not recall that we have commented on  
7 it specifically. Is that correct?

8 DR. APOSTOLAKIS: Unless we are asked to  
9 review these documents we will not do it, unless  
10 they're part of -- start plans to do less, in some way  
11 the Regulatory Guide, we generally do not review NEI  
12 documents.

13 MR. MERRIFIELD: That's fair. I'm not  
14 telling you one way or the other whether I think you  
15 should, but it's one I will further consider in that  
16 respect.

17 DR. APOSTOLAKIS: If you ask us, that's  
18 another way of doing it.

19 MR. MERRIFIELD: That will be up to the  
20 Commission to do that.

21 Dr. Wallis, I want to first start out by  
22 thanking you for the presentation you did today in  
23 which you correlated the impact that our codes have on  
24 the NRC performance goals. I thought that was a very  
25 good way of doing it. We had some discussion

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1 yesterday about the Research Office and some of the  
2 efforts we're doing there. I think there's a great  
3 corollary that I think our Research Office can learn  
4 from that type of approach because I think it closely  
5 aligns what we're looking at with where it meets with  
6 our goals.

7           You had, in Slide 28, a discussion of some  
8 of the activities associated with thermal-hydraulic  
9 codes and I guess my question for you is given your  
10 experience, where do you think we are most vulnerable  
11 in the area of thermal-hydraulic codes and what should  
12 we be doing that we're not at this point?

13           DR. WALLIS: I have an answer. I'm  
14 thinking about -- I think that what you're doing is  
15 the correct thing, so looking ahead to some  
16 vulnerability is something we haven't really done. I  
17 think we've focused on the vulnerabilities we see now  
18 and we have been, I think, quite severe in holding  
19 some people's feet to the fire on those  
20 vulnerabilities. If this is something new, I can't be  
21 sure.

22           MR. MERRIFIELD: Let me mention, too,  
23 we've got two issues that are either currently or  
24 perhaps before us. One is a significant increase in  
25 the size of power upgrades being sought by some of our

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1 licensees. We also, as we mentioned before, we have  
2 the potential for some new plant orders, some of which  
3 would be utilizing more innovative designs.

4           Given those actual and potential examples,  
5 looking forward to those, are there some areas you  
6 think we may need to think now about bolstering up our  
7 efforts of thermal-hydraulic --

8           DR. WALLIS: We have already said about  
9 power upgrades that up to now it seemed to be fairly  
10 easy, but there must be some limit somewhere and since  
11 we haven't yet seen the codes or any other prediction  
12 of where those limits would be, we are really curious  
13 about where they will be. So in the sense that we  
14 don't know where the limits are to power upgrades, I  
15 don't know if that's a vulnerability. It's something  
16 we're a little insecure about, I'd say because we  
17 haven't really seen the code sort of called to predict  
18 those extremes. We haven't seen that yet, so we don't  
19 know if there's a vulnerability or not. I think we  
20 have a little bit of concern about how far can  
21 upgrades be pushed because we haven't seen the  
22 evidence. It looks too easy so far. We haven't yet  
23 begun to push the boundaries of some envelope.

24           In terms of future designs, again, I think  
25 until we get more into the details of those designs

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1 it's hard to answer your question. What we have seen  
2 is AP1000. Again, we have not yet seen the comparison  
3 with code, so the hope is that AP600 analysis will  
4 work for 1000, but we have not yet seen the evidence.  
5 So we're not sure. I don't know that we're concerned  
6 about vulnerabilities. We just don't know yet.

7 MR. MERRIFIELD: That's fair. The  
8 following question I have is for Dr. Powers, although  
9 Dr. Shack may want to jump in on this one. We have a  
10 lot of work that's being undertaken at Argonne  
11 National Labs relative to detection technology for  
12 cracks.

13 It was my thought that we've been focusing  
14 primarily on one of the significant issues we've been  
15 looking at is issue of human error in terms of crack  
16 detection and analysis of test data.

17 Is it really a function of focusing on  
18 crack detection or crack sizing and are we focusing on  
19 the right areas, not to put you on the spot, but are  
20 we working on the right things at Argonne now or  
21 should we think, given some of the more recent  
22 evidence that we should be evolving in that regard?

