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NUCLEAR REGULATORY COMMISSION

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498TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FRIDAY,

DECEMBER 6, 2002

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ROCKVILLE, MARYLAND

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The Advisory Committee resumed at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Dr. George Apostolakis, Chairman, presiding.

COMMITTEE MEMBERS:

GEORGE E. APOSTOLAKIS, Chairman

MARIO V. BONACA, Vice Chairman

F. PETER FORD, Member

THOMAS S. KRESS, Member

GRAHAM M. LEITCH, Member

DANA A. POWERS, Member

VICTOR H. RANSOM, Member

STEPHEN L. ROSEN, Member

COMMITTEE MEMBERS: (cont.)

WILLIAM J. SHACK, Member

JOHN D. SIEBER, Member

GRAHAM B. WALLIS, Member

ACRS STAFF PRESENT:

JOHN T. LARKINS, Executive Director

SHER BAHADUR, Associate Director

SAM DURAISWAMY, Technical Assistant

PAUL A. BOEHNERT, Staff Engineer

HOWARD J. LARSON, Special Assistant

ALSO PRESENT:

ROBERT J. BUDNITZ, Lawrence Livermore

FAROUK ELTAWILA, NRC

TOM KING, NRC

TAD MARSH, NRC

MOHAMMED SHUAIBI, NRC

I-N-D-E-X

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

8:32 a.m.

CHAIRMAN APOSTOLAKIS: The meeting will now come to order. This is the second day of the 498th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following: Proposed ACRS plan for reviewing safeguards and security activities, future ACRS activities, report of the Planning and Procedures Subcommittee, reconciliation of ACRS comments and recommendations, proposed options for evolving policy issues for future non-light water reactors --

MEMBER POWERS: Does that mean we're going to turn them around?

CHAIRMAN APOSTOLAKIS: I don't understand -- revolving policy is actually more accurate, is it not? Draft final ANS external events methodology standard, election of ACRS officers and proposed ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. Sam Duraiswamy is the Designated Federal Official for the initial portion of this meeting. We have received no written comments or requests for time to make oral statements from members

of the public regarding today's sessions. A transcript of a portion of the meeting is being kept, and it is requested that the speakers use one of the microphones, identify themselves and speak with sufficient clarify and volume so that they can be readily heard. And I'm pleased to say this is the last time I read this. Please wipe the tears away.

(Laughter.)

But there is one thing I want to say since we are talking about it. First of all, I appreciate the honor that the members made me by electing me twice as Chairman, but I would like to point out to say something that you already know. We have an excellent staff here. I don't think that a part-timer like me or anyone else could run a Committee like this without the help of a superb staff that we have working for Dr. Larkins, who's not paying attention right now.

MEMBER POWERS: Because he knows all this stuff.

CHAIRMAN APOSTOLAKIS: So I really think we should recognize this in public, on the record, because we tend to take it for granted sometimes that the help we get is the natural thing to do, and it is not. Everybody's really very dedicated and they're

doing an excellent job supporting the Committee.

(Applause.)

Okay. Now, we have to make a few changes in the agenda because of the weather yesterday and so on. So we'll start with me briefing you regarding the security and safeguards reviews that we will do. Then we'll go on to the election and reconciliation of comments and let's try to finish these things by nine o'clock, is that all right?

MR. BOEHNERT: At nine o'clock, you're going to have the briefing on the review standard.

CHAIRMAN APOSTOLAKIS: Nine a.m., right?

MR. BOEHNERT: Yes, sir, 9 a.m.

CHAIRMAN APOSTOLAKIS: Okay. Let me start with the security and safeguards.

(Whereupon, the foregoing matter went off the record at 8:36 a.m. and went back on the record at 9:09 a.m.)

CHAIRMAN APOSTOLAKIS: We're back in session. The next item is left over from yesterday: Status of the Development of the Review Standard for Power Uprates. The cognizant member is Professor Wallis.

MEMBER WALLIS: Let's move right along. We have reviewed a handful of power uprates and we

suggested to the Staff and they came up in a meeting with a Commission, and there should actually be a review plan or review standard for these power uprates. The Staff has been working on it, and Mohammed is going to tell us the results that he's produced.

MR. MARSH: Good morning. I have a few opening comments this morning too. My name is Tad Marsh, and I'm the Deputy Director of the Division of Licensing Project Management in the Office of NRR. And good morning and congratulations to our new Chairman and our new member-at-large. I enjoyed the parliamentary procedures -- and the Vice Chairman, I beg your pardon.

Before we get to discussions of the review standard for the extended power uprates, I'd like to remind the Committee of some of the reasons that led to this initiative. First, we are experiencing, as many organizations are, a loss of institutional knowledge due to retirements and transfers of senior staff, and we believe that the review standard will provide a mechanism for retaining some of this loss of knowledge. Essentially, it will become a legacy file.

Second, as a result of this attrition and this loss of institutional knowledge, we are expecting

a large number of new Staff hires over the next few years; in fact, we have some very large intern classes that are coming in. We believe that the review standards will provide the necessary guidance for use by these new hires in carrying out the Agency's mission.

Third, much of the current Staff review criteria is organizationally out of date and review standards will provide a mechanism for updating this information. Fourth, we believe that the review standards will provide sustainable legacy of review criteria, methods and procedures for the Staff. Fifth, we believe that the concept of review standard will make our activities consistent with the vision of having a centralized and fully operational work planning center for the purpose of scheduling and monitoring NRR work.

And it's in that context that the review standard that you're going to hear a lot about will add efficiency and effectiveness, we believe, to the review. In the course of going through and constructing this review standard, which Mohammed will describe, you'll see that we've looked very carefully at the underlying standard review plans, generic letter, information notices and asked ourselves what

needs to be reviewed for the purpose of extended power uprates. We believe that this effort will add an efficiency and effectiveness in our reviews.

Now, the initial focus of this activity has been placed on extended power uprates and on early site permits. Our work in these areas will be a pilot for many of the Staff in determining the proper approach to be applied in developing review standards for other areas. So this then, the EPU review standard and also the early site permits, is the first effort, the first chance we've had to really put this concept in place, and I hope you get a feeling for what it is and how it will guide us.

I also hope you've had a chance to get a presentation on centralized work planning and how that organization is working, how they will use review standards and what this concept will embody.

Let me now turn to power uprates and the timing for this review standard. As you may already know, we conduct semi-annual surveys of licensees to obtain information related to expected power uprates. The results of the last survey, which was conducted in July of this year, indicate that applications of 20 extended power uprates should be expected over the next five years. Discussions with vendors indicate

that the number may even be larger. In light of this information, we believe that the development of the review standard is timely to help with the review of these applications.

We last briefed the Committee on the status of the review standard in July this year, and during that briefing we provided our schedule for issuing the draft review standard for public comment by the end of this year. My staff has also briefed Dr. Kress, Dr. Bonaca and Dr. Larkins and Mr. Boehnert in October about the status of the review standard. I'm pleased to say that we have made significant progress since then and expect to meet our goal for issuing the draft review standard by the end of this month. Although the review standard is essentially complete, however, it is going through official concurrence process, and NRR Management has not yet had a chance to review it. The leadership team, which is made up of the division directors in NRR, is scheduled to be briefed on this review standard this Tuesday, December 10.

Based on the feedback we received in July from you, we are proceeding with our plan to issue the review standard, and we do plan on coming back to brief you following the public comment period. We are

not seeking a letter from the Committee today but would welcome, of course, any comments or suggestions you may have that you'd like to share with us. As you'll see from the presentation, we have incorporated comments that we have received from you and welcome any further comments you may have.

With that, I'd like to turn to Mohammed who will lead us through the presentation.

MEMBER LEITCH: Just one question before you get started.

MR. MARSH: Sure.

MEMBER LEITCH: The audience for the review standard is primarily internal, that is for the reviewers.

MR. MARSH: Yes.

MEMBER LEITCH: Is it the intention also to share this document with the licensees?

MR. MARSH: Absolutely. Absolutely. That's public comment period. We've also met with the industry and got comments from them. But you're right, this is primarily a Staff review guidance, but it bears a lot, of course, on what licensees submit and give to us because it will guide them in scope and content. So they're anxious about this review standard; it should help.

MEMBER LEITCH: Okay. Thanks.

MR. MARSH: Thank you. Mohammed?

MR. SHUAIBI: Thanks, Tad. Again, my name is Mohammed Shuaibi. I'm the Lead Project Manager for Power Uprates at NRR. I apologize about the slides saying December 5. We were scheduled to come here yesterday, and unfortunately we couldn't make it.

I had a presentation ready to go over some of the background and other material leading up to this effort; however, we discussed this quite a bit last time, and what I propose to do today is to skip through some of these slides to save some time and get right to the review standard itself if that's okay with the Committee. Okay.

Turning your attention to Slide Number 8, we discussed this at great length during the July 11 meeting, and the reason I wanted to bring this back up again is to inform you of two changes. Two changes to this diagram. If you notice up at the upper right and upper left corners, we've added two boxes, one for inspection guidance and one for a review of past RAIs. The inspection guidance is there to indicate that this review standard will provide references in material for -- to provide inspection guidance or for people to inspection guidance that exists. The review of past

RAIs, we've conducted a review of past RAIs, and we wanted to make sure that the review standard adequately addresses the areas that we've been asking questions on in the past. And that's about the extent that I want to discuss this diagram; we discussed it at great lengths last time. So unless there are any other questions on this diagram, I'd like to get into the review standard itself.

The review standard is going to be made up of four sections. The first section is going to cover procedural guidance for the Staff. The second section is going to cover technical review guidance or technical review criteria to be used during the reviews. The third section will cover the documentation of power uprate review. And the last section will be the inspection guidance.

What I'd like to do is hand out some of that material that's going to be in the review standard. As Tad indicated, this is still being reviewed by Management, but I'd like to share it with you just to give you a feel for what it's going to look like.

MEMBER LEITCH: A couple questions that we wrestle with concerning the license renewal process. One of those questions is the influence, if any, that

the current standing a licensee has in the reactor oversight process. Is that at all a factor in power uprates? In other words, part of the standard, does it involve looking at the current ROP status of that particular licensee? Does that have any influence on the process?

MR. SHUAIBI: At this point, no, we don't have anything in here that goes back to the ROP to do that.

MEMBER LEITCH: The same question, I guess, relates to material condition of the plant. This inspection guidance, I guess, is primarily paperwork guidance. Is there any intention of going out and looking at the plant to see whether the -- in other words, does the material condition have any bearing on the power uprate?

MR. SHUAIBI: I guess I'm not sure I understand the question.

MR. MARSH: I think what you're asking, if I could rephrase it, is if there were material issues --

MEMBER LEITCH: Exactly.

MR. MARSH: -- material condition issues which would bear on the application information. In other words, a licensee asserts that the flow induced

material degradation is such that it's covered by existing programs or existing systems, and would we ask ourselves if that is a statement that bears out by the material condition in the plant, in other words.

MEMBER LEITCH: Say you found very poor housekeeping practices, for example, and the plant was just plain not in good material condition, would that in any way influence the extended power uprate decision?

MR. MARSH: I doubt that aspect, but if there were corrective action program issues, such that there are material condition or design issues, then that would be part of the synthesis, I would think, of the review. I mean perhaps that's in the inspection area that we would feed that back into the review process. Mohammed, am I off on that?

MR. SHUAIBI: No. Actually, what we've done here, and I'll go through some of this a little bit later, in the documentation area -- I'm not sure how much this is going to answer your question, let me know if I need to go back -- in the documentation area, we do have places that direct the reviewers of the power uprate to highlight areas that they feel are important for the inspectors to consider when they choose what they look at. So that if they have an

area -- materials, degradation issue, flow-assisted corrosion issue, system pump valve, whatever -- that doesn't have a lot of margin and they want to point that out to the resident so that they could consider it as part of their inspections, we will have a place in the safety evaluation that directs the inspectors or that provides that guidance to the inspectors.

MEMBER ROSEN: I'm convinced that you'll look at the margins properly, but I think the thrust of Graham's question about the condition of the plant, let me give you another thing to think about. He asked about housekeeping. Let me ask about, let's say, main steam line vibration and the guy wants an -- the plant wants an uprate.

It seems to me it bears quite a lot on whether or not you'd be comfortable in uprate if you went out and found that the main steam lines from the stops inboard -- the turbine stop valves inboard to the main steam isolation valves was vibrating rather significantly compared to what you experience elsewhere. And one could say that that's clearly -- the forcing function is flow, and we're going to increase it.

Maybe you went out and stood by the turbine on the turbine deck and felt the whole turbine

moving a little -- the whole deck moving a little bit. And, clearly, that's kind of driven by the generator being a little bit off magnetic center or something like that. You would have concerns about making it worse. It seems to me that the thrust of Graham's question is one that really I think came up during license renewal --

MEMBER LEITCH: Exactly.

MEMBER ROSEN: -- and by analogy power uprate. In license renewal, we asked would you extend this plant's license if you went out and found them in the red ROP area and the plant heavily degraded material-wise? I think you'd be derelict if you just went straight ahead with license renewal under those circumstances. And so I think the same thing applies here, maybe in a little bit different way but I think you really can't and shouldn't blind yourselves to just this process, we're just looking at this process, without thinking about the whole thing.

MR. MARSH: Synthesizing plant conditions or things of that sort. I think that's a fair comment.

VICE-CHAIRMAN BONACA: Well, I guess I don't want to leave without this comment, if you go back to your Page Number 4. It was an issue we

discussed before; in fact, you listed material degradation now as a consideration. But one of the concerns we have then, just looking back at how you came to that, was this is not a new plant, this is not a new plant. So when some of the applications for power uprate do not address the fact that they're not new plants. I mean you have an evaluation of design capability toward components, which you do, and it seems to me that you have to account for aging of those components in the sense that if their capability is degraded, right, they would have an impact on your determination of how much margin you have left in a component.

MR. SHUAIBI: The impact of aging and the impact of a power uprate on the plant that is being considered. Material degradation here it's the impact of the higher fluence on the vessel, the impact of the increased flow rates on the flow-assisted corrosion, that type of material degradation issue. That will be considered as part of this power uprate.

VICE-CHAIRMAN BONACA: Lock-up blowdown --

MR. SHUAIBI: That's correct.

VICE-CHAIRMAN BONACA: -- forces and components and --

MR. SHUAIBI: That's correct. That will

all be considered as part of the review of the power uprate.

MR. MARSH: To the extent that issues have been communicated to the industry via generic communications, those are rolled into this review standard. So it doesn't quite answer the question because you're in a plant-specific aspect as opposed to a generic aspect, but many of these issues come up generically. Those are part of the review the Staff would go into. But in terms of the plant condition as it deviates or as it's unique and it differs from the generic part, that's worth thinking about, so let us do that.

MEMBER ROSEN: Well, yes. I think just for your own sanity. I mean you can be assured that certain members of this Committee will ask you how the plant's doing when you come in for EPU.

MR. MARSH: And have asked us, sure.

MEMBER ROSEN: Well, you want to be able to say something more than, "Well, we don't look at that in this process."

MR. MARSH: Right.

VICE-CHAIRMAN BONACA: Specifically, on some of the BWR uprates, I mean we ask questions about you have a lot of blowdown and then now you're

evaluating the capability of a component versus the stress imposed by the blowdown on the component. And there was always an assumption that the component was as new. I mean you only evaluate increasing the blowdown forces on a component and you look at the margin you have there. The question at the time is the component still as capable as when it was designed and implemented? Maybe 40 years after implementation it's not as capable as it used to be, so you should look at what margin you have. And that involves two factors: One is the component itself and the capability, the other one is the increasing blowdown forces on the component. Just an example of what you have to look at.

MEMBER SIEBER: I think you would hard pressed to use an application for a change in the license to cause a licensee to correct some housekeeping condition. For example, the inspection and enforcement process is supposed to take care of that, and if you have bad housekeeping that's a fire protection issue perhaps or an internal flooding issue, blocked drains or a sump blockage issue if it's inside containment and so forth, that's the place where those things should be take care of.

MR. MARSH: To that extent, that's right.

MEMBER SIEBER: And you cannot withhold approval of an application for a change in the license for an issue that's not relevant to the matters at hand in that license amendment.

MR. MARSH: Nor should you exclude issues that are relevant to the review at hand.

MEMBER SIEBER: For example, in the case of the vibrating steam line during extended power uprate, I think that if there is a real concern, you know, an inspector probably would not have the tools or equipment to measure the extent of the vibration, but they can certainly issue an RAI that asks the licensee to look at the extent of the vibration and as to whether that's satisfactory and where they figure it will go under EPU conditions. I mean that's probably a fair question to ask.

MR. MARSH: But I think that would be the intent if the Staff were aware of there being an issue or if it's part of their review guidance in the first place.

MEMBER SIEBER: That's right.

MR. MARSH: But the thrust of the question is are there plant-specific conditions that are there of which the Staff may be unaware at the outset of the review that would then drive a question or would drive

an extra effort to look at? And that's the part that we'll think about. If there are many -- the guidance that we've got has been thought through a lot to the extent that it's synthesized generic communication, synthesized reg guides or issues that have come up, reactor vessel internal vibration issues, things of that sort, which are generic, okay, and which we're now aware of. But it doesn't probe corrective action issues, it doesn't probe inspection findings, it doesn't look for that link, as many amendments don't do. You know, licensing space is -- the link between licensing space and inspection enforcement space is not a very tight link. They're basically separate aspects.

MEMBER LEITCH: Perhaps a better --

MEMBER SIEBER: What I'm saying is that I would have a hard time putting something in an ACRS letter or voting for a letter if it held the licensee hostage on some kind of an amendment for some issue that didn't directly bear on that amendment. There's go to be --

MR. MARSH: Right. Oh, right.

MEMBER LEITCH: An example of where that linkage may exist, for example, is suppose a licensee had a couple of yellow findings in emergency planning.

Would it then be appropriate to issue a license for power uprate where you were increasing the inventory of radioactive products?

MEMBER SIEBER: Yes.

MR. MARSH: Good question. I don't have an answer.

MEMBER LEITCH: Just something to think about.

MR. MARSH: And we will.

MEMBER LEITCH: That's an area where there might be linkage, I guess, is all I'm saying.

MEMBER SIEBER: Well, and on the other hand, the action matrix is supposed to take care of the yellow findings, and you have to -- that's an example of holding the licensee hostage, in my view.

MR. MARSH: Okay.

MEMBER ROSEN: Well, it seems to me that you did not disagree, Jack -- I'm trying to get the sense of your disagreement -- you did not disagree with the example raised of a steam line that was vibrating and judged to be okay at the current power level, but that the question is raised --

MEMBER SIEBER: But there's no -- additional analysis maybe be required or a test program toassure its adequacy under uprate conditions.

MEMBER ROSEN: Clearly, your higher power level you're going to have more forcing function for the vibration. And they might say -- they could come back and say --

MEMBER SIEBER: I think that's pertinent.

MEMBER ROSEN: Yes, and I think so. But the answer could easily go the other way. They could easily say at higher velocities, we'll come out of the resonance we're in and it will be better.

MEMBER SIEBER: So that's the way it goes.

MR. MARSH: Let me add a little --

DR. RANSOM: Am I missing something? I would think this whole process would start very early on with an engineering inspection that specifically looks for is this plant suitable for uprating?

MR. MARSH: No, that's not.

DR. RANSOM: Why wouldn't you do that?

MR. MARSH: No. We don't have that type of program. This program is driven by the licensee's amendment request with suitable documentation meeting the Staff's regulations, and the burden is on the licensee to give you the information that would allow us to make a finding of meiculation, not being driven by an inspection.

DR. RANSOM: I think a lot of these points

that are being brought up would be brought out.

MR. MARSH: I understand, I understand that, but just --

DR. RANSOM: And I would think that would go on quite early in the process.

MR. MARSH: It's not. At this stage, it's not part of the process. What we're asking is the linking between the review of an amendment to inspection findings or plant conditions as they exist at the plant, not having been disclosed by a systematic inspection, which is what you're describing.

DR. RANSOM: Well, the problem I have with that is you'd be -- the previous inspections would be from the standpoint is it --

MR. MARSH: Material condition.

DR. RANSOM: -- does it call for continued operation under its licensing basis?

MR. MARSH: Right.

DR. RANSOM: I would think that you'd want a specific inspection which you began to look is this really -- is it suitable for uprating?

MR. MARSH: Well, there's post-review, post-approval inspection efforts, okay, but not pre, okay?

DR. RANSOM: It seems like that's backwards.

MR. MARSH: Well, you're asking the licensee to assert on the docket that they meet the regulations. It's up to them to make that assertion and to prove it to you. So the burden's on them to do that, and now the Agency is in the position of once we review that, by questioning, by meeting the regulations, then after the fact, we'll go and find out whether that in fact is true, as opposed to interrupting the review to find out whether the assertions they've made are incorrect and the level of knowledge the Staff may have.

DR. RANSOM: I'd be surprised that the applicant wouldn't prefer to actually have you come in at the initiation of the process and if you have any real concerns, identify them so that they don't waste their time.

MR. MARSH: It's done through questioning as opposed to through inspection.

MEMBER SHACK: I mean he has to demonstrate that his plant --

MR. MARSH: Absolutely.

MEMBER SHACK: -- can take the uprate.

MR. MARSH: Right.

MEMBER SHACK: That's the whole point of his application.

MEMBER WALLIS: Well, I think we've made the point now. I think the Staff knows what the point is, and they will take it under consideration.

MR. MARSH: Yes. I think it's worth thinking about, the connection between --

MEMBER SIEBER: it's a tutorial for us.

MEMBER WALLIS: But I'd like to move on, because we've spent too long on this. I think we've made the point.

MR. MARSH: Thank you. Okay. Mohammed.

MR. SHUAIBI: For our procedural guidance, we decided to go with a graphical representation of the process. We believe a flow chart is easier to follow and more useful for the users. The flow chart that was distributed shows the process for the power uprate. It shows the -- the green path is the technical review path. It shows the different steps in the technical review path. You've got a path for the environmental assessment, a path for the proprietary review and a box there for the noticing of the amendment in the Federal Register. You'll notice that under each one of those boxes we include a reference to an office instruction or a guidance

document that gives the reviewer or the project manager a reference to the guidance that they would use in completing that step. So this goes back to the idea of the review standard being a road map document.

MEMBER WALLIS: I think in terms of procedures it's easy to make a road map. When we get to the next slide, technical review, it's not quite so clear because it depends a lot of the experience of the reviewer to raise the right technical questions.

MR. SHUAIBI: Let me go to that slide next. We're going back to Slide Number 4, it's not allowing me to get this purple slide off the screen. But I think going to the next slide in your handout, the technical review guidance is provided in matrices, not a flow chart, so let me distribute that now.

MEMBER WALLIS: Is there anyone who's an expert on this computer who can release you from your predicament?

MR. SHUAIBI: I can reboot it. It will allow me to do that, not reboot the computer but take this off and bring it back.

MEMBER WALLIS: Is this an approved computer for this use?

(Laughter.)

MR. SHUAIBI: It's an NRC computer.

CHAIRMAN APOSTOLAKIS: What's wrong with the computer? How come this is not fancy?

MEMBER WALLIS: It's Bill Gates trying to help you is the problem. You've got to go right back to the beginning and start again every time you get out of order or something?

MR. SHUAIBI: I had to pick up the slide itself.

MEMBER WALLIS: You want to go to 11. Oh, your numbers are different from my numbers, that's another problem.

MR. SHUAIBI: Well, I had to generate slides for handouts that are different than the presentation. The computer automatically takes figures off the page, that's why the numbers are different.

MEMBER WALLIS: It's helping you again. Just go on, we need to move on.

MR. SHUAIBI: For technical review guidance, we've developed matrices that cover the areas that need to be reviewed for a power uprate. It identifies the responsible NRR review branch, the guidance to be used when performing the review, and every matrix has an Attachment 1 with it that would identify either guidance or areas where the Staff

would do independent calculations. Independent calculations is something that's come up here with the ACRS.

We've also added a glass column to the matrix. This was based on the feedback we got in the last meeting with a couple of the members about having an acceptance review, a formal acceptance review done of the application. So we have that last column that would -- and guidance to go with it that would tell the reviewers, "Look at these areas and the matrix, let us know if there's enough information to proceed with this review."

MEMBER WALLIS: I think we're going to be interested in what you've actually written for this guidance for independent analysis when you get a final version of this thing.

MR. SHUAIBI: Okay. Every group -- in developing these matrices and the independent calculations guidance, we went back to the groups and asked them, of course, to put that together. Every group decided the best approach for their portions of the review. Some groups already know which areas they want to do independent calculations for, other groups have criteria that they will use in determining when to do independent calculations. So the different

matrices will have a different way of doing this. The last page --

MEMBER LEITCH: I'm a little concerned that we may get a little mixed up between a license renewal application and extended power uprate running through our review processes simultaneously. Could that happen or do you have to do one and then the other? I guess my concern is if there is an extended power uprate -- let's think the other way. Say there's a license renewal application coming along and in that license renewal application, nil ductility transition temperature is very close to the margin at 60 years but just barely within the margin, and we approve that extended power uprate. Then there's a -- I mean we approve the license renewal, I should say. And then the extended power uprate is coming through the pipeline for that plant shortly afterwards. Would you be aware of the license renewal and review it on the basis of 60 years?

MR. SHUAIBI: I think the example that you gave, I think we would be looking at it for power uprates. If the plant was going to be going for 60 years, or I guess whatever the plant is licensed for, we would be looking at that in terms of what the tech specs have for PTU limits and what the PTS criteria

are and whether they meet that or not. If the plant decides to go higher than the power level that they're licensed to, they would have to come back in and justify those again. It would be a tech spec change or it would be demonstrating again that they still meet those.

For power uprates, we would do it based on the license power level. In license renewal, if a plant wants to come in and extend their license, we would do the review there for license renewal or the Staff would do the review for license renewal. I think it would be captured, I don't think it would be missed. Are we aware that we have both of these applications at the same time? Of course we're aware because we have project managers on the plants that keep track of what licensing actions are in-house.

MEMBER LEITCH: Yes. It seems to me the only potential would be if they were coming through at the same time and you're reviewing on the basis of 40 years and yet we were taking action on the basis of 60 years, so there could be some confusion there.

MR. MARSH: These are very, very big applications. Each one of them are major applications, so they require major resources by the Agency, and it would be closely coordinated. Brown's

Ferry is being faced with this very same issue. They've got a license renewal and power uprate. They both are occurring at about the same time. And so we're aware and in communication with the organizations and keeping apprised of that.

MEMBER SIEBER: It would seem to me, though, that in the event of either a license renewal or a power uprate that the PTS rule would not directly bear on that, because the licensee is required to report whether the PTS rule is adequately implemented at their plant. And whether they upgrade or not or if they extend the license or not, they're required to take remedial action or shut down if they fall outside the additional analysis that would occur beyond the screening criteria.

So it would seem to me that it's possible, even though you may ask for a lot of RAIs, it is possible that you could renew a license or grant an upgrade even if the current data on PTS would show that you would exceed the screening criteria prior to the end of the license term or whether you had an upgrade or not. That would be my impression of how this works, and to try to mingle all of these effects together when each one is covered by a separate rule, I think probably is not appropriate. Maybe you can

comment on that, because I think that will help us all get straight on how you play the game, so to speak.

MR. SHUAIBI: Well, I think that's exactly true because the PTU limits, the PTS criteria I think those are time-dependent things.

MEMBER SIEBER: That's right.

MR. SHUAIBI: It's not that we'll have licensed a plant at 20 percent more power and now the plant could operate indefinitely and we won't go back and look at PTS or PTU limits or transition nil ductility temperatures. We would go back and look at that, because they have in their tech spec PTU limits that are only good for so long.

MEMBER SIEBER: That's right.

MR. SHUAIBI: That are good for what they've demonstrated to be adequate. Those temperatures, I believe, in the limiting material are identified in the tech specs, so I don't see how a plant could do that.

MEMBER SIEBER: Yes. The chart is in there. The chart's in there.

MR. SHUAIBI: Right.

MEMBER LEITCH: I can just foresee a situation occurring downstream where a plant has to make a decision whether they run at a higher power

level or run for longer time.

MEMBER WALLIS: Well, that's up to them.

MR. MARSH: And they would have to justify and meet the regulations and their tech specs that are in place at the time. And whatever choice they make they have to justify it, it has to be approved, then the burden's on us to make sure that their submittals and their tech specs are being met for whatever the licensing bases is at the time. So there are -- these are major overlapping and there are technically overlapping issues involved in license renewal and in power uprates and other technical issues as well. We try to keep -- project managers try to keep aware of these things by looking carefully at the tech specs and by the submittals.

The extent that licensees meet commitments is an issue as well. This came out as part of the Lessons Learned Task Force in Davis-Besse, and it's something that we're looking at as well. So they may make commitments on the docket to support a license renewal or a power uprate submittal which doesn't rise to the level of being a tech spec. And then to the extent that that commitment has been met is something that we're looking at in terms of that effort.

VICE-CHAIRMAN BONACA: I have a question

on -- these are technical areas of review.

MR. SHUAIBI: That's right.

VICE-CHAIRMAN BONACA: Do you require the licensee to provide you with operating experience, a description of what happened to that plant in the past 20 years? For example, I'm focusing on BWR and they may have had a cracked shroud that now is repaired in some way. There are some plants out there with those kind of repairs. They're not equivalent to the exact new component that was originally installed. Spargers that have been cracked and bolted. I mean there are many plants out there which have been repaired that way. Are you asking for the information so that when the person performs the mechanical evaluation he understands --

MR. SHUAIBI: Well, the licensee is required by rule to submit full and accurate information describing the areas that are affected by this uprate. That's a 50.9 issue.

VICE-CHAIRMAN BONACA: Well, this is not only the uprate. I'm talking about the operating experiences as far as component performance so that there is an understanding on the part of the reviewer. My concern here is that you have a technical person going through the pressure-temperature limit. He's

checking to see from these guidances here whether or not it's met, and he just moves on. This plant, again, is not a new plant, and there is a history of that, and I've seen personally plants which have those kinds of repairs that did not restore the original capability in the components.

MR. SHUAIBI: I understand your question, but I think when we go back to these uprates that -- these extended power uprates are 4,000-hour reviews in NRR. And while there are a lot of technical people involved, there are also project people involved, project managers that are assigned to that plant. Those project managers are usually on phone calls with the region on a daily basis getting status of what the plant has gone through overnight, what the plant is going through, what sort of inspection activities the plant has had, what the results of those inspection activities are.

It's the responsibility of the project manager to keep track of the status of the plant and the shape of the plant and the material condition of the plant and that sort of information. The project manager gets all these inputs and he coordinates all these -- he coordinates all these reviews and in the end gets the inputs and generates the safety

evaluation that you see in the safety evaluation that goes out. So it's not just a technical reviewer sitting in a cube doing a review, there is also the project manager that coordinates these things, that is aware of all these things.

VICE-CHAIRMAN BONACA: But you know very well that your guidance will be read by the licensees and if you have a section that says request the licensee to describe the physical conditions, the operating history, et cetera, et cetera, they will be paying attention and provide you that information if you don't.

MR. MARSH: Sounds kind of like the first question we were going to think more about, right, which is the plant conditions, site-specific issues.

VICE-CHAIRMAN BONACA: They are two different -- I mean one thing is housekeeping, one thing is --

MR. MARSH: Yes. We were construing the first question as only housekeeping. We were construing the first issue as plant-specific issues which may not be part of something generic which is identified in the guidance. But Mohammed did say something that's real important: It's up to the licensee to meet the regulations. They must meet the

regulations. To the extent of the information they give you to prove that to you, the extent of the review that you do to assure yourself that they do meet the regulations is the review process, but they must meet the regulatory criteria, they must. And if they have an issue, a vibration issue, a repair issue, a degradation issue, it's incumbent on them by regulation to bring the plant into compliance with the regulations. It's not up to the Agency to make them do that unless something is broken, some process is fallen down.

MEMBER WALLIS: Can we move on? I want to see if you can manipulate this computer.

MEMBER ROSEN: I don't want to move on out of technical review and get into documentation --

MEMBER WALLIS: Maybe technical is the most interesting part of this.

MEMBER ROSEN: For me. And I haven't touched on my issue yet, which is what we raised and there were differing -- I understand differing professional reviews on this, transient testing. Where is that covered here?

MR. SHUAIBI: We have a section in the review standard for testing. It covers steady-state power ascension testing and large transient testing,

which was the issue that was raised. We're developing a standard review plan specifically to cover testing.

MEMBER ROSEN: So that will be in this technical review guidance section or a reference to it.

MR. SHUAIBI: A standard review plan will be issued for public comment at the same time as its review standard. The matrix for the testing group will have that standard review plan referenced as their guidance for reviewing all licensee applications related to testing.

MEMBER SIEBER: But that may not solve your problem, Steve.

MEMBER ROSEN: Well, I only want it addressed. I mean I may or may not agree with what the matrix says, but at least it's been addressed.

MR. MARSH: That was part of the DPV resolution was that a standard would be developed in order to decide when there should or should not be large transient or other types of power ascension testing. So that was a charge that we were given, and that is being done or has been done at this stage. It's a specific tab in that three-ring binder that Mohammed has there, which is the draft of the review standard.

MEMBER ROSEN: And that's not something we're looking at today.

MR. MARSH: No.

MEMBER ROSEN: So I'm only asking if it's covered, and your answer is yes.

MR. MARSH: Yes, sir.

MR. SHUAIBI: Yes. The purpose of today's meeting is basically a status update on where we are.

MEMBER WALLIS: And to learn where you're going to get the most questions when you come back.

MR. SHUAIBI: Right.

CHAIRMAN APOSTOLAKIS: We will finish this by ten o'clock, won't we?

MEMBER WALLIS: That is the objective, Mr. Chairman.

MEMBER SIEBER: And that's entirely in their hands.

MEMBER WALLIS: But if the members have some really pressing questions that are important, I think they should be permitted to ask them.

MEMBER FORD: Well, I have a pressing question. This format for materials degradation is very prescriptive and yet materials degradation is a continuous state of flux of knowledge, especially for the internals. Where in this document or this

guideline does it take into account that science is moving forward? We are understanding and coming up with new problems, potential problems. Would a reviewer address the state of knowledge?

MR. SHUAIBI: I guess I'll address that by two comments. First, we expect this to be a living document. We do not expect that once we issue this review standard that it's done. We will continue to update it, we will continue to keep it up-to-date with new information such as the experience we had with Quad Cities and whatever experience we'll have and whatever new information is gained through --

MEMBER FORD: So that somewhere in this decision process it tells the reviewer, "Hey, is there anymore information to come up, scientific or operation information to come up in the last five months?"

MR. SHUAIBI: I addressed what we're going to do with this document. The other comment that I had is we are not limiting the reviewers to what's in here.

MEMBER FORD: Okay.

MR. SHUAIBI: As a way of controlling our reviews we're saying that if there is an area that needs to be addressed that is not covered in here,

that we would go to Management and identify that and make sure that we would pursue that through approval by Management. But we are not limiting the reviewer to what's in here. If there's an area that needs to be covered, if there's a plant that has a unique feature that is not in this review standard, we are not limited to what's in here.

MEMBER ROSEN: For example, if the guidance was so bold as to require large transient testing and that transient testing was therefore done in some unexpected -- the results were obtained, that would be the kind of thing you'd put in the book, right?

MR. SHUAIBI: That would be as part of it being an update and a living document if we learn something new as a result of whether it's transient testing or whether it's an actual event.

MR. MARSH: We just have to ensure that whatever new thing that we pursue is covered by the regulations. That means that if it's not, then you have to go through your approval process, your backfit process if you're changing scope. If it's within scope, absolutely, follow it. If it's outside scope, then you have to -- you have Agency procedures for that. If large transient tests were done and

something unacceptable occurred, the licensee has to address that as part of their recovery program, as part of their complying with the regulations program. And it gives us the latitude to ask questions about that to find out how they do meet the regulations associated with that test.

MEMBER WALLIS: Can we move on now or do we have another question on technical review guidance? It appears that we can move on if you can make the computer do so.

MR. SHUAIBI: I was going to very quickly go over some of the material in here just to show you how it's laid out. The matrix in front of you the first column identifies the area of the review. The second column, every matrix, again, because of the groups that are involved and the way they do the reviews and the material that's going to be reviewed, that identifies what's applicable, and in different matrices you may find different ways of identifying this. Sometimes it's just applicable to all EPUs because of the area that's being reviewed. Sometimes it would be applicable if such a change -- if a change that would make a difference here was made at the plant for this power uprate, but that identifies when that area of review would be done by the Staff.

The next two columns identify the groups within NRR that do the reviews. The first is a primary review branch; second are the other groups that may be involved in doing this technical review. The next three columns is where we provide the guidance for the Staff in terms of where they go to find the information they need to do the review. We identify the SRP section. SRP sections may identify -- may discuss more areas than we need for a power uprate, so the focus of SRP usage column identifies which areas in the SRP section they need to focus on when they do the review.

The next column identifies other guidance documents that are out there, generic communications that we found as part of the work that we did for this review standard that needs to supplement the information in the SRP. The next two columns are the sections in the boilerplate safety evaluations where those areas would be covered. For consistency, we'd like future safety evaluations to look the same and have the same formatting with the same numbering. And the last column I already discussed, that's the acceptance review column.

MEMBER SHACK: I'm sort of surprised flow-induced vibrations doesn't deserve a --

MR. SHUAIBI: Flow-induced vibrations is covered by the Mechanical Group. We're looking at the materials and chemical engineering area.

MEMBER SHACK: So that's under reactor coolant pressure boundary materials?

MR. SHUAIBI: There's another matrix. This is just one of the matrices.

MEMBER SHACK: Oh, this is just one of the matrices.

MR. SHUAIBI: We actually have 11 matrices, and this is a small one compared to some of the other ones that we have. There's a group that has 40 section or about 40 sections in the SC that they would have to --

MR. MARSH: This is a really -- I hope you get a chance to look at this document. This is a very good product. This has each branch, what their areas are, then there are matrices for acceptance criteria. It's been a very well laid out structured document, so I hope you come to that conclusion.

MEMBER SIEBER: And the three major categories are BWRs, PWRs and everybody, right? As far as I can see here.

MR. SHUAIBI: Well, you mean in applicability?

MEMBER SIEBER: Yes. You don't distinctive within the PWR, I presume.

MR. SHUAIBI: Sometimes --

MEMBER SIEBER: Combustion, Westinghouse and --

MR. SHUAIBI: No. Actually, to give you an example of applicability, sometimes when it's -- in this case, it's an easy one where it's applicable to all plants. In some cases, and I'll give you just an example, flooding, internal flooding, there are specific criteria that says if these things are affected, volumes and tanks, or other things that affect the flooding analysis, that's when we will do the review.

MEMBER SIEBER: Okay.

MR. SHUAIBI: Okay. The licensee is to address that, is to say that there was no impact or there was no increase in volume. But if they say that and they demonstrate that, we're not going to do a detailed review of the flooding analysis, because, obviously, the old flooding analysis continues to be bounding. So in some areas, we are more specific than what you see here.

MEMBER SIEBER: Okay. And so the "applicable to" section could be generic other than

PWR and BWR.

MR. MARSH: Right.

MR. SHUAIBI: Right.

MEMBER SIEBER: Okay. Thank you.

MR. SHUAIBI: Okay. If no other questions, I'll move on to the next slide. The next slide is a documentation of review. I'll have a handout. I'll move through this quickly. Consistent with our office instructions, we wanted to make sure that we identified the regulatory basis for every area that we cover, and as I discussed earlier, we wanted future safety evaluations to have a standard format and same content or similar content. You'll see in the handout that's being passed out we have drafted a generic regulatory evaluation section for every area covered in the matrices that we have. You have the section that goes along with the matrix that we handed out. We have a regulatory evaluation section, we have a conclusion section as well. The technical evaluation section will of course be provided at the time of the review.

Now, there will be guidance in the review standard to say that if a plant is not a GDC plant or if a plant is not an SRP plant, that you're to go back and rewrite this using the same format and content

that we've used here to generate a regulatory evaluation that's similar to what we have here. But every area will be addressed the way that you see in this handout. This will give you an idea. In the past, we've combined certain things and that's led to some confusion and some feedback on the safety evaluations. I think this will be more specific in terms of what areas were covered and how they were covered.

MEMBER ROSEN: Now, Mohammed, just recall, I'm sure Tad recalls, that the Committee views on safety evaluation reports in terms of rather than just stating the conclusion stating the conclusion and saying why the Staff reached the conclusion, so that --

MR. MARSH: Yes, you bet. Yes. That's one big gain we hope we're going to get is to steer the statements that we make towards the bases for saying why we're saying things as opposed to just it's okay, it's okay, it's okay.

MR. SHUAIBI: One of the reasons why we did this this way is to address the comment that we've been getting. This is what you've seen in the past. The comment that we've received is this is what you've seen documented in the past. Well, now we've got a

blank section in here that needs to be covered, that needs to be addressed, that needs to be provided, so stating that it's acceptable like we have in that bottom paragraph isn't sufficient anymore. We have to provide some technical evaluation of what we looked at, what the criteria were, why it was acceptable. And then we come to the bottom paragraph that says, well, therefore it meets the regulations.

MEMBER WALLIS: So in some cases this middle section might be quite lengthy if it needed to be.

MR. SHUAIBI: It could be. It depends on --

MEMBER ROSEN: So it wouldn't be here if it wasn't acceptable.

MR. SHUAIBI: In some cases, it may be lengthy. In other cases where the area may not be applicable to the plant, the whole section may be deleted. The number would --

MEMBER WALLIS: It would be one sentence or something.

MR. SHUAIBI: That's correct, "This is not applicable because."

MEMBER WALLIS: All right.

MR. SHUAIBI: Period.

MEMBER ROSEN: Let me amend what I just said. You wouldn't be at the ACRS unless you thought it was acceptable, you believed it was acceptable.

MR. SHUAIBI: That's correct.

MEMBER ROSEN: So all you're asking us is to agree with you that it's acceptable. And our question is why do you think it's acceptable.

MR. SHUAIBI: Right.

MEMBER ROSEN: That's what the dialogue's about.

MR. SHUAIBI: And we're hoping this format will bring it out in a technical evaluation portion so that when it comes to you you could look at that technical evaluation portion and see what was done and what the Staff thought about when they decided that this thing was acceptable.

MEMBER WALLIS: That might focus our questions better perhaps too. We might get through a meeting quicker.

MR. SHUAIBI: We hope.

MR. MARSH: We want to.

MR. SHUAIBI: Let me go to the last section in the review standard. The last section, again, references an inspection procedure that was already written for power uprates. It also refers

back to the safety evaluation. I handed out only a section of the safety evaluation. There's a section in there that talks about recommended areas for inspection, and this section in the review standard refers the reviewer and the inspector back to the safety evaluation or it provides a link to the safety evaluation that would have a discussion of what areas were recommended as part of the review that we went through.