23 DR. POWERS: We had an opportunity to  
24 examine some of the work that's going on at Argonne.  
25 It's a very exciting kind of facility they're setting

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1 up to MOX steam generator where they can have cracks  
2 that are either laboratory made or actually generated  
3 and people can use a variety of techniques,  
4 characterize those cracks that are subsequently  
5 characterized in a metallurgical sense and you run a  
6 comparison and get a lot of information about the  
7 technologies.

8 I think it's very worthwhile to do that  
9 work. I will comment that within the field  
10 operations, the people doing the inspections, we have  
11 a little different problem there and a little  
12 different problem is human error, as you point out,  
13 arises that the technology -- you can imagine  
14 technology is getting too complex to be used in the  
15 name of getting higher and higher accuracies. The  
16 licensee himself has a problem of he'd like to check  
17 things quickly. He's certainly finding himself with  
18 a criteria for fixing or leaving in place flaws within  
19 the confines that team support plays, but elsewhere in  
20 the facility, he's on a plug on -- essentially  
21 plugging the tubes on detection of any flaw and  
22 clearly that's ripe for some sort of change in process  
23 there, if we can get a handle on what kinds of flaws  
24 it's okay to leave in place. The problem is the  
25 phenomenon is highly non-linear and it's non-linear in

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1 the sense that stress corrosion cracks grow very  
2 slowly, initially, and to a lateral link and then they  
3 grow very quickly and so you get this peculiar  
4 phenomena of not seeing anything in one detection and  
5 the next cycle that you suddenly have a crack.

6 I think our assessment of the work that's  
7 going on was at Argonne was all appropriate for -- we  
8 found all the work at Argonne was necessary and indeed  
9 all the work that was going on in steam generators was  
10 quite appropriate at the Office of Research. We did  
11 suggest some other areas that they expand into and  
12 apparently an action plan is being prepared in that  
13 regard.

14 Bill, did you want to say anything?

15 DR. SHACK: In my own vested interest, I  
16 do think that detection is the critical issue, that  
17 you know, I'm not so much worried about the flaw  
18 that's inside the tube support plate that I know  
19 about. I'm worried about the flaw in the U-bend that  
20 I missed in the inspection and so to my mind,  
21 improvement in detection is the critical issue. If  
22 you're going to avoid tube ruptures as Dr. Powers --  
23 I don't think we can ever completely avoid them. The  
24 statistics are just against you, you know. And what  
25 we're finding in our Argonne research is that at least

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1 in the best circumstances, people do a very good job  
2 of detecting significant cracks. We probably can't --  
3 that's the one thing we can't model very well in our  
4 mock up is the human area, the pressure to do the job,  
5 you know, it's a different sort of situation. So I  
6 think there's an important need to assess the  
7 capability to reduce the possibility for human error.  
8 Industry is going that way. We've already had some  
9 advance techniques where Z-tech and MHI have come to  
10 Argonne with the ray probes and different software  
11 that will help increase that and so I think that I  
12 still think that is the first line of defense in steam  
13 generators is first you detect the cracks. Then we  
14 can argue about what to do with them. But until we've  
15 detected them, we have no discussion.

16 DR. POWERS: But I think you cannot take  
17 simply vast improvements in our technology and  
18 detection and not have this debate about what to do.  
19 We'll pull every steam generator tube we have out.

20 You can't divorce the two. It can't be so  
21 antiseptic. And I think that's the next challenge is  
22 to approach the -- a better characterization of the  
23 tubes, of flaws in tube is going to be coupled with  
24 now what do you do with it.

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1 DR. SHACK: Well, if I wave the flag, we  
2 have some done work at Argonne and better  
3 characterization of the flaws.

4 MR. MERRIFIELD: That will be our final  
5 comment then. I just want to say for my final  
6 comments, I do want to say that ACRS is clearly a  
7 learned and learning organization. I think that in  
8 the time that I've been here, going on three years,  
9 this is the most succinct and useful of the briefings  
10 that we've gotten from all of you and I think it is  
11 very good. So thank you.

12 CHAIRMAN MESERVE: Well, I'd like to just  
13 repeat what Commissioner has said, that this was a  
14 very helpful presentation and I also want to express  
15 our appreciation to all of you. I know that this is  
16 a great burden that we place on you and we get great  
17 benefit from it and I want to express, on behalf of  
18 the Commission, express our appreciation to you for  
19 your hard work.

20 With that, we're adjourned.

21 (Whereupon, at 12:38 p.m., the meeting was  
22 concluded.)

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