In terms of schedule, I think Tad already covered this. We are on track to issue the draft review standard for interim use and public comment by the end of the year, that's the end of this month. The review standard currently has not reviewed by Management. We hope to have that done very soon.

MEMBER WALLIS: When it goes out for public comment it will come automatically to us, so if we want to do our reading, we can do it.

MR. SHUAIBI: We will -- that's correct. We will send you a copy and we also plan on coming back and briefing you.

MEMBER WALLIS: Will this be a CD or a pile of paper?

MR. SHUAIBI: We could do it either way.

MEMBER ROSEN: Yes, do a CD.

MEMBER WALLIS: Do a CD.

MR. SHUAIBI: Okay.

MR. MARSH: We could do that. I think we could do that, right? We can do that.

MR. SHUAIBI: Yes, we can do that. And the last bullet on here -- of course, we'll come back to ACRS after the public comment period for the official review of the review standard. The last bullet on here says that final issuance will be early 2004. Of course, there's a lot of uncertainty here. If we don't get a lot of comments, it could be earlier; if we get a lot of comments, we'll have to go back and look at the schedule.

MR. MARSH: What we don't show in this schedule, though, is the CRGR review. We will have to go through the CRGR in this as well.

MR. SHUAIBI: That's correct. And the last slide is I think you've seen most of these words before and basically we are nearing completion on this review standard and hope to have it done by the end of the year.

MEMBER SIEBER: Does this review standard or any other initiative right now proclaim what the power uprate level will be submitted to ACRS for review? You know, we had customarily had not reviewed

--

MR. MARSH: Measurement uncertainty uprates or stress power uprates, things of that sort.

MEMBER SIEBER: Yes, stretch up to five percent.

MR. MARSH: Right.

MEMBER SIEBER: Understand there's a rumor floating about that folks would like something different than five percent.

MR. SHUAIBI: I think this goes back to -- I had discussed with Paul Boehnert possibly revising the five percent or changing the five percent to go to stretch and extended where we would come to the Committee for extended power uprates. I've indicated to Paul that I will need to discuss this. I got some feedback, initial feedback that it may not be a good idea. I'm not really sure. I think maybe we could explain a little better what we meant by that. Our definition of stretch power uprate I believe is the intent -- I believe it meets the intent of why the five percent was established. I think five percent was based on the power uprate being within the original design capacity of a plant, and our definition of stretch is exactly that.

MEMBER SIEBER: On the other hand, if you

go to like eight percent and you look at the last plant that did that, which was ANO 2, the way they did it was to change steam generators. Everybody I think now that's looking at steam generator change-out in PWRs is looking to increase heat transfer surface, which automatically gives you as much as eight percent. I would not be favorably impressed if those kinds of uprates bypassed ACRS scrutiny. On the other hand, if you don't change the plant at all except perhaps put a leading-edge flow meter in there, then I don't think that that's particularly pertinent to us because we reviewed the leading-edge flow meter as an entity and understand its improved accuracy and --

MEMBER WALLIS: I think what will happen is this proposal will come to us --

MEMBER SIEBER: It's not clear to me that it will if it gets hidden in a Staff --

MR. BOEHNERT: Well, in fact, if I may comment. Based on our discussions, I had suggested to Mohammed that the Staff come to the Committee and make its case, present the case and let you guys decide what you think. I think that's the way to handle this. You may be -- like Jack said, some of them you may think is okay, some you may not, but I think you need to give it consideration. Commenting also on the

five percent issue, I think it was also, besides what Mohammed said about being a stretch case, I think there was also the Committee had some consideration about risk impact and felt at the time that five percent was about what they were willing to pass on without a detailed review. Now, again, maybe you'll think different later, but anyway --

MEMBER SIEBER: I'm not aware of any stretch cases that went beyond five percent so far.

MR. SHUAIBI: We don't have any that have gone beyond five percent at this point. When we do surveys, Tad indicated we do surveys twice a year, we get information on power uprates and until this point we've been saying five percent and above. When we internally keep track of which ones we expect to be extended. We're basically marking anything that's over five percent extended. But we have had discussions with a licensee that's going to be submitting a power uprate of about six and a half percent in the near future, and their discussions they say that they are not going to be making changes to the plant, many changes to the plant. The types of changes that fit under the stretch they're not the types of changes that you would see when we came in here with ANO or when we came in here with some of the

boilers where they were going 15, 20 percent.

MEMBER POWERS: It seems to me offhand that that's really the criterion rather than an absolute magnitude of the power uprate: Are we making significant changes? I know it's a little more difficult to characterize what a significant change rather than a nice number, but I mean it's yourself willing to trust your judgment.

MR. MARSH: It just seems like we should maybe put some words around this.

MEMBER WALLIS: Yes. Then come back to us.

MR. MARSH: Yes. The same way we try to put words around when we would do a confirmatory calculation or when we would do something. We need to wrap some thoughts around this. If there's significant plant changes or there's significant change in risk or there's well beyond the licensing bases which requires significant new calculation or new technologies, new methodologies, something we can --

MEMBER POWERS: I'd be careful about how much new because new is a little bit in the eyes of the beholder, what a change is. But it seems to me that you guys are pretty good at judging whether

something is like one of these one and a half to two percent -- I mean it might happen to be eight percent power change but it's like that in the magnitude of plant change versus something where I'm really having to worry about stuff.

MR. MARSH: You know, I just think we need to write something down, because we're going to go away and you're going to go away and there's going to be new people coming, and we need to have some thoughts so we can guide other people. We're going to get wrapped in other jobs and maybe miss a mark.

MEMBER WALLIS: I think also we need to see your thoughts written down so if we approve it, we know what we approved.

MR. SHUAIBI: Right. And that's the action I took back from my discussions with Paul. We discussed this, and I explained to Paul that we will do that. Right now we're focusing on getting this review standard done, so it's a little bit on the back burner. Once we're done with this review standard, we may put together, of course go through Management concurrence and approval, and then send it over to you for your consideration, but that's the approach that we're taking.

MEMBER SIEBER: That would satisfy my

concern.

MEMBER POWERS: It seems to me that minor changes -- it's just kind of a waste of your time to prepare to come here, it wastes our time to listen to it, especially since you've kind of got those in better shape because of you're doing so many. And I, quite frankly, am willing to trust your judgment.

MR. MARSH: I appreciate that, of course. We need to write some thoughts down, I think, because there will be others who will need a plan beyond us, and so I think it's worthwhile doing.

MEMBER WALLIS: No, I think I agree that you would.

MR. MARSH: Yes. We'll be glad to.

MEMBER WALLIS: So we don't need to discuss it anymore, perhaps. Are we ready to finish, Mohammed? No more questions? I pass it back to you.

MR. MARSH: Can I say something?

MEMBER WALLIS: Sure.

MR. MARSH: I want to thank you for your time, and I sincerely appreciate the comments and the feedback and the discussions that we had, I really do. That helps us in our thinking, that helps us in coming up with the right kind of a product, and it's worthwhile conversation that we have. I appreciate

that. We're excited about this product. This is new, and as such, it won't be -- you know, there will bumps along the way as we implement this.

One thing we've asked ourselves and continue to ask ourselves, is this going to be more or less work in the end? Is this going to be a reduction in Staff effort or increase in Staff effort? Is this going to require more or less hours worth of work? We don't know the answer to that at this point. Isn't our goal, of course, to have a more efficient and effective program, but anytime we write down our guidance that we have been using and try to systemize it, it will probably be a greater effort at the end. So I wouldn't be surprised if schedules are impacted and Staff hours are impacted while this thing gets implemented and gets rolled out.

But we're very excited about the structure of that document, and Staff has got a lot of effort to put it together in a nice cogent way, color-coding things, and it's well thought out. So we really appreciate your comments and your thoughts. We'd be glad to come back in this forum if you want or if you want to discuss it individually, we'd be glad to do that too. So thank you very much.

MEMBER WALLIS: Thank you too.

CHAIRMAN APOSTOLAKIS: Okay. We'll recess until 10:30.

(Whereupon, the foregoing matter went off the record at 10:13 a.m. and went back on the record at 10:30 a.m.)

CHAIRMAN APOSTOLAKIS: Back in session. The next item is proposed options for resolving policy issues for future non-light water reactors.

Dr. Kress.

MEMBER KRESS: Thank you. That was all the introduction I was going to make. I think Farouk wants to make a few words before we start, so I'll turn it over to him.

MR. ELTAWILA: Okay. Thanks, Mr. Chairman. I'm sorry that I'm not going to be here. I have another meeting, and because of the snow and things like that, we doubled the meetings today. But what I would like to just bring one point to your attention which is related to three of the items that -- policy issues that Tom is going to address today. The three policy issues that we're talking about is the selection of the event selection, which is going to be on PRA and the source term associated with these accident scenarios and the option whether we use a confinement or a containment.

What we would like to do as they are presented right now in the draft paper that you have in front of you, they are presented as separate issues, but in reality we are planning to deal with them as an integral -- as a single issue with three subissues associated with them. You make the selection of the scenarios and you look at the associated source term, and this on that you determine whether you need a confinement or containment to mitigate the consequences of that accident. So we are not going to be presenting them as a single issue, but they are going to and integral issue, and I hope that Tom will be discussing that in more details today, but that's the direction that we are heading towards right now. That's all the opening remarks I have, so I apologize for leaving.

MR. KING: Okay. Thanks, Farouk. For the record, my name's Tom King. I'm with NRC's Office of Research and have been working for the past six months or so on the subject we're going to talk about today. This is really a follow-up to a briefing we had given you at your October full Committee where we talked about what the issues were and what some of the options were for the resolution. We did not get into recommendations. What's happened since then is we

have had a public workshop, we have had a lot more internal discussions.

CHAIRMAN APOSTOLAKIS: I don't understand the title, "Technical-Related Pulse Issues." What does that mean?

MR. KING: Well, I put the word "technical-related" in to distinguish from the other paper that's gone to the Commission several months ago on legal and financial policy issues.

CHAIRMAN APOSTOLAKIS: So it's just technical policy issues.

MR. KING: Yes. The paper we talked about last October was the SECY-02-0139 that had gone up in July and laid out the seven issues for Commission information. It was an information paper. Those issues resulted from our pre-application work to date on PBMR and GTMHR, but recognized that there's also other non-light water reactor work going on elsewhere in the world, particularly that associated with the Generation IV Program.

The purpose of the paper that we're working on today and we're going to talk about today is to get the Commission to give some guidance, some direction on these seven issues. Those issues we think are key to the licenseability of future non-

light water reactors and consistent with the Commission's advance reactor policy statement. Even though we don't have any applications in front of us, the idea is to get early feedback to designers so that they can prepare their applications and know what the ground rules are, as well as have the Staff know what the ground rules are.

MEMBER ROSEN: It's more than just their application isn't it? It starts so they can prepare their designs. I mean this impacts their design, not just the application.

MR. KING: Yes, their designs. Their designs, their research programs and all the things that go along with it, that's right. That's right.

The scope of the issues is reactor design and operation. We have not identified to date any fuel cycle issues, and security is being handled separately, recognizing that security issues may impact some of these things.

As Farouk said, many of these issues are linked, and we'll talk about that linkage --

MEMBER KRESS: Were these options presented at the workshop you talked about?

MR. KING: Yes.

MEMBER KRESS: Okay. And you had lots of

industry participation?

MR. KING: We had 19 non-NRC participants. One of those was from Green Peace, the rest were from industry or reporters. Industry National Labs was --

CHAIRMAN APOSTOLAKIS: When was this workshop?

MR. KING: It was October 22, 23. And what I'll do is as we hit the issues, I'll summarize the feedback we got at the workshop on each of the issues.

I also recognize that these issues resulted from non-LWR pre-application work, but some of these issues, depending on what the Commission decides, could have a bearing on future light water reactors as well, and I'll mention that where that's a possibility as we hit the various issues.

Four of the issues had been looked at previously by the Commission back ten years ago when we were doing pre-application work on the light water reactors. What this paper does is revisit those issues because things have changed in the past ten years. The major changes have to do with the emphasis on risk-informed regulation, which was kicked off with a PRA policy statement in '95 and also the Commission's strategic plan, which lays out goals for

the Agency. So we think it's appropriate to revisit those.

The schedule is we owe the paper to the Commission at the end of this month. We provided you with a draft of that paper, stamped it pre-decisional because it is still under review, still going through concurrence. And there are probably some changes that are going to take place before the final paper goes up. Farouk talked about one maybe trying to package three of the issues together, and I'll talk about another one, modify somewhat our recommendation on one of the issues.

We're here today to talk about the background and the issues, the key questions that we looked at in reviewing the issues, the options, the feedback at the workshop and the recommendations. We are requesting a letter from the Committee at this point after this meeting or as soon as you feel you're able to write one. So that is a difference from the October meeting, which was just an information status briefing.

Okay. In looking at the issues, we sort of laid out some ground rules or general guidelines that we followed. We wanted to make sure that in recommending a position on these issues that we were

consistent with the safety goal policy, which states that the population around a site should be consistent or the risk to the population around a site should be consistent with the safety goal policy. We wanted to take a risk-informed performance-based approach wherever we could. We wanted to recommend resolution of these issues on a technology-neutral basis recognizing that they could have implications for LWRs We considered the Commission's strategic plan which has performance goals in it and the previous Commission guidance. And we also considered practicality. We don't want to recommend something that's just too resource-intensive or too complicated to implement.

Okay. Now what I'd like to do is go through the issues one by one in the order they were listed on the earlier slide, starting with what we call expectations for enhanced safety.

MEMBER KRESS: Do they come out of a policy statement or events to reactors?

MR. KING: They come out of really three things that I've listed here, the first three sub-bullets. The first one was the severe accident policy statement, which said that for future plants we expect a higher standard of severe accident safety

performance than prior designs. Then a year later the advance reactor policy statement came out, which said we expect future designs to have enhanced safety features, but it also went on and said we are -- as a minimum, the level of safety of advanced designs should be the same as current designs. So it said we have an expectation but we're not making that a requirement. The SRM Staff requirements memo that implemented the safety goals also basically said that same thing.

MEMBER KRESS: Maybe you'll cover it but let me ask you about the last bullet, about the expectation that it has the same degree of protection for current iteration LWRs. If you look at existing plants, there is a spectrum on distribution of risk statuses if you count CDF and LERF, or status with respect to prompt fatalities. When you make a statement like we want the advanced plants to have the same level of protection --

MR. KING: As a minimum.

MEMBER KRESS: -- as a minimum, does that mean that it has to be as good as the worst one, the mean, or the best?

MR. KING: No. I think the way that's been interpreted is, and that actually gets to the

last bullet here, we had that same question when we went through the ALWR design certifications. We had to implement these policies when we did those. We've derived a core damage frequency goal and a large early release frequency goal from the safety goals that have been applied to today's plants and were applied during the ALWR design certifications. So my view on that question is what we're shooting for is the goals that we've derived from the safety goals that apply to today's plants. We're not looking at the whole spectrum and looking at the worst one.

MEMBER KRESS: Even though the ALWR exceeds those.

MR. KING: Yes.

MEMBER KRESS: We're not shooting for the ALWR as a --

MR. KING: Not as a requirement. Remember what the reactor policy statements says, "Hey, we expect safer designs." The ALWR has come in and said, "We're giving you safer designs, and here's all the things we've done to improve the designs and here's what it's done to core damage frequency and so forth." The Staff looked at that. Where there were some areas that they felt maybe because of additional uncertainty or concerns, they may have added a few extra things,

but they didn't turn around -- we didn't turn around and change the entire body regulations to now raise the bar to this new level of safety that the designers were offering up. We accepted it with some additional enhancements, and for those particular designs we codified that in the design certification rulemakings. But we haven't made generic changes across the board in the regulations to raise the bar for everybody else. So that's the process on the ALWRs.

MEMBER WALLIS: So on these safety goals I think I understood in past discussions of safety goals that these are not requirements, these are some sort of thing which you aim at and hope to achieve. But it would seem to me that was a very strange way to set a goal, but that seemed to be the way they were interpreted. There were requirements and then there were goals, and you sort of strove to get somewhere close to the goal, but all you had to do is really satisfy some requirements which are considerably less. So they don't really tell you what you're going to require.

MR. KING: It's not as simple as that. The safety goals have shown up in various places. They've shown up in the regulatory analysis guidelines, which are what were used to set new

regulations or to change regulations. They've shown up in the ALWR design certifications as part of the review criteria that the Staff used in looking at those designs. Do they meet the safety goals? That was one way to see --

MEMBER WALLIS: So it became a requirement rather than one of these goals that you don't quite reach but you hope to get close to?

MR. KING: The goals were used to help establish a basis for new requirements, either through the regulatory analysis guideline approach, which affects the regulations and the reg guides, or through the design certification process.

MEMBER KRESS: Tom, when I asked this same question once to a different set of people from the Staff, I got an answer that went like this, and I wonder what your reaction to it is, that if it didn't meet the safety goals, some plant that they were either looking to make a change in the licensing basis or new license or whatever, if it didn't meet the safety goals, to quote -- now I'm quoting, "This would put into question the presumption of adequate protection." That was the answer I got from them.

MR. KING: No.

MEMBER KRESS: Is there any validity to

that?

MR. KING: That's not consistent with the way we're using safety goals or I think the way the Commission intended safety goals. The safety goals are supposed to define where you stop regulating, how safe is safe enough, not the minimum in terms of regulations. So I guess I would take issue with that statement.

MEMBER WALLIS: It's a very strange kind of safety goal. I've said this before, but I mean for the public to understand that strange idea that you have a safety goal but you don't really meet it, it's something where you stop regulating, it's the wrong end of the scale. You've got to set the minimum standard. I don't really care where you stop with anything, it's the minimum standard I care about.

CHAIRMAN APOSTOLAKIS: You don't really stop regulating, I don't think.

MR. KING: Well, we can always say, yes, we make some judgments based upon uncertainties and so forth, but some people might think it's really beyond the safety goals. But the intent is to stop there. You may disagree with some of the numbers or some of the judgments that are --

CHAIRMAN APOSTOLAKIS: But we stop even

for plants that are above the goals.

MEMBER WALLIS: Yes, but the guy who's next to the plant doesn't care. He wants to know what the minimum standard is.

MR. KING: If you're looking at existing plants, you're looking at backfit, and the safety goals give you, through the reg analysis guidelines, give you some guidance on should you backfit or not. There's some criteria. And, in effect, if you're not making a substantial improvement in safety, you're not going to pass the backfit test, and the safety goals have been used to help define what that substantial improvement in safety is. So you can say, well, some existing plants may not meet the safety goals but may not also pass the backfit test, so they're caught in a position where, yes, they don't meet the safety goals, but it's not cost beneficial or they're close enough that it doesn't make sense to make them spend money to do anything else.

For future plants, you know, we're not talking backfit, we're talking forwardfit. It's easier to design safety in in the beginning, so we're not going through the backfit process on future plants, but we are still using the goals through the subsidiary objectives that have been developed to help

define a gauge as to how safe do these things have to be?

MEMBER WALLIS: If they're the same safety goals and the old plants' requirements are based on them, how are you going to get any kind of enhanced safety?

MEMBER SIEBER: Well, it seems to me that where you go from a goal to a requirement is in the certification process, and to get to the design that is acceptable for the certification process, that's where you apply the safety goals. Now, the safety goals came after the designs of the current generation of plants, and so some plants make it and some don't. Most of them do make it, and so you're stuck with that, and since they were all designed under a deterministic system of regulations, they meet adequate protection standards, even if they don't meet the safety goals. So it seems to me where the regulatory punch comes is in the certification process. Is that a good way to look at it or not?

MR. KING: I think that's a good way to look at it. And, again, it gets back to these policy statements where the Commission has said, "The way we're going to get enhanced safety is we're going to put the burden on the industry to come forward and

volunteer it."

MEMBER KRESS: As a practical matter, I can't imagine somebody will come forth with something that doesn't meet --

MR. KING: No design has come forward and said --

MEMBER KRESS: Yes. And I don't think they will.

MR. KING: No.

MEMBER KRESS: But just as a hypothetical statement, what if one did come forth and had a CDF greater than ten to the minus four or a LERF greater than ten to the minus five? I think the regulatory system would really question that very strongly.

MR. KING: I do too.

MEMBER KRESS: And I just don't think it would get certified, even though there's no such requirement in the regulations, but I just don't think it would get through anyway.

MR. KING: I tend to agree with you, and you'd pull out these policy statements and say, "What are you guys doing? We told you 15 years ago that we don't want to see that approach anymore and you're not following it." So I agree with you, they'd have a tough time.

MEMBER KRESS: I don't think it's a problem because I can't imagine anybody coming forth with one that won't well meet the safety guidance.

MR. KING: No. I mean you look at the advanced designs, whether they're the HTGRs or the Generation IV, all of them have as goals enhanced safety and all of them are promoting enhanced safety, not just because they want to make us happy but because it makes their investors happy, investment protection. High reliability means better economic performance and so forth, so they do it for a number of reasons, so I really don't think it's a -- from a practical standpoint it's an issue.

CHAIRMAN APOSTOLAKIS: Before the reactor safety study the estimates -- I mean if you go to conferences and find the proceedings and look at the numbers that people were coming up with for unavailability of safety systems and so on, we're talking about estimates that were about two orders of magnitude lower than what is accepted now and has been supported by data. So people were a little more optimistic in the beginning. In fact, one of the lessons from the reactor safety study is that people were a little shocked when they were told that the core damage frequency is about once every 10,000

years. They thought it was much, much lower than that.

Are we going to have the same thing here? I mean we start with ten to the minus seven as being optimistic again, and then we build one of those and with time we learn that it's not ten to the minus seven but it's ten to the minus five? I mean we can figure out now -- I mean I remember when we were looking at the AP600 the numbers were very low, people tried very hard. They couldn't find a failure mode that would raise that number. They couldn't find anything. But on the other hand, there were things like digital I&C, there were all sorts of controls and -- who knows? Are we going to have a repetition of this historical fact and learn from experience?

MR. KING: I have no doubt we're going to learn from experience and people are going to find out the reliabilities they put forth in their PRA maybe don't turn out to be as good. I think that's a fundamental question on how you implement whatever your safety goals or criteria are for future plants.

CHAIRMAN APOSTOLAKIS: Is that influencing your thinking at all when you develop these?

MR. KING: Yes. Yes. It has gone through our thinking.

MEMBER KRESS: It has something to do with defense-in-depth.

MEMBER ROSEN: I think you need to look at history again to answer your question. Remember that one important person in the history of nuclear power said that paper reactors are always cheaper to build, you can build them quicker, and safer than real reactors.

MR. KING: So one of the questions is how do you compensate for that? Do you require additional testing, put more stringent goals on so that maybe that compensates for some of these areas where you really don't know as you much as you'd like?

VICE-CHAIRMAN BONACA: But you would expect that the same situation would happen as normal coolant reactors which is you learn from experience, you're improving them and you're bringing them back to where they really were expected to be on paper.

MR. KING: Yes.

VICE-CHAIRMAN BONACA: But that the experience we've had.

MR. KING: But that's also part of the risk-informed process. Remember, one of the five elements is the feedback element, and when you're using a PRA to help certainly guide your design and

guide your operation, as you learn from experience, you can feed that back in and see what it means. So I think there's a way to try and accommodate that. I agree with you, initially, you're going to have some surprises probably.

Let me say one other thing that applies to all these issues. These are pretty fundamental issues. We're not trying in this paper to figure out how to implement all the details that go along with each of these issues. What we're trying to do is get the first step in front of the Commission to make a decision do we go this way or do we go that way? And depending on that decision, then we can go and start developing details. And whether that has to do with defining defense-in-depth or figuring out what the right criteria are for event selection, you won't find that in this paper. What you'll find is just trying to get the direction from the Commission.

CHAIRMAN APOSTOLAKIS: We haven't even discussed the options for the very first issue yet. It's been 25 minutes.

MEMBER KRESS: He'll get to that.

MR. KING: Okay. I'll speed it up. First issue has to do with enhanced safety, how do we handle that? And, again, the things we looked at in going

through this issue we were we're going to have additional plants, both possibly on a site as well as nationwide, how do we factor that into looking at the level of safety we need? What's the Commission's performance goal to maintain safety? It probably means don't raise the bar, generically, but we still need to look at what do we want to do for future plants?

That third bullet has to do with getting back to the question of would it make sense to raise the bar in some areas to account for larger uncertainties? An example being maybe we ought to stress prevention more because we know less about severe accidents on some of these new technologies. And then the implications for LWRs.

Okay. The options we looked at, and I think these are -- we talked about these before -- are basically three. Let's continue to do like we did on the ALWR design certification process, we're expecting applicants will come in with designs with enhanced safety. We would codify that applicant-proposed enhanced safety feature in the design certification or if it's a COL through some license condition, and then we may add some additional things on there if we feel through engineering judgment the uncertainties were

large enough to warrant that.

CHAIRMAN APOSTOLAKIS: Now, the goals, as they have been stated, are in terms of rates, aren't they? One-tenth of one percent of the accident rate, right?

MR. KING: Yes, reactor year basis, usually.

CHAIRMAN APOSTOLAKIS: And this refers now to a particular site or to the nation? What I'm getting at is if the NEI and DOE are thinking about the future and it turns out to be true and we're going to start building reactors again, crazy, would that affect the enhanced safety part, the fact that now you have many more reactors than you thought you would have, because your criteria are in terms of per year probabilities rather than absolute?

MR. KING: Yes. There's two aspects --

CHAIRMAN APOSTOLAKIS: I think you address it somewhere else, don't you? But I think here it's probably relevant here too.

MR. KING: Yes. It comes up in this issue in the next slide or two. There's two issues: There's a modular plant issue where you've got maybe eight or ten smaller reactors that add up to one big reactor in terms of electrical production. The

designers have all proposed that they will account for the integrated risk for those eight or ten modules so that the integrated risk is equivalent to one big plant. So I think that's --

CHAIRMAN APOSTOLAKIS: But that's at the site.

MR. KING: At the site.

CHAIRMAN APOSTOLAKIS: How about nationwide?

MR. KING: Nationwide, I think at this point there's nothing being proposed because of additional plants nationwide. My view is all these future designs, whether they're modular or big plants, we expect them to be safer. And if you look at the ALWRs, they're probably an order of magnitude safer, if you're looking at CDF or LERF. So if you start to add one or two additional ones on a site, it's a small incremental risk for that site. If you start to add them nationwide, yes, I mean if you have 1,000 plants nationwide, you might want to start to rethink things. But I think from a near-term practical standpoint, I don't think it's an issue we need to worry about right now.

MEMBER KRESS: The quantitative safety goals are all on an individual risk basis, and it

wouldn't account for nationwide in the totals.

MR. KING: Right. And today they don't account for multiple units on a site either.

MEMBER KRESS: That's right.

MR. KING: I mean we have some sites that have three units on them when we did --

CHAIRMAN APOSTOLAKIS: The question is whether that's appropriate.

MR. KING: Yes. Our view is, at this point, if you have a three-unit site and you add Unit 4 and 5 but Unit 4 and 5 are of an order of magnitude safer than the units that are there, it's not a problem.

MEMBER KRESS: It doesn't add much to it.

MR. KING: No. It doesn't add much. Like in Reg Guide 1.174, we said ten percent change increments were okay.

MEMBER KRESS: In principle, the prompt fatality safety goals say on a LERF there ought to be a site criteria. But practically speaking, it's not going to change much if you add one or two or more plants. I guess if you started getting ten or more on a site, which is not likely, you'd have a problem. But practically speaking, it's not going to be a problem.

MR. KING: Our view in this paper is that's not a near-term problem.

MEMBER KRESS: I think that's a valid view.

MR. KING: The other options are raise the bar generically in terms of level of safety. And the third option is we may want to require some additional testing or oversight in areas where we do have large uncertainty to deal with those. So those are sort of the three areas we looked at.

Advantages, disadvantages, certainly requiring enhanced safety can compensate for less experience and compensate for the integrated risk, multiple units situation. Disadvantages, the big one I see is it results in a set of dual regulations, which, you know, is a practicality issue.

MEMBER KRESS: We shouldn't worry too much about that sub-bullet issue, just the second one.

MR. KING: Right, right. So that leads to what are we going to recommend, and what we're going to recommend, and this is modified a little bit from what's in the draft paper, but it still is let's use a process similar to what we used on the ALWR certifications, because we do expect all these designs are going to come in with enhanced safety in their

proposals. The modular designs should account for integrated risk modules, they're all saying they're going to do that. And let's not worry at this point about the incremental risks from additional plants on a site because it's going to be in the near term a small factor. We think this is practical, it's certainly is consistent with the ALWR approach, so we're not getting into a dual regulation type situation.

MEMBER KRESS: Now, the ALWR approach does allow you to think about areas of high uncertainty --

MR. KING: Yes.

MEMBER KRESS: -- and you might want to do something like that. So that's implied in that statement.

MR. KING: Yes, yes. And from an implementation standpoint, if the Commission agrees with this direction, then through this framework effort that's underway to develop a framework --

MEMBER KRESS: Option 3?

MR. KING: Well, this would be the follow-on to Option 3, developing a framework for future plants, would be the way to implement this process. That's where you would develop risk metrics and criteria for non-LWRs and talk about how you would

look at each design and apply the framework to each design. So those are sort of the implementation issues that would need to be dealt with as a follow-on activity.

Okay. Defense-in-depth, second issue. We talked before about -- defense-in-depth is talked about in a lot of places but it's not really defined. Dr. Powers pointed out it was talked about in Appendix R, and, yes, it is in terms of fire protection. We found one other place in the regulations it's mentioned too, and that's in the siting regulations. Part 100.1 where it says -- it basically makes the statement that siting away from densely populated areas is an element of defense-in-depth. So those are the two places we found in the regulations.

The Commission's white paper on risk-informed performance-based regulation had a short definition. To me it read more like a goal of defense-in-depth, and I thought it was a pretty good goal.

MEMBER KRESS: Yes. It was more like a goal of defense-in-depth.

MR. KING: Right. So in looking at this issue, you know, the key questions we thought were would it make a sense to develop a description of

defense-in-depth? What value would it have? And, basically, the answer was we think it would have some value. It would certainly help implement all these places where we talk about the defense-in-depth philosophy or preserving defense-in-depth would add some consistency and transparency as to what we mean. It would be something we could put in the regulatory analysis guidelines because that's a document that's sort of weak when it comes to defense-in-depth and I think should be certainly a key factor in making regulatory decisions. And a good definition of defense-in-depth could form the foundation for this new licensing framework depending on --

CHAIRMAN APOSTOLAKIS: I think what you're going to end up with is more like on the next slide, that you have a description of what defense-in-depth means for programmatic issues and so on. Because it's really a philosophy, and I don't know how you define a philosophy. It's difficult to come up with a three-line definition of a philosophy, but I think what you do here with the key questions and give an example is probably the best way to do it.

MR. KING: Yes. This paper hasn't settled in on what defense-in-depth is, what that description would be, but at least the way the version that you

have in front of you has a couple of examples in to give the Commission an idea of if we go ahead and develop such a description, here's sort of the scope and depth of what we're talking about developing. We're not talking about a three-line definition, we're talking about laying something out that has a little more meat in it.

CHAIRMAN APOSTOLAKIS: Yes. Stay away from the conditions --

MR. KING: Yes, yes.

CHAIRMAN APOSTOLAKIS: It's better to do something like this with examples and descriptions.

MR. KING: Yes. But if the Commission says, "Yes, go do that," then we're going to have to decide, okay, what is in that description, and we sort of listed at a high level here some of the key elements that we will need to consider for putting in that description, and that can include programmatic items, physical features, is it a process just to treat uncertainties like NEI has proposed, exactly what's in there? So the paper tries to give the Commission an idea that, hey, we're going to wrestle with these. If you say, "Go do that," that's the stuff we're going to wrestle with.

And we also say maybe the reactor

cornerstones would be a good structure to start with because we already have the oversight process that's laid out in that fashion, and it might be nice to start laying out other things in that fashion. So we would look for some feedback from the Commission whether they like that idea or not.

Okay. The options we considered are let's not do anything, let's just continue case by case. Let's develop the description. It would have -- we're not sure exactly what it will have yet, but it could have some elements in it that are independent of the PRA, just some givens and some things that everybody has to do as well as maybe some probablistic type criteria. And then the third option --

CHAIRMAN APOSTOLAKIS: Is there any reason why the ROP cornerstones cannot be or could not be a description?

MR. KING: In the argument against that?

CHAIRMAN APOSTOLAKIS: Yes.

MR. KING: The only argument I could see, and it's just a hypothetical now, is if we actually get into trying to describe defense-in-depth and we find some better way to do it. At this point, I don't -- I haven't thought any better way to do it.

MEMBER KRESS: Well, the cornerstones are

just a framework. They're too limited because they don't get into the questions of things like how do you allocate risk among sequences or how do you allocate among the cornerstones, what do you about uncertainties related to those? So it's a framework --

MR. KING: Yes. The cornerstones are not the definition, but they may provide the structure of the seven top-level elements.

MEMBER KRESS: They provide structure -- they're just incomplete as a DID.

CHAIRMAN APOSTOLAKIS: I didn't mean that they were complete, but it seems to me that having those four -- I think there are four -- cornerstones, we talk about accident initiation, protecting the pressure boundary, safety systems, emergency planning, are there any designs where these things don't apply? I mean these are very high level.

MR. KING: Yes, but the cornerstones go on and talk about --

CHAIRMAN APOSTOLAKIS: And the moment you say that you have to worry about these four things, you have placed a major defense-in-depth element in your analysis.

MEMBER KRESS: I don't disagree with that.

CHAIRMAN APOSTOLAKIS: In fact, this is what's missing I think from 1.174, is it not? My colleague here on the left has complained that some of the decisions we're making based on delta CDF and delta LERF do not really reflect the intent of the regulations. If you went back to these four cornerstones, perhaps you would manage to do a better job, right? The regulation are not there just to protect the core damage. Of course they are there for core damage but other things as well.

MR. KING: Yes, yes. But recognize the cornerstones also have three other elements too. They have the radiation protection of the worker, of the public, and of safeguards and security.

CHAIRMAN APOSTOLAKIS: Sure.

MR. KING: Which at least the intent in developing this defense-in-depth description would be bring those in as well because they're important.

MEMBER KRESS: Yes. And somewhere in there you have to address the structureless view of just what if we're wrong in following deterministic analysis and converse analysis, what do we do then?

CHAIRMAN APOSTOLAKIS: Well, he will come to that, he will come to that. Are you asking yourself, "What if I am wrong," every five minutes?

MEMBER SIEBER: But when you go back to the certification process --

CHAIRMAN APOSTOLAKIS: How often should he ask that, Mr. Powers?

MEMBER POWERS: Well, I think the appropriate times to look at that is after you've developed the major elements of your structures. The problem you get into with defense-in-depth in a risk-informed regulatory structure is the same one we identified in the development of what became Reg Guide 1.174, that uninhibited defense-in-depth considerations can be applied at too low a level and they trump any considerations of risk. And our suggestion has always been that defense-in-depth should be applied at the higher levels. And the question of what if I'm wrong is a high-level question over the overall structure, not about individual pipes, individual meters, diagnostics and things like that, because our general feeling is that these points of quantitative analysis are legitimately applied to those questions. Whereas the major omissions are things that we just don't know about right now.

CHAIRMAN APOSTOLAKIS: So the cornerstone level would be --

MEMBER POWERS: Well, I think that is

exactly the level to start thinking about these things. I mean --

CHAIRMAN APOSTOLAKIS: Well, by accepting the cornerstones in fact you have, as I said earlier, put a level of defense-in-depth there, because you say now you have --

MEMBER POWERS: See, the difference is that -- maybe there is no difference here. It is a different view of what the cornerstones are maybe between structuralists and rationalists there, though they're both very happy with cornerstones.

CHAIRMAN APOSTOLAKIS: I think they are.

MEMBER POWERS: But, yes, they -- and I've never come up with a nice way to articulate this difference between high-level and low-level application of defense-in-depth, but it's very clear to me, it was very clear to the whole Committee ion the discussion of what became Reg Guide 1.174 that the trumping issue always became -- arose because you applied defense-in-depth at too low a level. And so now what isn't at too low a level I think that's something you just have to mandate, because I haven't found a way to just describe it succinctly to somebody. But render under PRA that which PRA does well, render under defense-in-depth that which

defense-in-depth does well.

CHAIRMAN APOSTOLAKIS: Whatever that may be.

MEMBER POWERS: Well, I think it does very well in protecting us against things that we simply don't anticipate. That's where it's served us well over the last 50 years. And so you want to use it that way and --

MEMBER KRESS: So you would necessarily put a containment around the gas-cooled --

CHAIRMAN APOSTOLAKIS: They will address this.

MEMBER POWERS: You know, when you come down to the wrestling between containment and confinement, I would surely look to have a barrier there.

MEMBER KRESS: Let's ask the question of no barrier at all.

MEMBER POWERS: Well, that's where I would tend to come in and say I don't really care what your calculations show, because there's this issue of what if you're wrong, okay? Now, you ask me what kind of barrier do I put in, containment or confinement --

MEMBER KRESS: That's a different issue.

MEMBER POWERS: -- you know, that's where

your quantitative analyses come up, and I have written a justification for confinements in DOE sites as opposed to containments, so I can't say I throw out containments -- or confinements automatically. They have advantages over containments, they have deficiencies over containments. But I would tend to say, okay, make that a part of your quantitative analysis, but the existence of a barrier there is part of defense-in-depth.

MR. KING: I can envision other things where you may just want to say, regardless of what your PRA says, "I want two independent ways to shut the reactor down. Don't give me a design that just has one way." Have some fundamental things like that as part of your defense-in-depth.

MEMBER KRESS: I think you could say that about emergency cooling, "Give me at least two ways to diverse emergency cooling."

MR. KING: Yes, yes.

MEMBER KRESS: Same thing with electric power coming in, "Give me several sources." I think those are defense-in-depth you can almost just mandate without --

CHAIRMAN APOSTOLAKIS: But you can use a rationalist approach to see whether those things make

sense.

MEMBER KRESS: You can see how good they are, but I think you just mandate those.

MEMBER POWERS: I think what I would do, Tom, is I would say the quantitative analysis is what you do to say do we need to two sources of electrical power or do I need three?

MEMBER KRESS: And how reliable do they have to be?

MEMBER POWERS: Well, I mean that's what they do is they go through the reliability and what not. But going below two it doesn't matter what your analyses are, because I know you haven't take into account everything.

MR. KING: I think those are the kinds of discussions where you get into a condition that says go develop a description.

MEMBER KRESS: Now, your recommendation, is that B or C?

MR. KING: The recommendation is either/or. It's develop a description.

CHAIRMAN APOSTOLAKIS: Where is the recommendation?

MR. KING: The bottom of Page 11. The workshop -- everybody in the workshop was unanimously

in favor of developing a description. What that description would be there was some discussion about, but that's an issue for the next phase of this activity.

MEMBER KRESS: I'm sure people would like to see defense-in-depth articulated to the point that they have some expectations of what's going to be imposed on them. A good description would probably do that for them.

MR. KING: Yes. And back on the previous issue, the workshop -- I forgot to mention the workshop summary there. All the industry representatives agreed with the recommendation to follow the ALWR process. The only disagreement came from the public interest group, Greenpeace, which liked the middle option of raising the level of safety, requiring a higher level of safety across the board. So that was the workshop results on that.

Anyway, what we're recommending to the Commission is let's go forward and develop a description or a policy statement of defense-in-depth, and we'll do that through the normal public process like we develop policy statements.

VICE-CHAIRMAN BONACA: You said C, right?

MR. KING: B or C. We're not sure --

VICE-CHAIRMAN BONACA: You're not sure, okay.

MR. KING: Both B and C talk about developing a description or policy.

VICE-CHAIRMAN BONACA: One of them is process.

MR. KING: Yes. But we're not distinguishing at this point which way. We've tried to give an example in the draft paper of both options just to give the Commission a feel for what we mean by this.

MEMBER WALLIS: Do you have a feel for how long this description is going to be?

MR. KING: How many pages?

MEMBER WALLIS: Is it going to be one sentence?

MR. KING: No.

MEMBER WALLIS: One paragraph?

MR. KING: No. I would -- I mean --

MEMBER WALLIS: Is it going to give examples?

MR. KING: Well, the paper has two outlines in it, one that goes with Option B and one that goes with Option C. And the outline for the Option B is about a page and a half, so I would

envision a policy statement would be ten pages or so for that. I mean maybe it's five pages, maybe it's ten pages. It's not 100 pages, but it's --

MEMBER WALLIS: But you're looking at a really thorough description.

MR. KING: Yes. That's what I'm looking at. Okay. And I guess I'd like the Committee's views on whether it's useful to put those examples or outlines in there.

CHAIRMAN APOSTOLAKIS: I think we have conflicts here. On the one hand, people want to have flexibility, high-level goals be left alone, try to meet them and so on. But then I have found that consistently the industry wants the NRC to explain in detail what the NRC wants. Even 1.174 was criticized as not being restricted enough when at the same time they were complaining that the Agency is very prescriptive. I am afraid that by doing this, especially if it's a policy statement, of course it would depend a lot on how it's stated, but this is a philosophy, this is an approach. I think it's going to go against risk informing the regulations if you describe it too much.

MR. KING: So your view is maybe a page.

CHAIRMAN APOSTOLAKIS: Yes. Give a few

examples where it will work well, what we mean by it and so on. But that doesn't mean you have to do this in the future plants. To go down to saying, "I need two sources of electric power and this and that," I'm a little uncomfortable with that. We're back to prescribing everything.

MEMBER POWERS: Absolutely not, George. I mean that's the whole point, that you don't prescribe it at the levels of analysis.

CHAIRMAN APOSTOLAKIS: You said below two is non-negotiable. Two or three, I can look at the numbers --

MEMBER KRESS: But these are for very limited functions that we all know are real safety functions for nuclear power plants. You want to shut down the power, you want to have emergency cooling, you want to have electrical power coming in, and you want to be able to get rid of the long-term decay heat. Everybody agrees --

CHAIRMAN APOSTOLAKIS: I'm not sure I want to go beyond that and say we need two --

MEMBER KRESS: Well, you may not have to go further than that just for those.

CHAIRMAN APOSTOLAKIS: Anyway, I think there is a downside to developing descriptions and

policy statements.

MEMBER KRESS: Well, I think we've gone through this debate and argument for years on how much DID is necessary and how much is sufficient and when can we arbitrarily impose it on plants, and I think the more of a description and the more of a definition we give, the better we're going to put that in a box at least and let people know what it is, and then could make an arbitrary --

CHAIRMAN APOSTOLAKIS: But, you know, Tom said we have to be practical with these things. I have yet to see anyone from the Agency or from the industry who did not treat defense-in-depth with respect. As a practical matter, it's really ingrained in what we do, the way we think. So trying to define it --

MEMBER KRESS: AP600 certainly didn't like us putting spray in their containment.

CHAIRMAN APOSTOLAKIS: That's an individual --

MEMBER KRESS: Well, but it's an example. I mean you can find examples --

CHAIRMAN APOSTOLAKIS: But that's a matter of judgment there. I mean it's not --

MEMBER SIEBER: On the other hand, if you

make something very prescriptive, you're really tying the hands of the designer.

CHAIRMAN APOSTOLAKIS: That's my problem.

MEMBER SIEBER: And it would seem to me to avoid tying the hands of the designer you're better off being more conceptual in nature and then doing the analysis as the design evolves to determine what elements of defense-in-depth really make a difference and which ones do not.

VICE-CHAIRMAN BONACA: But I thought the concept of implementing successive, what is it, layers of protection, which is I think we all could agree with that, that's a first step, and I think below that you can put some other criteria on the type that is general enough. It doesn't even tell you that you have to use PRA or you don't have to use PRA.

CHAIRMAN APOSTOLAKIS: I think that we call the pragmatic approach in that paper, which for some reason people don't pay much attention to, does a lot of what we're discussing. You apply defense-in-depth when the PRA has problems. Let's not forget that. You apply defense-in-depth --

MEMBER POWERS: That's a particular philosophy you have, and that's not one that --

CHAIRMAN APOSTOLAKIS: I think it's very

consistent with what you said earlier. At the lower levels if there is something that's missing, you apply defense-in-depth. At the higher levels, you don't look at the PRA, you say, no, I want these things, the structure of these.

MEMBER SHACK: Yes. We're talking about what things we want, George.

MEMBER WALLIS: George, if I could --

CHAIRMAN APOSTOLAKIS: I think we all agree that the cornerstones are a very good starting point.

MEMBER WALLIS: George, if I'm going to apply this defense-in-depth, I need to know what it is.

MEMBER KRESS: Absolutely.

MEMBER WALLIS: And if I'm going to regulate how people apply it, I need to know and they need to know what it is.

MEMBER KRESS: You need to know how to quantify it and put limits on it.

MR. KING: We don't have to decide today what this description contains, but the question for today is should we try and develop a description?

MEMBER WALLIS: Yes, you should. If you find you can't you may fall back to the one-paragraph

description.

MEMBER ROSEN: I come down on the side of wanting to have a description, but I am alarmed by the idea that it would be ten pages long at this level.

MEMBER KRESS: That's triple-spaced.

MEMBER ROSEN: It comes off almost like a procedure, and that would be conflict to the objectives that I would see.

MR. KING: The ten pages is Tom King's view on what this thing would say and how long it would take to say it. It may be one page, I don't know where we're going to end up, but that's next year's discussion.

MEMBER ROSEN: And Steve Rosen's view is that if it takes ten pages to say it, you're at too low a level and you're not abstracting enough.

CHAIRMAN APOSTOLAKIS: There are certain things that --

MEMBER ROSEN: And you're tying the hands too much.

CHAIRMAN APOSTOLAKIS: They are topical in nature and they cannot be constrained by a single definition.

MEMBER KRESS: I think we better get on to the next issue.

VICE-CHAIRMAN BONACA: In what we know as a deterministic world in the past 20 years, there is a lot of examples of application of PRA to apply defense-in-depth. I really disagree with this divergence of the two things. I mean you can go back 15 years and see designs that were being implemented and the questions that came about, auxiliary feedwater trains, how many should you have? Well, PRA gave a lot of insights and I am convinced the NRC always looks at that that way too. So I'm saying that there is some insights that come from experience that this document could benefit from.

MEMBER KRESS: I still believe defense-in-depth needs to be tied somehow to the uncertainties that you get out of the PRA analysis. I'm not sure what that tie is.

MR. KING: If you look at what -- IAEA and INSAC have taken a stab at the finding, and they've put two or three pages of description together, so it's not all a paragraph.

MEMBER POWERS: Tom, I think that the tie is at best conceptual in nature, because though there's often words about we've completely characterized the uncertainties in this PRA, it's not done, it's not doable.

MEMBER KRESS: And when I say it ought to be tied to the uncertainties, I implied that that has to be recognized, that character, that you can't really quantify fully the uncertainties, you can only do part of them. And that has to enter into your concept some way.

MEMBER POWERS: I think that's where this what if I'm wrong question comes about is that I'm quite certain that any analysis done with PRA or otherwise has left something out that I just don't know, and so now you're asking what if I'm wrong. The difficulty with it is it's too facile of a question to ask and you ask it at too low a level. And so I think you're running into something that's very akin to the growing possibility, is that you can't set up a completely unarbitrary political system here, that you've got to establish a constitution that just mandates and restricts certain things or --

MEMBER KRESS: That's why I say you use the uncertainties in the PRA where you can.

CHAIRMAN APOSTOLAKIS: It's an uncertainty, Tom, that we never deal with, and that uncertainty is the one that I mentioned earlier. Look back in 1970, all the papers, unavailability of auxiliary feedwater system ten to the minus six. Ten

to the minus six was the magic number. Now it's two orders of magnitude greater than that. Why? We missed common cause failures, we missed this, we missed that. It's this kind of uncertainty that we are not dealing with, the uncertainty of the new. See, I can't find a way to raise the number that the AP600 gives me, but I know it's a new design.

MEMBER WALLIS: But "what if I'm wrong" doesn't help.

CHAIRMAN APOSTOLAKIS: But that's where you say --

MEMBER WALLIS: But "what if I'm wrong" doesn't help you at all. If I go out here and I push the button to bring the elevator, I assume that there's a high probability it will come, and worrying about whether I'm wrong when I do that and all the things I do every day based on the probability of various things is silly. I only worry about big things about where I'm wrong.

CHAIRMAN APOSTOLAKIS: It's also for new designs. The elevator is not a new design.

MEMBER WALLIS: Then I don't have to worry anymore. I don't keep asking. I don't keep asking about when I'm wrong.

CHAIRMAN APOSTOLAKIS: No, but when you

send a new spacecraft to the moon, then you should ask that question.

MEMBER WALLIS: Well, that's because --

MEMBER WALLIS: You have some reason to be unsure. But most of the time you know pretty well.

CHAIRMAN APOSTOLAKIS: I think if you look back at history, I repeat, it supports the view that if you have a new design, you really can't figure out everything.

MEMBER WALLIS: That's true.

MEMBER ROSEN: I think you're absolutely naive to think otherwise.

MEMBER SIEBER: Let me ask a fundamental question before we try to develop the description for you. Which of the three options will you concentrate on in developing the description, A is probably out of it, but B or C? One is process and the other one is what I think of as the element.

MR. KING: Yes. I don't think --

MEMBER SIEBER: And that determines what the description looks like, to me.

MR. KING: I don't think we know yet, and this paper is not intending to lean one way or the other. All the paper is intending to get from the Commission is direction to go develop such a

description, and then we'll consider B, we'll consider C, we'll consider any other bright ideas that people have.

MEMBER SIEBER: On the other hand, it seems to me that we have discussed here a little bit of both B and C. For example, when we say you have to have two different power sources or you have to have so many barriers between fission products and somebody's nose, those are physical requirements. Beyond that, though, you need some overarching set of requirements that says when you put this whole thing together here's the risk and here's the uncertainty and here's all the things we've done to minimize the uncertainty and fit this into the context of where we want to be in risk base. And so I think there's a little bit of that here.

MEMBER KRESS: We'd better move on to the next issue.

MR. KING: All right.

MEMBER SIEBER: Yes, let's.

MR. KING: Five issues in 30 minutes, all right.

MEMBER KRESS: That's easy enough.

CHAIRMAN APOSTOLAKIS: Well, what you need to do is to go to your recommendations.

MEMBER KRESS: Could be.

CHAIRMAN APOSTOLAKIS: Let's go to the accommodations and say why you're recommending a particular option. I don't see how else you can do it.

MEMBER KRESS: But he asks such wonderful questions on each one of those.

CHAIRMAN APOSTOLAKIS: He can raise them as he discusses the accommodations.

MR. KING: All right. Third issue, use of international codes and standards.

MEMBER KRESS: Let me ask you about that before we get into it.

MR. KING: Okay.

MEMBER KRESS: When I think of codes and standards I'm thinking of things like the ASME codes and ISO 9000. Some people think of safety standards and safety goals and risk acceptance criteria. What are we talking about here?

MR. KING: We're talking about the design codes --

MEMBER KRESS: Design codes.

MR. KING: -- maybe some programmatic codes like ISO 9000 and possibly some safety standards, particularly the IAEA safety standards,

because all of those are being used to some degree in these advanced designs, and we're going to be faced with having to deal with those at some point. And this issue really deals with do we want to deal with that in a reactive mode or do we want to deal with that in a proactive mode. And the recommendation is let's figure out a way to deal with that in a proactive mode so we can, one, have some influence on what these standards say if they're still being written, and, two, be prepared to deal with them when the application comes in, and, three, let's use them to help our infrastructure and efficiency standpoint. So that's really the recommendation.

MEMBER ROSEN: The issue is also some, all or one. I mean are you talking about all international standards?

MR. KING: No, no. And, again, it's the ones -- certainly the ones that are going to be proposed in an application we need to look at, but also where our infrastructure doesn't have a standard to deal with, particularly use the HTGRs as an example, you know, graphite structures that were manufactured, we don't have any standards in our reg guides or anywhere else that deal with what's an acceptable design code for graphite.

MEMBER ROSEN: How about INSAC IV on safety codes, just as an aside.

MR. KING: I'll skip that one. So the idea is not everything but where it improves our efficiency and where we know we're going to have to deal with it in the future. And to me, the implementation issue is let's figure out a way to go identify those and get some resource on reviewing or participating in the development of those standards. I think the issue -- certainly, one of the issues for the Commission is what's this going to take in resources, and that's a key thing, because you can't start and stop this kind of thing. If you're going to do it --

CHAIRMAN APOSTOLAKIS: But don't the Germans have the DIN system, D-I-N, so they have a -- like we have the ASME here producing all sorts of codes, they have the DIN.

MR. KING: The Germans have some standards, and they have some HTGR standards.

CHAIRMAN APOSTOLAKIS: So what do we do now? We want to check whether their standards apply to us or we look only for standards for which there is no American counterpart? I don't know.

MEMBER SIEBER: I think that what will

happen is that some foreign reactor vendor will come in and say, "I want to certify my design and it's built to these standards, ISO 9000 or what have you," and now you're going to have the job of reconciling the standards that it was designed to and built to to our standards and perhaps adopt or convert, as the case may be.

CHAIRMAN APOSTOLAKIS: Yes, but that's his problem. Why should we do that?

MR. KING: I mean it's our problem.

MEMBER SIEBER: I'm not sure that it's his problem.

MR. KING: Well, you mentioned a couple of things. We have a Management Directive 6.5 that gives the Staff direction to go use consensus standards wherever it's practical to do that, and they --

CHAIRMAN APOSTOLAKIS: I thought that was domestic consensus standards.

MR. KING: No. There's a sentence in there that says they make no distinction between domestic and international standards.

CHAIRMAN APOSTOLAKIS: Oh.

MEMBER ROSEN: That's in response to the OMB Circular --

MR. KING: Right.

MEMBER ROSEN: -- A-119?

MR. KING: Right.

CHAIRMAN APOSTOLAKIS: Correct. But that's very different from what Jack was just saying.

MR. KING: So as a matter of Commission policy, we're already expected to go take that approach wherever we can. So this is a way of saying to the Commission we need to do that for these future non-LWRs, not just because of the Management Directive but because we're going to get some applications that have this stuff in it. And the pre-application reviews are a good way to start to identify those, and that's another advantage of doing these pre-application reviews.

But in addition to that, we need to look at where do we want to have something on the books, because we don't have anything to deal with some of these non-LWR high-temperature materials, graphite, whatever it is, and how we actually go about identifying those I think is something that's part of the implementation. This paper doesn't say how we're going to do that other than we're going to have to look at the pre-application reviews and we're going to have to figure out what's the best way to go do that.

MEMBER SIEBER: It would seem to me that

if you're going to certify a design that utilizes foreign standards, that you're going to have to adopt a rule similar to 50.55(a) where the Staff has analyzed the standards and finds that it's adequate for the purpose intended, and before you invoke it as part of the certification process. That's the way I would see it.

MR. KING: That's one way to do it. Another way to do it is to codify through the certification process. Another way to do it is put it in the -- there's a reg guide that implements 50.55(a) that has a whole bunch of standards in it. I think the trend is to get the standards out of the regulation and into the reg guide and we could put some of these things into the reg guide. So there's different way to do it.

MEMBER SIEBER: Yes, but they all amount to the same thing. You have to do the work --

MR. KING: We have to do the work.

MEMBER SIEBER: -- to understand the standard and see whether it's applicable and then endorse it somehow.

MR. KING: Yes.

MEMBER SIEBER: Okay.

MR. KING: And maybe participate in the

development of the standard so it's, one, we understand it better and, two, that it does what we want it to do.

MEMBER SIEBER: That's right.

MR. KING: So all of that's wrapped up in there.

MEMBER SIEBER: And that's a good idea.

MR. KING: Yes. So what we're recommending is let's go do that. We have to work out the details to figure out how to do it, but that's the recommendation.

MEMBER SIEBER: Okay. Let's go do that.

MR. KING: All right. Fourth issue, now we're into the issues that were looked at ten years ago. I'll just go right to the recommendation. This has to do with --

CHAIRMAN APOSTOLAKIS: Yes. That's very good.

MR. KING: What, jumping right to the recommendation?

CHAIRMAN APOSTOLAKIS: Yes. Page 18, right? You say you want to go to the recommendation?

MR. KING: Yes.

MEMBER WALLIS: I think we should read the disadvantages or probablistic approach first.

CHAIRMAN APOSTOLAKIS: Look at the recommendation. The rest is just --

MR. KING: I'll mention on the previous issue the workshop participants were in favor of us going ahead and taking the proactive approach, so there wasn't any disagreement there.

MEMBER KRESS: Let me ask one context question here. Is it the assumption here that for these new plants there will be a set of design basis accidents, and you're dealing with now how to select those?

MR. KING: For the pre-application review so far, they've all taken that approach, and this is a method and approach to how you select those.

MEMBER ROSEN: Why do you call them design basis events?

MEMBER KRESS: Because they'll define the licensing basis then.

MEMBER SIEBER: Well, you design features into the plant to prevent design basis events from having a safety impact on the public. The problem is that when you do a PRA, what you end up finding as the risky parts of the plants are the severe accident things, which go beyond design basis. And the reason why that happens is because when you define the design

basis events, you design at an impact.

MEMBER KRESS: Yes. I don't think there's anything wrong with that.

CHAIRMAN APOSTOLAKIS: And that's why you have a safety goal.

MEMBER SIEBER: I don't either. On the other hand, why not start with a clean piece of paper and do a probablistic assessment to define what the design basis events ought to be?

MEMBER KRESS: I think that's what he says.

CHAIRMAN APOSTOLAKIS: That's what he says.

MEMBER KRESS: Yes. I think that's exactly what he's proposing.

VICE-CHAIRMAN BONACA: Let me ask you a question, and I agree with this anyway, but I have a question. First of all, clearly, here you're talking about the event selection, they are not going to be anymore sooner events bounding because that's not the issue anymore. So I mean in the conditional accident analysis, you define the concern with some possible effect in the plant, activity insertion, for example. You found the bounding event. You did make it even more bounding by assuming ejection with very high

ejection rate, very fast ejection rate, and that's how you got to bounding the particular effect. You're not talking about doing that, you're talking about identifying an event and making it -- okay. So you're going on a best estimate.

CHAIRMAN APOSTOLAKIS: Well, he's not saying where he's going.

VICE-CHAIRMAN BONACA: Well, I'm trying to understand it. And the other issue that I would like to touch on is take the PTS rule, for example, or the change we're doing right now. We eliminated as important events to be considered for those changes steam line breaks because we gave credit to the operators for preventing steam line breaks from causing the limiting overcooling. So therefore the steam line breaks are out of the table for that particular thing. How shall we treat the operator action here in plants that are new, new designs? We don't know really exactly how they'll respond.

MR. KING: Yes. What you're talking about is uncertainty. Again, the PRA is going to make assumptions on human performance and operator actions. If you don't believe it, that's where the engineering judgment and the deterministic overlay on what the PRA tells you is going to come into play. So this paper

doesn't lay out a detailed process as to how you do that, but it says that's the concept behind this.

VICE-CHAIRMAN BONACA: I understand. I guess I mean details, but they're very important details and the devil is in the details.

MR. KING: I agree. I agree. Again, in 1993, what the Commission approved was a process that said let's deterministically said pick the design basis accidents and then let's take a PRA and see if we missed anything. What we're proposing now is something that flips that around and says let's start with a PRA and then where we feel we've got uncertainties in the PRA, incompleteness or whatever, let's then use our engineering judgment and supplement what the PRA says. So this goes beyond what the Commission said in '93. The real question I think for the Commission is does it go beyond the PRA policy statement, because the PRA policy statement says use PRA to complement the traditional deterministic approach. What does complement mean? Does complement mean --

CHAIRMAN APOSTOLAKIS: That has to change.

MEMBER ROSEN: And that's what he's proposing.

MEMBER KRESS: He's proposing to change.

CHAIRMAN APOSTOLAKIS: I would propose that you rephrase the first bullet. The first bullet should be rephrased, I think. It's not --

MR. KING: Which one?

CHAIRMAN APOSTOLAKIS: "Larger uncertainties make PRAs less useful." I mean the whole idea of a PRA is to look at uncertainties, not the way the industry is doing them now but that's a way .

MEMBER KRESS: Well, I think what he means there is the difficulty in characterizing the uncertainties for the non-LWRs.

MR. KING: What I meant is --

CHAIRMAN APOSTOLAKIS: Yes. But that difficulty exists regardless of whether you do a PRA or not.

MEMBER KRESS: No, it's more difficult -- yes, but it's more difficult --

CHAIRMAN APOSTOLAKIS: It's difficult to quantify.

MEMBER KRESS: Yes. That's what --

CHAIRMAN APOSTOLAKIS: That's what you should say, that it's difficult to quantify.

MEMBER KRESS: But I think whether you use the deterministic approach supplemented by PRA or PRA

supplemented by the deterministic, you end up at the same place.

MR. KING: Maybe.

MEMBER KRESS: Yes. And, you know, I don't think it matters whether -- let's say you select a set of design basis events just from judgment on what can go wrong and judgment on the frequency of them and say we'll look at this and then we'll impose an arbitrary source term based on the type of reactor it is, we'll impose a single failure criteria and the other kind of stylized things we do, and the you have a design based on that. Maybe you have to use the PRA and see if you meet your uncertainties, your defense-in-depth, your safety goals or whatever you have. If you don't, you have to select -- do something more in design basis space. So you would end up the same way either way you go, but it just makes sense to me to have the design basis accidents first because that's what the designer designs to.

MR. KING: Well, I agree with that.

MEMBER ROSEN: Not true. My new vision is the designer designs to the PRA. He does a PRA and says this is unacceptable, and then he puts in more of --

MEMBER KRESS: But you have to have a

design before you do a PRA.

MEMBER ROSEN: You can lay out the conceptual design.

MEMBER KRESS: Well, in any case, I think they're iterative.

CHAIRMAN APOSTOLAKIS: It is iterative.

MEMBER KRESS: And you can't say these are the design basis accidents --

MEMBER ROSEN: I think it's iterative.

MEMBER KRESS: -- because you have to iterate.

MEMBER ROSEN: I agree, I think it's iterative, but I think this is a fundamental improvement to the way we do business.

MEMBER KRESS: Oh, I do too.

MEMBER ROSEN: And it's a very high time that we start to do and think this way and that I don't think you'll end up in the same place. I think you'll end up in a better place with this.

MEMBER KRESS: Well, you may end up in the same place.

VICE-CHAIRMAN BONACA: You'll end up in the same place because you'll iterate.

MEMBER ROSEN: You won't spend money needlessly, that's Jack's point, is that there will

lots less false starts and going in the wrong directions. But my point is more than that, you'll end up not just half independent, you won't end up in the same place. You'll end up in a place in the design space that's better because you'll have considered all the things and made rational choices along the way about what's likely and what's not.

MEMBER SIEBER: Well, you spend the money where you make the biggest impact on --

CHAIRMAN APOSTOLAKIS: We seem to agree with what Tom is proposing so we might as well move on.

MEMBER WALLIS: Not just it's the regulators, it's the designer of the reactor has to do this.

MR. KING: Yes.

MEMBER WALLIS: Has to do the PRA as part of the design process. Of course. That's where it has the biggest effect, it seems to me.

MEMBER KRESS: So since we're regulating that a PRA has to be part of the process, which is interesting, we ought to move on to the next --

MR. KING: All the industry representatives at the workshop agreed with this approach. The public interest groups said, no, they

don't trust PRA. That was basically the bottom line. And there are a number of implementation issues associated with this. It brings PRA more into the licensing basis, so you've got the PRA quality documentation.

CHAIRMAN APOSTOLAKIS: Is there another name? Aren't you the public interest group?

CHAIRMAN APOSTOLAKIS: You're a public interest group.

CHAIRMAN APOSTOLAKIS: You're a public interest. In fact, you have responsibility, actually. You don't just talk. You are -- the NRC is the public interest group here.

MR. KING: So if I work on this on my retirement time, I'm a public interest person, right?

(Laughter.)

CHAIRMAN APOSTOLAKIS: Well, I just don't know that we have to call those public interest groups. Special interest groups. I'm sorry, that's the way it is. You are the public interest group.

MEMBER POWERS: More risk-averse non-owners.

(Laughter.)

MR. KING: All right. Source term.

MEMBER SIEBER: Do it right unless you're

too tired and then do it inter-boundary way.

MR. KING: Well, again, this is an issue the Commission looked at ten years ago. What they approved was let's use scenario-specific source terms for licensing decisions, the two key ones being siting and containment performance. Again, there was some caveats that went with that in the sense that, hey, we better make sure we have sufficient understanding of fuel and plant performance and fission product transport before we go ahead and do that, which puts a burden on the licensee as well as the Staff to understand how those things perform.

It also said the events selected for source term evaluation should bound design-dependent uncertainties, that's fine, and severe accidents. Now, they didn't mean severe accidents in the sense of core melt, they met severe accidents in the sense of some low probability events that would bound these uncertainties. Now, Commissioner Rogers in the SRM in '93 did question this as is this really practical to do, but the SRM itself approved this.

To me the fundamental question is -- and we're recommending let's retain that guidance and the details in terms of conservative analysis and level of confidence and so forth will be an implementation

issue. To me the fundamental question on the source term is for LWRs the source term is based upon an in-vessel core melt, you know, a severe accident, severe core damage type event. Should that be considered a fundamental element of defense-in-depth that we always want for siting decisions and containment decisions, do we want to assume severe core damage? To me that's the policy issue for the Commission to wrestle with. They wrestled with it ten years ago, and we're recommending that keep that position, but that's what I see as the heart of the issue.

MEMBER KRESS: Now, when you talk about a reactor-like prism, a big pool of molten salt, I mean molten liquid metal, when you're talking about a source term here and stuff has to get out of that liquid metal before it goes into containment --

MR. KING: Do you give credit for the --

MEMBER KRESS: Yes, yes.

MR. KING: -- for the scrubbing or whatever you want to call it?

MEMBER KRESS: Yes. Do you allow credit for those kind of design features?

MR. KING: Yes. That's an implementation issue, and this paper doesn't deal with that. But the same with an HTGR, the graphite's going to retain

some, some is going to plate out on the vessel walls and so forth. How much credit you give for that, I'm not sure.

Now, the workshop did not have a consensus on this issue. There were some industry folks who -- some industry folks suggested that maybe we ought to develop the equivalent of NUREG 1465 for HTGRs, that the Commission ought to just come out and say, "Develop one bounding source term for HTGRs and that's what we use." Others agreed with this recommendation. So there wasn't a -- I can't say there was a consensus in the workshop on this.

MEMBER POWERS: I'll bet you that if we have several gas-cooled reactors, that in the course of doing ordinary regulatory analysis that you will find a 1465-like source term becomes necessary just to carry out business. I mean it will be a regulator's tool. I don't know that you need to bring it up here in this, but I'll bet you that's the way it turns out, that you just need something to tell you what happens in an accident to kind of evaluate options and stuff like that.

MR. KING: Yes. You may be right.

MEMBER POWERS: It will naturally evolve that you just need something to conduct conversations

with people rather than relying on some computer code calculation and uncertainty bars this big and things like that.

MR. KING: Yes. I mean Fort St. Vrain used an adaptation of the old TID source term on timing and some retention, but it was basically severe core damage.

MEMBER POWERS: I mean you just need to do it just to be able to talk, because you trip over uncertainty bars and things like that. You know, when you come down to quantify it, you come back to your specific calculations.

MEMBER KRESS: I still think you've got a lot of difficulties, because you could end up with a WASH-740 source term. You've got all these fission products in there, you might as well use all of them. I mean that's a bounding source term. So you've got to decide where to stop.

MR. KING: Yes. Do you assume the graphite --

MEMBER KRESS: And that ought to have something to do with the design concept on top of the reactor head.

MR. KING: That's the idea behind going with this scenario specifically.

MEMBER KRESS: And you'll have to look at, I think, frequencies and probabilities also.

MR. KING: If you want to add realism and give credit to the designer and give him some incentive to reduce core damage likelihood, then this is the approach that would do that.

MEMBER KRESS: But I agree with Dana, you may end up with some sort of a source term, but it will have to be reactor type specific.

MR. KING: Okay. Next issue, containment versus confinement. I'll say up-front there was no consensus at the workshop on this, absolutely none, so I'll just leave it at that. This was an issue the Commission, again, looked at ten years ago. They basically came out and said, "Okay, we're not going to require a pressure retaining containment building. We're going to develop some performance criteria."

MEMBER WALLIS: What's wrong with pressure? You're trying to retain fission products.

MR. KING: Well, that's the idea of pressure retaining --

MEMBER WALLIS: Well, I know, but I mean retaining pressure is -- there's nothing wrong with pressure per se.

MR. KING: No, no. It -- leak-tight maybe

is a better way to say it, leak-tight.

MEMBER WALLIS: Right. That's better.

MR. KING: Okay. What the Commission said ten years ago was, "Here are some performance criteria that you can use. One, whatever building you have, you have to be able to show you can meet your release limits." But, two, it said, "Okay, you need to postulate a core damage event and then for 24 hours following the onset of that core damage event the building has to maintain that leak rate that's assumed in the analysis. In other words, the building can't have a hole develop in it. And then after 24 hours, you can take measures to reduce the pressure inside but don't have any uncontained release of radioactivity. Basically, you have a vent system, you can have a filter system to help reduce stress on the building, but the building can't fall apart."

What we're proposing, and, again, the fundamental question for the Commission is should a leak-tight building be a fundamental aspect of defense-in-depth or not? What we're proposing is to supplement that guidance. We're proposing let's retain some set of performance criteria that will guide you as to whether you need pressure-retaining building or whether you can get away with a

confinement-type concept. But let's not automatically assume we have to go to a core damage event. Let's use the results of the event selection and source term process to decide what the challenges are. And as Farouk said, these things are linked, so this is the linkage.

But then add another criterion that says, okay, if you're coming in with a confinement building, you ought to take a look at whether if you did add a leak-tight building, a containment-type building, would it really make a substantial improvement in safety? And if so, then maybe we ought to consider --

MEMBER WALLIS: The definition of that substantial may be the same as in the regulatory analysis definition?

MR. KING: Yes. And Reg Guide 1.174, the ten percent change. If it's greater than a ten percent change for whatever metric you're using, LERF or --

MEMBER WALLIS: This concerns me a bit, because when I looked at the SAMDAs for AP600 I came to the conclusion that the containment building was worth about $1,400 in terms of the ten to the minus seventh and things they were predicting. Then the conclusion would be it's not worth building, and yet

we did. They do have a containment building for AP600, so this doesn't seem quite consistent with that logic.

MEMBER ROSEN: Well, maybe the numbers are incorrect.

MEMBER WALLIS: Because you didn't believe their numbers or something where the defense-in-depth and all that stuff comes in.

MEMBER KRESS: Are safeguard issues likely to override this?

MR. KING: I don't know. This is not a security issue. To me whether you have a leak-tight building or a confinement building, either one can be strong to prevent or protect against external events, so from a security -- I mean I don't know where the security issues are going to end up, and they could have some impact on this, but this, to me, I think you can deal with the security issues separate from making the leak-tight versus non-leak-tight decision.

MEMBER POWERS: Tom, when I look at disadvantages of pressure retaining buildings and think about this issue, the uncontrolled pressurized release of radioactivity emerges as a disadvantage of the containment design. You can bust it and build up all that pressure, you get a heck of a release.

Whereas a confinement you're much less driving force for. A lot of people -- not an original thought on my part -- a lot of people have looked at that, and we see the Europeans, especially in Sweden, moving to these hybrid kinds of designs where they achieve some period of retention, and then they deliberately open up the containment and do a vented filter design and what not. Is that something that the Commission needs to be aware of as an alternative between classic pressure vessel-type containments and say Savannah River-type containments?

MR. KING: It seems to me those concepts -- if those concepts met the criteria that were being proposed, then any of those would be acceptable. So to me it's not an issue -- a question of do we want the Commission to pick one concept over another at this point, although maybe it's worth mentioning. I don't disagree with that, but I'm --

MEMBER POWERS: It's really the only question I'm asking is if in your background you need to comment on these hybrid-type designs?

MR. KING: No. I think in the background that's probably a good idea.

MEMBER POWERS: Yes.

MR. KING: Okay. Let me say something

else about security. I think from external threats, the question of leak-tight versus non-leak-tight is to me not a security issue. Now, when you -- I don't know what's going to help security in terms of internal threats and then it might have some bearing on what kind of core damage you need to assume, and that should drive you to the leak-tight versus non-leak-tight decision. So I think there is some link in security when you're talking internal threats. That's my own personal opinion. All right. I have five minutes.

The last one is emergency preparedness. What the designers have proposed is in the extreme to shrink the EPZ down to the site boundary. This was looked at in the past as well. The Commission at the time said, "We're not ready to do that. Let's keep an open mind, but we're just not ready at this point." Basically, we talked about this at the workshop and basically what it boiled down to was a discussion of in the near term this seems to be a moot issue for two reasons.

One, for HTGRs, which are probably the most likely near-term non-LWRs, the regulations already allow a provision for case-by-case determination of the EPZ. For the early site permits

that are being talked about, they're all being associated with existing sites which have the EPZ consistent with today's regulations and all the other things that go along with emergency planning, so it's sort of a moot issue for those.

So the thought was we don't really need to deal with this issue now. Perhaps what we ought to do is let the designs progress, and then if at some point in the future it becomes an issue, deal with it then. Maybe we'll have more experience, more testing under our belt, whatever. So that's the recommendation we're making to the Commission.

MEMBER ROSEN: You're aware of the Gen IV objectives.

MR. KING: The Gen IV objectives are, yes, basically no off-site impact.

MEMBER ROSEN: Yes. The whole idea was that you wouldn't need this, and that set a very stringent bar for the Gen IV plant.

MR. KING: But, again, Gen IV is 20 years down the road.

MEMBER ROSEN: Yes, I know. But something would have to be done different with this if the Gen IV plants were to be a reality.

MR. KING: Again, we're not trying to say

no forever, we're just trying to say we don't have to deal with this right now for these near-term designs. So let's wait a little bit and see how things develop.

Anyway, that's the presentation. Let me just say a couple words in summary. What this paper is trying to do is get direction from the Commission at high level on these issues. There's a number of implementation aspects that have to be dealt with, but we would propose to deal with those after the Commission points one way or the other how to go on these issues. So we recognize there's a lot of follow-on work. We'll be back to the Committee a number of times on a number of issues, and some of these are linked together in sort of a package deal the way we've put the paper together. So with that, I'll --

MEMBER ROSEN: I'd like to come back to the Gen IV point for another reason. You need to make sure that whatever you do at this particular point that you don't deincentivize Gen IV from attempting to read this thing. You need to make it very clear that this could be -- this could be addressed again in the future. Because if this is it and somebody reads it as forever, then all kinds of different things might happen in the Gen IV --

CHAIRMAN APOSTOLAKIS: But Gen IV won't pay much attention to regulatory matters.

MEMBER ROSEN: They will.

MR. KING: I think it's a good point.

CHAIRMAN APOSTOLAKIS: Maybe this will be a good incentive for them.

MEMBER KRESS: I don't think it's only a good point, I think you devise your regulations to do what you want to and let the plants worry about how to meet them.

MR. KING: Well, except on this one we're not saying, no, at this point, we're saying let's put that off, let's defer this one to a later --

MEMBER KRESS: Of course EPZ, that could be considered just an element of defense in depth and say we are goinmg to require it.

CHAIRMAN APOSTOLAKIS: Okay thank you. Tom are you happy with that?

MEMBER KRESS: Yes, very happy with that.

CHAIRMAN APOSTOLAKIS: Okay we will come back at 1:30.

(Whereupon, the proceedings in the above-entitled matter went off the record at 12:02 p.m. and went back on the record at 1:32 p.m)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(1:32 p.m.)

CHAIRMAN APOSTOLAKIS: The meeting will come back in session.

The next item is the draft final American Nuclear Society standard on external events methodology. The cognizant member is Dr. Powers.

Dana.

MEMBER POWERS: We're going to discuss yet another of the standards that are getting proliferated lately on how to write a PRA.

MR. BUDNITZ: No, that's not what our standard is.

CHAIRMAN APOSTOLAKIS: Wait, wait, wait.

MR. BUDNITZ: On the record, if he thinks that's what this standard is, he's off base, and if everything else is predicated on it, then that's all off base.

CHAIRMAN APOSTOLAKIS: This is going to be exciting.

MR. BUDNITZ: It's very, very important that people understand that distinction.

CHAIRMAN APOSTOLAKIS: Your turn will come.

MEMBER POWERS: To correct myself, a set

of requirements for PRAs, and those of you that have been on this committee for long enough know that I have struggled and struggled over these what I call soft standards because they're really quit radically different than the standards that you get used to in the metallurgical professions where they kind of say, "Do it this way."

There are two ways in the world to do it, the code way and non-code way. And so if you want to comply with the code, you do it this way.

These are different because PRA people need lots of flexibility, I guess.

This particular standard is going to deal with how you do an external event PRA.

MR. BUDNITZ: No, it doesn't deal with how you do an eternal --

MEMBER POWERS: The other thing about PRA people is they can split hairs better than the best of us.

MR. BUDNITZ: Just speak in plain English.

MEMBER POWERS: The external events PRA is a subject of troublesome definitions throughout its history. In the past, fire has been included in the external events PRA, but here it's not.

On the other hand, fire is not included in

the internal events PRA. The fire is left abandoned someplace, neither in internal nor external, nor is it really provided for in an FDA 805.

This --

MEMBER SIEBER: May IEEE should do it.

MR. BUDNITZ: Well, there's another committee writing fire standards right now.

MEMBER POWERS: This particular set of requirements for an external events PRA really focuses primarily on things like seismic events, external, not internal, but external flooding events, high winds like tornadoes and hurricanes and things like that.

It has been written to closely parallel the structure that was created by the ASME committee for the internal events PRA in the sense that there is a bunch of capability categories for the PRA, and that has proved to be one of the more challenging aspects of the standard to understand.

In addition, it includes material on what's called the seismic margins method for analyzing the plant, and the standard goes to great lengths to try to say, well, that's the kissing cousin of a PRA. Whereas myself, I view them as almost antithetical to each other.

The presentation we're going to have today

is a little different. We've previously gone over the major structure of this set of requirements for a PRA, and so what Mr. Budnitz has proposed to do is to give us a bit of an introductory to the subject and then throw himself open to ask questions.

He did say questions and not heavy objects.

MR. BUDNITZ: I'll catch them if you throw them.

MEMBER POWERS: And there are lots of things in here that are worthy of trying to understand better. For instance -- see, Bob, I get the introductory. So I get to talk a while -- is that when you think about -- most of the standard deals, as it should, with seismic events. That's by far and away the one that's ubiquitous for nuclear power plants. Most of it deals with the seismic events.

And when you think about seismic events, what do they do? Well, seismic events knock things down, break things, and cause fires.

The standard deals a whole lot with knocking things down and breaking things and really deals very, very little with fire, and in fact, does not invoke an appeal to something that would deal with fire for you the way it does with internal events.

In fact, the standard is predicated on the availability of an internal event, but it is not predicated on the availability of a fire PRA. That's an issue that I think I would like to understand more about.

The difficulty with soft standards like this is that you look around and you say, "Now, how do I know that this set of requirements is both necessary and sufficient?"

You know, if I follow this, that I will get an adequate PRA, and they don't provide evidence of this. It's quite different, again, than the standards we have like in structural mechanics and whatnot.

And I had reasons to raise this question earlier with Bob, and he gave me the good advice. He said, "Well, you're taking the judgment of experts, and if you trust those experts, then that's how you judge the necessary sufficiency of these," and I though that was probably the right answer here.

What I find interesting is that you look at this panel, the working group that put it together, and you say, "Gee, how many of these people have actually prepared a seismic PRA so that I have some confidence that this set of requirements can be done

and that it will be adequate when the product goes out?"

And I don't know the answer to that.

So with that introduction and background on what we're going to hear about, I guess I'll turn the floor over to Bob. He will give his introduction, and then I guess he will throw himself open to questions, and he says he will catch bricks if thrown at him.

MR. BUDNITZ: Yeah. Okay. Thanks, Dana.

And you can ask both of those questions again because I'm not going to try to answer them here directly.

I've just got to tell you a little history. The ASME standard began in early '98. About a year later, in the spring of '99, the ANS -- the ASME standard is internal events PRA methods -- the ANS took it upon itself with ASME's concurrence and understanding that ANS would develop a standard for external events PRA methodology that would we always use the word "be hand and glove with the other." They could be used together. That was the objective.

You want to have them both on the table in front of you if you're an analyst or a reviewer, and they should be able to be used together just as if it

was another chapter.

And with that objective in mind, the ANS appointed a working group -- you see them in front of you -- in the sort of September time frame of '99. I've been the chair right along, and the straight truth is the standard is written by Ravi Ravindra, Nilesh Chokshi and me. We wrote it.

The other three didn't write a thing, but they were crucial reviewers in the first draft. Let me be sure you understand what I mean. We decided rather early that it was easier for a smaller group and we were willing and able; easier for a smaller group to write something than a bigger group.

In fact, ASME's curse -- and I was on that committee -- was there were 18 people, 14 of whom were trying to write something. It's very, very hard, and it wasn't necessary. In fact, it's actually counterproductive.

So the three of us wrote it: Ravindra, Chokshi, and me. And Stevenson, Henries, and Yee were, as I said, first round reviewers before it went anywhere else, in fact, before you know -- as soon as something was on paper, sent to everybody; they were there. And that was a crucial piece.

Now, to answer your question about PRA,

all six of us have actually performed seismic PRAs, a lot of them. We're practitioners.

The number of practitioners in this field is only a couple dozen, and you probably know a lot of them, both on the systems side and on the hazard side, and we worked along from the fall of '99 until the end of the year 2000, about a year and a quarter, and I actually clicked off -- that's what you do nowadays with your computer. You click and it's done -- sent off the draft, first draft, for public comment on December 25th, 2000, a date to remember for those of you who are Christians, and it went out for public comment the week after the New Year.

And you got it for public comment, too. Public comment period ran from early January to early April, and you got it. And I was here in February, I think February 2 or 3, 2001, right here discussing it with you, and you commented, too.

And by April 2001, we had a whole lot of comments on that draft, which took a long time to try to sort out.

We have an oversight committee, the ANS, like ASME, has an oversight committee that oversees the working group, and that committee met in perhaps September. I think that's right, September 2001.

Six months had passed since the close of the public comment period, and in a couple of days, sorted through what their guidance was to be on a couple of very crucial issues, and I'll explain them in a minute.

And then we went off in perhaps October of 2001 and wrote it again. Because everybody here is a volunteer, these things don't get done in a day, but by April we had another draft, April of this year, 2001. It was about six months later.

And we sent that out both to the parent committee and for public comment, and the balloting ended in August, I guess, and we got favorable ballots from all but three or four parties. I'll explain that in a minute, what we got back.

And even though the balloting was positive, we got a whole lot of comments, but mostly little stuff, a lot of little stuff, which had to be incorporated, and I have now, with Ravi and Nilesh, I have now pulled that together, and just three weeks ago perhaps I sent off what we think is the final version to you.

But what you have is also the final version that has gone back to the committee. The committee balloting, by the way, was positive, even

though I guess there were four negatives, and I'll tell you about that in a minute. I'll tell you what the issues were.

We also got a lot of public comments. You know, people send in comments. So we incorporated them, a whole lot of little stuff, nothing really crucial except some things we couldn't accommodate, which I'll explain, and that's been complete, and now it has gone back to the committee.

The idea is, you know, even somebody who voted yes, maybe I screwed it up as the chairman or, you know, we screwed it up. So they get a chance at -- you don't get a chance at bringing in a new comment, but you get a chance to see whether or not the resolution of somebody else's comment was okay, and that's in the process now.

It's a one month thing that started about November 15th, and the week after next it is going to be done, God willing. Three and a half years. Okay?

So that's the schedule. Now, the process. It's been a volunteer effort all the way through with one crucial caveat. The Nuclear Regulatory Commission gave the ANS a grant some time in the fall of '99, which paid for administrative costs of the ANS staff and for travel for the group so that we could travel

to have meetings.

By the way, the grant also covered lower power shutdown standard, which is going on in parallel. We'll talk about that, but that grant is there, and you didn't have to pay for my travel today because I'm now in Washington. You know, I rode the Metro, I won't charge you for it.

Now, just one more thing about me, and then I'll talk substance. For the whole duration of this standard I was, as I have for more than two decades, the president of a one man consulting company in Berkeley called Future Resources Associates, Incorporated, and that's what was in the standard. It's me.

In all the work that was done with that hat on, I became a Livermore employee several weeks ago, and with Livermore's understanding I'm continuing this in a voluntary effort until we get it done, but none of this has to do with Livermore, although I'm a Livermore employee. That's a disclaimer. It's very important you should know.

Furthermore, I was hired at Livermore to go on detail to the Department of Energy Yucca Mountain Project, which is where I'm working in Forrestal now, and nothing I'm saying here has

anything to do with DOE or the Yucca Mountain Project either.

This work was all done before, and I'm just continuing it to its completion as a volunteer. I just had to say that for the record because you understand why it's important to say that.

Now, those procedural things aside, here's what's left. If the balloting from the committee comes back December 15th and everybody does what they do, we hope to turn around the no votes, but one doesn't know.

Then the ANS will issue the thing in final form, but there's one more round. Because ANS is one of the standards development organizations under ANSI, the American National Standards Institute, it has to go to ANSI, and they publish it on their thing for another 30 days, and you know, then it's done.

And you might get a comment, although when the ASME standard went out, we didn't get any comments in that round. Everybody had done it before.

So, you know, it will be another couple of months and then it will be done. All right? So that's the procedural stuff. Now, let me talk some substance.

When we had the first round draft, and I

said we published it December 25th, 2000, and the commentary went through April, those of you who aren't familiar should know and those of you that aren't, that will remember will remember that we only had one element of requirements, not three like ASME. One set of requirements for everything. You know, there's just one thing to do. No gradations, a graded approach towards the requirements.

And the committee came back and said they wanted to have three capability categories just like ASME. So we did that.

That turned out to be a completely non-trivial exercise. It was just very -- I mean for us experts, it was very, very difficult.

And what was difficult was because we had a very hard time trying to sort out what might go in Column 3 that was separate -- that's the highest capability category -- that was separate from Column 2, which is today's sort of state of the art or standard practice.

And we also had a terrible time because we had lots of back-and-forth with people that thought that the signs of margin approach should be in Column 1. But we argued back with them that signs of margin is not a PRA, doesn't go in Column 1. Column 1 is a

PRA of a certain kind, and we fought that off.

I mean that. I have to say the word "fought" outright, and so you see those three categories there, and if you want to talk about what they mean, I'll explain exactly what they mean.

But for some capability requirement to be in Category 3, it has to have been done by somebody some time somewhere, published, and has been accepted as okay. Okay?

CHAIRMAN APOSTOLAKIS: Category 3?

MR. BUDNITZ: Yeah. In other words, if we have a requirement in Category 3 that's separate from Category -- you know, some of them go all the way across.

CHAIRMAN APOSTOLAKIS: But I thought Category 3 was --

MR. BUDNITZ: That's very important.

CHAIRMAN APOSTOLAKIS: -- Category 3 was pushing the state of the art.

MR. BUDNITZ: No, it's not pushing the state of the art in our interpretation, and I want to make sure you understand. Category 3 for us means that somebody did it somewhere and published it, and we've said it made sense. It wasn't just sort of off the wall or somebody said, "Well, ask Joe."

CHAIRMAN APOSTOLAKIS: Let's think about it now.

MR. BUDNITZ: It's very important.

CHAIRMAN APOSTOLAKIS: You know, you go to the old days when Zion Indian Point PRAs were done, when a small group of people pioneered and did their seismic analysis.

MR. BUDNITZ: Yeah.

CHAIRMAN APOSTOLAKIS: So that would be no category because nobody had ever done it before.

MR. BUDNITZ: Well, we're writing this in the year 2000, George, when we have --

CHAIRMAN APOSTOLAKIS: Yeah, but somebody once --

MR. BUDNITZ: -- we have 75 PRAs on the shelf, 25 of them overseas..

CHAIRMAN APOSTOLAKIS: So if I want to advance the state of the art, I still end up in Category 2?

MR. BUDNITZ: If somebody somewhere had done a piece of work in a particular area that we thought was -- you know, had advanced the state of the art as of the year 2000 and we thought that was -- so somebody else could do it, right? So if somebody else didn't have to again, that's what we wrote in Category

3. I just want to make sure you understand that that's what we wrote. I'm just --

CHAIRMAN APOSTOLAKIS: But I thought the ASME though -- the ASME Category 3 was different.

MR. BUDNITZ: No.

CHAIRMAN APOSTOLAKIS: The ASME Category 3 was the state of the art of --

MR. BUDNITZ: No, no, no.

CHAIRMAN APOSTOLAKIS: No?

MEMBER ROSEN: Good enough to be risk based.

MR. BUDNITZ: Yeah, it was a PRA.

MEMBER POWERS: When I looked at --

MR. BUDNITZ: Just wanted to be sure you understood that. so --

MEMBER POWERS: When I looked at the standard, I looked at the requirements in each of the categories. I became hopelessly confused about all of this until I went back and read your introductory paragraph in which you described what the categories are.

MR. BUDNITZ: Right.

MEMBER POWERS: And I found that suddenly -- I mean, it was very helpful to read, and if you're doing any rewriting, I really recommend highlighting

that even more than you do.

MR. BUDNITZ: Well, you're supposed to read it from the beginning. I guess you read the newspaper from the back.

MEMBER POWERS: I --

MR. BUDNITZ: Go ahead, Dana.

MEMBER POWERS: I read it, but I think that I didn't pay so much attention.

MR. BUDNITZ: Thank you, thank you. We struggle with that.

MEMBER POWERS: It's worth reiterating, I think, that the categories represent different states of resolution of the result. That is, if I want resolution only to the level of trains, then I do a Category 1. If I want it to the resolution of components, I do Category 2. And if I want a finer resolution, then I do Category 3.

CHAIRMAN APOSTOLAKIS: Failure modes, in other words.

MEMBER POWERS: Yeah, yeah. And suddenly, before when you would go through and you'd look at these categories and you'd say all of the things that they are requiring here are the same for all of the categories. What does this mean? I mean, there's no difference here.

Then when I reminded myself it's a matter of resolution; yeah, the requirement is the same, but the way you apply the requirement is at a different level of resolution, then it all makes perfect sense. It's just fine after that.

MR. BUDNITZ: Well, I guess, just to be sure you understand, and it's on Table 1.1, something is in a higher category if it has either more scope or level of detail or more plant specificity versus generic or more realism versus conservatism. Any one of those picks it up. More of them pick it more.

CHAIRMAN APOSTOLAKIS: As long as somebody else has done it first.

MEMBER POWERS: And none of that -- yeah. None of that helped me --

MR. BUDNITZ: No requirement in here is something that no one has ever done.

MEMBER POWERS: None of that --

MR. BUDNITZ: That's very important.

MEMBER POWERS: None of that plant specificity of whatnot helped me a bit. It was the level of resolution that really made it much more palatable to read what you had written.

MR. BUDNITZ: Thank you.

CHAIRMAN APOSTOLAKIS: Does that apply to

the ASME standard as well?

MEMBER POWERS: Well, I don't know that.

MR. BUDNITZ: You're more expert on that.

CHAIRMAN APOSTOLAKIS: I'm not sure. I don't remember that.

MR. BUDNITZ: George, I think so.

MEMBER POWERS: But it didn't matter. I liked it.

CHAIRMAN APOSTOLAKIS: No, I like this, too, but I don't remember ASME saying the same thing.

MR. BUDNITZ: All right. I think so. So let's go on.

We had a terrible time trying to sort out how to write the three categories, and so you'll see that most of the requirements --

MEMBER POWERS: You --

MR. BUDNITZ: -- most of the requirements -- because we had to sort out what this meant to us, and we're supposed to be the experts, practitioners.

Most of the requirements go all the way across, which really means the same words apply, but if you have more specificity, you can claim you're in another category, see, or if you have more -- more --

MEMBER POWERS: More resolution.

MR. BUDNITZ: Right.

MEMBER POWERS: Well, you know, I mean, see, that bothered me a lot because sometimes you're doing it for us and sometimes it's just two categories, things like that. But when you interpret it in terms of resolution --

MR. BUDNITZ: That's a fair comment.

MEMBER POWERS: -- then suddenly you say it doesn't matter if it goes all the way across. This is just illustrating for you that there are different levels of resolution in the PRA, and the requirements probably are the same for all three of them. The high level requirements are all the same. It's just a matter of resolution.

MR. BUDNITZ: Right. So let me go on. I have two more things to say, and then I'm going to turn it to you. One has to do with uncertainty.

This standard from the start imbeds uncertainty issues, uncertainty requirements about developing and expressing and writing down and analyzing uncertainties in a way that is intrinsic to everything that we've done.

If you read it and you don't see it, you're blind. It's in there everywhere. We were careful about that. It meant a lot to us.

MEMBER POWERS: Even in the lowest

category.

MR. BUDNITZ: It meant a lot to us.

Now, I'm contrasting that with the ASME standard on which I was a member. I was one of the 18, in which that's absent, and by the way, it's glaringly absent, and I can tell you that in some discussions inside the committee, there was a minority, of which I was one, that wanted that, and we got outvoted.

I'm not going to throw any mud at the ASME standard. This thing has uncertainty all the way through. You can't do a seismic PRA, in my view, of any kind unless you're attentive to that because the insights and result and what you do with it depends so much on understanding roughly or -- do you want to do more, better? -- what those uncertainties are and where they arise.

CHAIRMAN APOSTOLAKIS: Is this uncertainty modeled?

MR. BUDNITZ: Some of it's modeled uncertainty and some of it has to do with data. Certainly in the hazard side, it's data driven in the sense that we don't have a lot of earthquakes and so, therefore, there's a lot of uncertainty in the hazard even in California. Never mind in the East -- which

is driven by we don't have a lot of earthquake data, but there's also quite a bit of model uncertainty, too, and we go into that.

And I just want to point that out because if you're not attentive to what you should be, and I hope you are.

Okay. Now, that comment having been said, we then had to struggle with this three capability category issue in that way, and it took us a long time.

Nilesh and Ravi and I spent a long time dealing with that, and I think we came out okay, and I'm pleased with it. We sent it out to the committee, and we didn't get almost anything back on that from anybody, public comments or our oversight committee or anything. So that either tells you they missed it or they liked it.

Now, the one other issue I want to be sure to talk about and then I'm open for you is now I'm going to stop right here and talk about earthquake caused fires.

Earthquake caused fires are not here. That's what Dana said. They're not here. Earthquake caused fire when you do a PRA for an earthquake caused fire, if you really want to work out the core damage

frequency, it's mostly a fires PRA question.

There's another committee under ANS developing a fire PRA right now. Dennis Hennecke is its chair, and Nathan Siu is the NRC member. There's five or six other people. They're doing that now. It's a year and a half away.

And when that's done, then you can come back to us and you can ask the question about whether an earthquake would cause a short in something that would cause an initiating event for a piece of equipment, and then it goes into the PRA.

So that's why it's absent, and I think it's rational that it's absent. We just need that standard because all of the earthquake becomes -- is an initiating event for what then becomes the fire PRA. So just answer that, why that's missing. Okay.

MEMBER POWERS: Well, but can I ask you a question about it?

MR. BUDNITZ: Sure.

MEMBER POWERS: You don't have a structure for it right now.

MR. BUDNITZ: Correct. We're going to have to develop that after.

MEMBER POWERS: And, on the other hand, you're perfectly willing to cite unpublished standards

on seismic things.

MR. BUDNITZ: I don't understand that last thing there.

MEMBER POWERS: You've got two -- you call out two draft standards.

MR. BUDNITZ: Yeah, but we don't rely on them. We only just mention them. There's nowhere in the standard are they in any of the requirements.

MEMBER POWERS: Why can't you mention this fire standard that's coming forth?

MR. BUDNITZ: Because the ANS 227 and ANS 229 have actually been published for public comment, and therefore are widely available in the community.

The other thing, there's not a single word that has been put on paper yet. They've only had two meetings. So there's nothing --

MEMBER POWERS: And you can't call NFPA 805?

MR. BUDNITZ: I suppose. What we did is like observe like the lower power shutdown standard that's under development, but ANS 227 and ANS 229, which by the way if you don't know what they are, they're standards in development for seismic hazard, but they've not been published.

And so we've taken them out of the

requirements because by rule you can't have a requirement.

MEMBER POWERS: Requirement, right.

MR. BUDNITZ: But we mention them in the text as being there if you want to know, and so there --

MEMBER POWERS: NFPA 805 is a public standard.

MR. BUDNITZ: Yes, but it's certainly not a PRA standard of any kind.

I yield to the prior experts in the room, although I think I'm one, too. We decided to refer to 805 would be erroneous, misleading, and we didn't do it on purpose.

If you want to write in your letter that we should, we will probably reject your writing. Okay? I'll just be as direct as I can be.

You're not going to get me as the chairman of this committee to refer to that because it's not a PRA standard, and the PRA appendix in the back is useless.

CHAIRMAN APOSTOLAKIS: Other than that, what --

MR. BUDNITZ: For these, for these purposes. Right? Just leave that unless you want to

--

MEMBER POWERS: Well, you can come in and say the same thing. As a seismic -- as an external hazard, the thing is useless because if there's one thing that earthquakes do, it's they knock things down and they start a fire. You deal with half of it. You don't deal with the other half. You're useless.

MR. BUDNITZ: No, it would be misleading.

In any event, if you want to go after me on that, fine. I was coming back from Argents (phonetic) because I wanted to just talk about -- this is the main issue that held us up for two years.

Let me back up. In 1984 and '85, NRC, DOE, and EPRI jointly sponsored an expert panel, and I was the chair, to develop a method that became known as the seismic margin method, and it's intention -- if you don't know what it is, I can't get into the details here -- but its intention was to develop a method whereby an analyst could go to a nuclear power plant and develop what we call the HCLPF capacity, the high confidence low probability of failure capacity, for components and ultimately through certain algorithms success paths, and ultimately the plant.

In order to ascertain what the HCLPF capacity was or a bound on it that then might be

compared with some figure of merit somebody might dream up --

MEMBER ROSEN: You might want to say that more slowly for our recorder, the HCLPF.

MR. BUDNITZ: H-C-L-P-F, HCLPF, the word HCLPF. We pronounced it "hiccliff." It stands for high confidence of low probability of failure, and it's a capacity of a component or ultimately you can combine them, of a system or of maybe the whole plan.

And I chaired that thing, and that method was intended to enable somebody who had a nuclear power plant to be able to say that they had a lot of margin if they did above the design basis.

For a typical plant a design basis might be 215.5(g), and if their HCLPF capacity was .3, they could say that if it were so. That was its intent.

In 1989, five years later, the NRC endorsed the seismic margins method for use in the IPEEE, a grievously erroneous decision, in my view, that I counseled them against, and I was in the position to counsel them.

And half of the plants went and did them instead of a PRA for the IPEEE. Okay. Half of the plants have a seismic margin review. The other half have a seismic PRA, and they all, by the way, now have

an internal events PRA, as you know, although you didn't have to do a PRA for the IPEEE remember, but they all have them.

Now, when we started this standard in '99, the plants that had a seismic margin review said -- and it's perfectly acceptable and correct to say -- "Golly, we'd like to be able to say that if we've got a good seismic margin review," good meaning they met the -- right? -- "we ought to be able to say that, and we can say that."

So we wrote requirements for the seismic margin method, and if you got a plant with a seismic margin review and you check off the boxes, you can say we met the standard. Okay? And that's fine, and that's what those requirements are. Nothing more, nothing less.

On the other hand, if you have a PRA, there's more. I can go into more if you want.

Now, here's the problem. The problem is that a seismic margin review is taken absolutely straight off the page without any enhancements, provides for the analyst for his plant capacities for what we hope are the important pieces of equipment or structures, but not even fully, you know, fragilities; just HCLPF capacities, which is the high confidence,

low probability capacities, and then you can combine them to work out the capacities of what is known as a success path.

Actually the requirements are that you have to develop two success paths, and the success path, you know, you might -- the success path meaning you have to do this, you have to do this, you have to do this, and you have to do this, and then you can shut down your sink (phonetic).

And so it works out the HCLPF capacity -- it's called A, B, C, and D. You have to work out the HCLPF capacity of A, B, C, and D, and the HCLPF capacity of the success path is the weakest of those because it's the smallest earthquake that would compromise one of them, and that's how the method works, and it not more or less -- and then if you have two success paths, one of them has a HCLPF capacity of .4 and the other has a HCLPF capacity of .5, but the HCLPF capacity of the plant is .5 because you could use the second one, and therefore, you can shut down even for a larger earthquake.

And that's all it is. It doesn't have any probabilities in it. It has nothing to do with the hazard. In fact, the whole idea in 1984 was getting away from the problems with the hazard to work out

capacities.

And so if you've got one of those, it's a marvelous tool if what you want to do is go to your plant and say, "Golly, I've got a pump or a valve or a shear wall, and I want to make sure it has a certain capacity."

It tells you that. Okay? But it can't be used in probabilistic space. But we had members of our oversight committee, including a couple that voted no this time -- and I'll tell you about that in a minute -- who insisted that an SMA was really a lower PRA, and they got outvoted by the parent committee. All right?

But that still was here, and we even got comments about it, you know, in the last round. SMA is not a PRA in any way, but we have requirements for it. So if you've got one, you can use it.

It's wonderful for risk informed applications of a certain kind. Let me give you an example.

Suppose somebody has got a valve, and they want to petition the NRC. They want to change the allotted outage time from 24 hours to 96 hours, and somebody in the back of the room says, "What about seismic?"

You can go to your seismic margin analysis and you can look it up and see that that's a five G value suppose in this. And the seismic margin method tells you that. You can put that on the table, and you walk away from that valve. Seismic.

Well, okay. So that's wonderful. Very limited applications, but for those applications, it really does the job, and that was what the intent was.

MEMBER ROSEN: The five G valve --

MR. BUDNITZ: Yeah, yeah.

MEMBER ROSEN: -- means it could stand five Gs and still function.

MR. BUDNITZ: Right. A five G valve meaning that at five Gs it still functions fine.

So you say, gee, for seismic it's no problem, and so there's an application, right? Trying to do something else, and somebody asks a seismic question, and this is a very strong value. Seismic margin didn't have to tell you that, right? But if it's a .15 G value, you can't use it for anything because you don't know how it combines with the other systems, the components, and stuff like that to make risk because it's not there. It can't be there. It's just not there.

So I spent a year, from mid-'01 to mid-

'02, struggling with several committee members on the parent committee with what to do about the fact that they weren't going to agree to this standard unless we said something more about seismic margins.

And so the outcome of that is Appendix D, which I know you have. Appendix D is a discussion which I wrote with Gene Hughes from ERIN Engineering, which describes what a seismic margin analysis can do and what it can't do as is.

It also describes what you could do if you enhanced a seismic margin analysis you have, you know, in certain ways so that you get more out of it. There are five or six -- I can't remember how many -- but there are five or six different kinds of enhancements.

In the end you can actually make a PRA out of it because a lot of the work has already been done for you, you know, the capacity work, and if you have an internal events PRA you've got the event tree, fault trees, you know, get started.

And after back and forth and forth and back and back and forth, and so on for half a year, a year, we finally have an appendix that describes that in a way that's satisfactory to just about everybody, and now we're out with it.

Now, that was a terrible struggle, and the

reason it was a struggle was that many proponents of seismic margins -- and I have to then say maybe plant owners who were duped into it, and I'm just trying to be as direct as I can be. D-u-p-e-d, reporter. Were duped into it -- thought they had a PRA when somebody sold them a seismic margin, and they don't, and they're mad, and they want to use, and it they can't. And they shouldn't be able to because it's wrong. You can't.

We had to beat that down, and we have. It's very important you should understand. It went on for a year. The seismic margin review was not a PRA of any kind. It's not even a lesser PRA because it doesn't have probabilities, the first word in PRA.

In any event, that appendix is there. People are happy with it, and finally we're done.

Now, let's talk about the negative votes. I can't remember how many the committee is. Twenty-five or six. Steve is on it.

MEMBER ROSEN: You're talking about the RIS, R-I-S --

MR. BUDNITZ: Yeah, yeah, the ANS committee.

MEMBER ROSEN: American Nuclear Society's Risk Informed Standards Committee, RISC. Yea, I am on

it, but I did not vote --

MR. BUDNITZ: That's correct.

MEMBER ROSEN: -- because of my role in --

MR. BUDNITZ: I understand you abstained from that.

But there's 25 or six members. I can't remember. I could look it up, and four people voted no in the round, you know, in August, and I'll explain what they were.

Jim Klaproth from G.E. voted no on the following basis. He said that he thought that the standard shouldn't have any peer review requirement because peer reviewers are a very small community, most of whom are on this committee, writing it to make work for ourselves.

I thought that was a low blow, and I'll just say that in public so it will be on the transcript.

And, well, that's wrong. We have peer review for a reason. It's part of the philosophy. Okay.

Allan Camp voted no because he didn't like the -- Allan Camp is from San Diego -- he voted no because he didn't like the peer review requirements, and after we changed some of them, he's voted yes now.

Gene Hughes voted no because in the end he didn't like the seismic margins write-up, but I hope I can turn him around in the next week or two because we've talked, and maybe he'll change his mind. I sure hope so.

MEMBER ROSEN: That's astonishing. I thought he wrote it with you.

MR. BUDNITZ: He wrote it with me, and so it did astonish me, but I'm just telling you what it is.

Bill Bohlke from Exelon voted no with about 20 different little comments, all of which we have responded to and sent it back, and I hope he'll vote yes this time, but I"m just going to have to wait and see.

And then finally, Nuclear Regulatory Commission voted no -- that's very important -- on the basis that --

CHAIRMAN APOSTOLAKIS: Even with Nilesh and you writing it.

MR. BUDNITZ: -- on the basis that we should have the SMA in there at all because it's not risk informed and can't be used in risk informed, and I tried to rebut that in revision of Appendix D, and I think I've got them on board, but we're going to see

in the next week or two whether they're on board and they vote yes.

But in any event it doesn't matter. We're going ahead without them. We've got the votes, and we're going ahead without them. They know that, see, because in fact, it doesn't make sense to us what they said.

I told that to Mark Cunningham and Mark Rubin directly on the phone, who were the two people on the committee, you know, voting, and so we'll see how that comes out.

But their basis was that they didn't think SMA should be in there at all. Three or four years after it has been in there, and I hope, you know, -- we were on this for a long time, and it was frustrating for -- remember we're volunteers.

So I'll just leave you at that. I guess I have just one more comment, and then you can ask anything you want, of course, thank God. I'm glad you're here.

In fact, what Dana said is completely true, that there is no evidence -- I wrote down on my pad what he said -- that the standard and the requirements therein are both necessary and sufficient.

There isn't, and the reason for that is it's not deductive. It's inductive. Okay? The ASME standard is an inductive standard. I don't know how intellectually to produce such evidence that what we have is sufficient; there isn't something missing; and that what we have is necessary. There are the right things there that there shouldn't be.

You know, I can't intellectually find a way to conclude that from this. It's inductive. So in that sense Dana's initial comment is correct, but it's in the nature of something like this, a methodology standard, and its validity comes from the review of practitioners. And over these years we don't know any PRA practitioners in the world, by the way, really who haven't commented on them.

We sent it to everybody, you know, not a big community, and they've seen it, and people are on board about it. So I can't defend to you that it's either necessary or sufficient in terms of the requirements and their what makes them hang together. I just have to explain to you that it is by its character not deductive, but inductive, and take it from there.

That's sort of a -- it's more than a philosophical point because unlike, you know, the

design of a vessel to hold certain pressure, there's nothing that's rigorous that you can start from first principles with, laws of physics, and the like, and then properties and materials. Put something together. It's just not like that.

MEMBER POWERS: You could do it.

MR. BUDNITZ: I don't know how.

MEMBER POWERS: If you said I have this set of things that I hope that I want a PRA to do for me. Then you could take your standard.

If Moses came down from the mountain and said, "Here's what the PRAs are supposed to do for you," and then you could set up your standard to say, "Yeah, verily, a PRA meets this set of requirements, would do these things."

MR. BUDNITZ: Well, no. Let me describe where I think we're on different Riemann sheets, R-i-e-m-a-n-n.

There is not a detailed treatment in our standard of requirements for analyzing slumping adjacent to the site after an earth quake. It was the judgment of everybody that looked at the standard and looked at practice and looked at sites that that's not an issue of importance in nuclear power plants.

But that's inductive, not deductive.

MEMBER POWERS: At the sites we have.

MR. BUDNITZ: At the sites we have. Now, there is an "other," right? There is a catch-all. Do you know what I mean? You've got to have that.

If somebody came up with a site where that was important, our standard wouldn't cover them. Okay. You know?

I mean, so in that sense and at that level you couldn't cover everything without making it not just too much work and too much plow-through, but unusable. So we had to make judgments about what's important at the plants and with the PRAs and with the systems and the structures and the operators and the control rooms and stuff. They're out there for our plants.

And that's what I mean by saying that it is intrinsically inductive because there's -- by the way, for seismic alone there are 600 issues like that. Let me just get down to microstructure. Slumping alone, 44 different kinds of slumping. I don't know for all I know.

So that's a problem, and I don't know what to do about it.

MEMBER ROSEN: Now, let's not be too negative. Let me say a piece here.

MR. BUDNITZ: I'm not worried about being negative.

MEMBER ROSEN: Some time ago there was this feeling abound in the industry that PRA is no good because we have no standards against which to do them. Everybody does them differently, however they want, and they're not reviewed by the Nuclear Regulatory Commission. So who can use PRA?

Well, the problem with that is we've got missions, policy statements; risk informed regulation is a fact, and it's fundamentally on PRA, based on PRA.

So the industry -- I say that broadly because the staff was involved -- set out to build some standards, and a peer review process melded up with it, which actually predated their standards effort, but the BWR owners groups' peer certification process melded up with the standards, and now we have an ASME standard for internal events. We've got an ANS standard of external events. We've got a fire PRA standard, et cetera. We've got a low per hour and shutdown standard coming. We have standards.

Moreover, we have peer reviews which are reported to be very effective. As a matter of fact, I vouch for that, having been at a plant which had a

peer review, first class plant in terms of its PRA, South Texas, which had a peer review and found out that it had a ton of things to improve.

This is not a bad thing. This is a good thing because they're out improving it. The best one in the industry is being dramatically improved.

Is that bad? No, of course not. That's good.

So that's where we find ourselves. You want to be apologetic about external event standards? Not you, but others. I am not apologetic. I think it's a good shot. We need standards across the board, and we're building them, and then we'll have experience with it through the peer certification process and through the use of a standards, and we'll improve them.

This is all good.

CHAIRMAN APOSTOLAKIS: Well, I think a key question related to this is how is a standard constraining me. Can someone come here to the NRC and say, "Oh, you have no right saying this because we complied with the standard," or is a standard a means of making sure that people meet certain minimum requirements, that they know what to expect and they do it? They will not come and say, "Well, gee, I met

the standard. Leave me alone."

MR. BUDNITZ: It's neither of those.

CHAIRMAN APOSTOLAKIS: What is it?

MR. BUDNITZ: First of all, it's a voluntary standard. If you don't comply with the standard, if you don't even pick it off the page and never look at it, you can come to the NRC with anything you want, and they will review your submission and do what they want with it.

CHAIRMAN APOSTOLAKIS: Fine.

MR. BUDNITZ: So it's a voluntary standard. So in that sense it doesn't constrain anything.

Secondly, if you say, "I met the standard," that doesn't constrain the NRC from saying, "But even though you met Requirement 37" -- I'm just pretending -- "we don't think that's enough to support this application that you have. You've got to go do more."

CHAIRMAN APOSTOLAKIS: So what is the --

MR. BUDNITZ: So in neither sense is it --

CHAIRMAN APOSTOLAKIS: So what is the value of this standard?

MR. BUDNITZ: Well, the value of the standard is that if you say you meet the standard, the

NRC may find itself able to review only very small pieces of the standard for giving an applicant --

CHAIRMAN APOSTOLAKIS: So it's --

MR. BUDNITZ: -- for giving an application and let the others go by because you met it.

CHAIRMAN APOSTOLAKIS: So it's the first interpretation I gave you, that you come in here and you have met the standard. That tells me that there is a minimum level of quality already there, that I shouldn't worry about you missing something important because the standard says that it should be there.

Internal events, if you --

MR. BUDNITZ: Fair comment.

CHAIRMAN APOSTOLAKIS: Well, I'm not going to worry about you missing common cause failures, for heaven's sakes. I know that you have it there, but you see, in that sense, it's a very good thing.

MEMBER ROSEN: Here's another good think about a standard, and I think it's essential. I'm a chemical engineer at heart, and chemical --

CHAIRMAN APOSTOLAKIS: You were 40 years ago.

MEMBER ROSEN: Well, okay. A degree in chemical engineering from a reputable, used to be reputable university.

MEMBER KRESS: Once a chemical engineer, always a chemical engineer.

MEMBER ROSEN: Chemical engineers have standards. Chemists have standards. Physicists have --

CHAIRMAN APOSTOLAKIS: There are standards.

MEMBER ROSEN: -- Physicists have -- there are physics standards. There are standards for all of the disciplines. The ASME, the American Society of Mechanical Engineers --

CHAIRMAN APOSTOLAKIS: Right.

MEMBER ROSEN: -- have standards for mechanical engineering.

Why is that PRA, the only technical discipline on this planet that doesn't have standards? It's nonsense.

And so I know, you'll have an answer to that question which I won't admire, but --

CHAIRMAN APOSTOLAKIS: He's a chemist. That's worse.

MEMBER ROSEN: My point is that PRA is a discipline just like any other engineering discipline. It ought to have standards, and we're working on them.

CHAIRMAN APOSTOLAKIS: It's not like any

other engineering --

MEMBER KRESS: No, it's not.

CHAIRMAN APOSTOLAKIS: I think Dana was right in the beginning. I mean, this is different. This sets a framework perhaps where the elements are there and so, but it doesn't tell you do it this way and do it that way.

MR. BUDNITZ: George, I think I have a better answer. Look. I can tell you standing here on my two feet that as of a couple of years ago or three when we started this effort, no more than have of the seismic PRAs out there amongst half of the plants that did them could have come close to meeting this standard. About half of them were good, and the other half weren't all that good at all.

Now, since we got this work going, they have on their own -- standards aren't out yet -- most of them have gone out and upgraded because they want to meet it, and that's terrific.

All right. Now, the standard then becomes a pull up, and that by itself is a tremendous positive.

Now, I can say something about margins, too. The seismic margin method had specific rules you had to meet that EPRI published. You know, there's 47

of them or something like that.

Our standard just parroted them back. Most of the margin reviews did better because it was specific. I'm like, you know, there were things you had to do, and they did them.

But some of them, although they thought they didn't do all that well, they're upgrading, too. So a principal benefit of a standard like this in the ASME standard is -- and Steve said it, too -- is it provides a bar that you can aspire to if you desire to.

Now, you may find you only come up a certain way and you're happy. And then an application comes along where what you've got isn't enough. You've got to do more.

The standard can tell you how to do more. Maybe you've got a category capability, too in, let's say, HRA, but for the problem you've got in front of you, you've got to do better.

This tells you what a Category 3 is, and so it enables you to know what 11 things, let's say, need to be improved to provide the greater capability that you need for your thing, for whatever your problem is.

So it's structured and it has been

reasoned through by a committee of experts. The HRA people wrote the HRA section in the ASME standard. The fragilities people wrote the fragilities section of our standard. The hazards people wrote the hazards section. So you know it has a certain -- I think that's a tremendous value quite separate from its use in regulation.

You just are producing something that people can use for self-improvement.

MEMBER POWERS: Let me ask a couple of questions. There's what seems to me to be a certain schizophrenia in the standard when you're discussing the seismic input to the PRA. It's a characterization of the site.

You used the words put in here "state of the art" or "state of knowledge information" on faults, ground motions, things like that.

And of course, I say, ah, that means to me that what I'm going to do is I want to build my plant on the least characterized site I possibly can because then I have less information to put in.

You don't have anything absolute that says --

MR. BUDNITZ: That's fair.

MEMBER POWERS: -- thou must know this

much about your site. You just say, "Here. Put in what's the best information that's known."

Then you come along and you're discussing -- you're into your discussion of uncertainties, and you say, "Look. In addressing uncertainties in human action you must address errors of omission, which seems reasonable. It's just that I don't know how to do it.

MR. BUDNITZ: Okay.

MEMBER POWERS: Okay? So here on the one hand, you're saying, "What have you got that's good enough?" and in another place you're saying you've got to go not only where the rule is, but you'd better go do something that I don't know how to do.

MEMBER ROSEN: You've got to if you want to meet that paragraph of the standard.

MEMBER POWERS: Well, it turns out it applies to the lowest category. Okay. Both of them apply to the lowest category and consequently they apply to all of the highest ones, too.

MR. BUDNITZ: Well, I understand your dilemma, and I think you're right. Let me describe what was in our mind. If you have a site on which you're -- let's just pretend you have an operating nuclear power plant on a site that's never been

characterized as opposed to a site that's never been characterized and you're just about to design one.

By the way, you can use this for a plant under design, too, as you know.

Then you would know rather little about the seismic hazard and, therefore, rather little about the seismic PRA. But the analysts could do the best job he could with the data, and that's all we are.

It's not the analysts' fault that somebody didn't dig holes, trenches and measure geophysics. So the analyst would have a quality PRA, but when he went to use it, the uncertainties would be so large he couldn't use it for anything.

So in that sense you're right, but of course, we had in mind there's no such thing as a nuclear power plant who hasn't had a characterized site following Appendix A, Part 100. We know that.

And so we have that in our mind and, I think, correctly so, which goes into gory detail, as I'm sure you -- if you don't know, I can tell you.

MEMBER POWERS: Yeah, I know.

MR. BUDNITZ: But what you have to do in order to characterize your site. So we had that in the back of our mind, but if you hadn't done that, you could do your PRA. It would be a great PRA. It would

be like this, huge.

Nothing wrong with a great PRA with huge uncertainties. The analysts did a wonderful job.

MEMBER POWERS: Well, I think you need to put a footnote on that input. It's a --

MR. BUDNITZ: That's an interesting point.

MEMBER POWERS: You know, this is predicated on our understanding that there are no sites out there that have not had some minimal level of characterization. Okay? And that if you should happen to apply this to a site that's not had some minimal level of characterization, you risk having huge uncertainties.

MR. BUDNITZ: Well, yeah, yeah, but let me explain why that footnote would then have to be everywhere. Let's suppose I have a PRA, internal events PRA. It could be a seismic PRA, but whose core damage frequency depends on the reliability on demand of a valve that's open that has to close to be safe. It's open. You've got to close it to get a safe shutdown.

And you want to ask the question: what's the probability I can close that valve on demand, you know, when I ask them to?

And we all know that the numbers for those

things are understood, ten to the minus three, you know, whatever it happened to be.

But let's suppose somebody had a valve for which he had no data, no data at all. Quite different from any other valve. He actually couldn't do the PRA, couldn't do it, absolutely couldn't do it.

I wouldn't throw mine at the analyst, nor do I think I need a footnote in the section. I'll leave you with that.

There is no such thing as a valve for which there's no data, and there's no such thing as a site for which there's no characterization, and there's no such thing as a human action for which we have no knowledge whatsoever.

There's always some knowledge, and we just approach it that way. So, therefore, while I understand why you would want to footnote, I insist that you have to put a footnote in every single requirement throughout this and the ASME standard, and that then becomes a self-fulfilling prophesy towards confusion.

Any comment?

CHAIRMAN APOSTOLAKIS: Now, judging from the discussion --

MR. BUDNITZ: Go ahead. I'm sorry.

CHAIRMAN APOSTOLAKIS: Oh, I'm sorry. You're through?

MR. BUDNITZ: No, I was done with that unless you have --

MEMBER POWERS: I want to chase this a little more. You tell me on the right hand that, first of all, you say don't blame the analyst because the site hasn't been characterized. I'm not using the standard to evaluate analysts.

I'm using --

MR. BUDNITZ: Well, you're using it to evaluate the analysis.

MEMBER POWERS: I'm using this to evaluate site, the facilities, installations. And so you've come in and you've gotten a wonderful PRA with lousy input, and it's come in with the imprimatur that it complies with the standard, and I say I've got limited amounts of time to spend on review. Surely they've done a wonderful job on the inputs because that constitutes a huge amount of this standard, and it calls out two other standards which sooner or later will get published. That must be good. I'm going to go look at that.

In fact, that's an Achilles heel. This is coming in with an imprimatur that it may not deserve.

MR. BUDNITZ: You're completely correct.

MEMBER POWERS: The next thing I --

MR. BUDNITZ: You're completely correct.

MEMBER POWERS: -- I take you to -- that I have trouble with is coming back to this errors of commission. You say anything in here has been done by somebody, and I'm sure there is somebody out there that has addressed errors of commission.

But it hasn't achieved the level of acceptance that it seems to me to deserve to go into the standard.

MR. BUDNITZ: Well, in the HRA section, human reliability analysis section, we, in fact, refer by reference directly to the ASME standard, which has a whole chapter on that, and don't deal with it at all except that way.

And by the way, that's not only common sense. It was a matter of policy.

So if you want to deal with that, you have to go to the ASME standard. The ASME standard, the committee, three or four of them struggled with that for a year or two, did the best they could, and actually have some requirements in there for errors of omission and commission separately, and they own up to the difficulties therein, thereby owning up to the

observation that there will be larger uncertainties and less robust applications you can use.

But that is what it is.

MEMBER POWERS: Well, I would ask if you're doing any rewriting to go and look at the words you have there. Make sure you're communicating well with the --

MR. BUDNITZ: Thank you.

I'd actually -- that's a good suggestion, and it's not too late. If you have any specific place -- you're talking about in the errors of commission part?

MEMBER POWERS: Yeah, yeah.

MR. BUDNITZ: I can't remember where it is, but I'll find it.

MEMBER POWERS: Let's see. If you look on page 76, Note SA-B2.

MR. BUDNITZ: I'll just make a note of that.

MEMBER POWERS: And just look to make sure you've communicated well with everyone.

MR. BUDNITZ: Thank you. That's useful.

MEMBER POWERS: I've taken up a lot of time here. I know there's --

MR. BUDNITZ: No, that's a fair -- that's

a fair comment.

MEMBER POWERS: Other members wish to interrogate Mr. Budnitz?

CHAIRMAN APOSTOLAKIS: Just to close the earlier discussion about the value of the standard, the way I understand what Bob and Steve said, there is no down side to having the standard, is there?

MR. BUDNITZ: Yes.

CHAIRMAN APOSTOLAKIS: Like what?

MR. BUDNITZ: Of course there is.

CHAIRMAN APOSTOLAKIS: What?

MR. BUDNITZ: the down side would be if someone claimed that their analysis met the standard, but it actually didn't because they neither did a through review with a standard, nor did the peer review do it right.

CHAIRMAN APOSTOLAKIS: But I have the right to review it myself.

MEMBER ROSEN: That's not a down side, Bob.

CHAIRMAN APOSTOLAKIS: That's not a down side.

MEMBER ROSEN: Because that would have to assume that the peer review failed open.

CHAIRMAN APOSTOLAKIS: That's right.

MEMBER ROSEN: Because what we ask here --

MR. BUDNITZ: Fair enough.

MEMBER ROSEN: -- what I intend to ask and what I've always been intending to ask when someone comes in with a risk informed application that they want to prove and the staff has said, "Yeah, okay. You can go talk to ACRS about it," is to say to them, "Has your PRA been peer reviewed?"

"Oh, yes."

"Then tell me what the facts and observations have been and what the important ones are and what you've done about them.

So there's basically a line of questioning that gets them to understand that we want improvements. We want this --

MR. BUDNITZ: But even if --

MEMBER ROSEN: We want the peer review and the standards taken seriously --

MR. BUDNITZ: That's a fair comment.

MEMBER ROSEN: -- and we want them improved.

MR. BUDNITZ: That's a fair comment, but --

CHAIRMAN APOSTOLAKIS: As long as you tell me that I am not constrained by the decision making

process by the fact that somebody claims that they met the standard, I don't see any down side.

MR. BUDNITZ: But, Steve, I'm going to --

CHAIRMAN APOSTOLAKIS: Only good things can come out of it.

MR. BUDNITZ: I'm going to give you a down side from my experience. The IPEEE, the individual plant evaluation for external events and NUREG 1553 had in it a requirement that the IPEEEs be peer reviewed All right?

Now, I was a peer reviewer for several of them. Okay? That is, the utility would hire me to do a peer review. And I can tell you that several of those peer reviews were very thorough and useful. I participated, and there was back and forth and, you know, things to do and people listened.

And I can also tell you that several of them were in which I would write a peer review and nobody paid any attention, and I went back to them, and they said, "We're submitting it anyway," and that's a problem.

And I don't know what to do about that. That's a problem.

MEMBER ROSEN: That may have happened. I grant that, and I --

MR. BUDNITZ: It happened to me.

MEMBER ROSEN: Yeah. I'm saying that can happen. I think the world is changing, and we are moving forward.

MR. BUDNITZ: Thank God.

MEMBER ROSEN: And we happen to have a consultant, not you; the ACRS has a consultant working on issues of PRA, and he has spoken quite favorably about the PRA review process.

CHAIRMAN APOSTOLAKIS: Oh, I think everybody is for it.

MR. BUDNITZ: Oh, it's wonderful now, yeah.

MEMBER ROSEN: And so the fact that in the past there have been problems with it --

MEMBER POWERS: Recognize --

MEMBER ROSEN: -- but I don't think it's dispositive.

MEMBER POWERS: -- there's at least one dubious member of the committee.

MEMBER ROSEN: You may be dubious on peer review, and I have said to you on the record in public that what you ought to do about your dubiosity level is to go out with a peer review team and take another HCR staff with you, another one because we already

sent one, Mike Markley.

And you will find out, I think --

MR. BUDNITZ: Sent there for a week.

MEMBER ROSEN: Yeah. I think you will find out that it is not the -- and it won't be the Hawthorn effect doing it. It will be the fact that the process is robust. It's going to strain even a good site's PRA team and PRA. It will be robust and it will be critical, and I think it will be responded to.

MR. BUDNITZ: Yeah.

MEMBER ROSEN: Over time, not immediately. It just goes on a corrective action. It goes in the corrective action system, and it gets corrected.

MR. BUDNITZ: I don't think the interview approach in this standard is a problem at all. I just want to say that. I really think what we wrote was -- the requirements for it -- it followed correctly, and by the way, what ASME did, too --

MEMBER ROSEN: Right.

MR. BUDNITZ: -- should produce a very high quality peer review each time.

I mean, I think you don't know, you know, but the requirements I think are very good.

CHAIRMAN APOSTOLAKIS: What's going on

with the IPEEEs now. A lot of them were done using applied methodology for targets (phonetic) and the SMA for seismic. Is there any move to do PRAs or we don't know?

MR. BUDNITZ: I do know.

CHAIRMAN APOSTOLAKIS: What is going on?

MR. BUDNITZ: I don't know anything about five. About half of the price at SMAs, seismic margin assessments. Perhaps five or ten of them -- I'm not quite sure what the count is because some of them, you know, the same one applied to two plants -- are operating through a PRA now.

MEMBER ROSEN: Isn't that a sweet thing?

MR. BUDNITZ: Huh?

MEMBER ROSEN: And isn't that a sweet thing.

MR. BUDNITZ: That's good.

MEMBER ROSEN: That's part of the consequences of what we're doing here.

MR. BUDNITZ: It is what it is.

MEMBER ROSEN: People see that what they had before isn't serving them in the current environment, and people are improving it. This is a good thing, George, not a bad thing.

MR. BUDNITZ: Yeah, I think that's -- no,

I can't speak about five, but, by the way, you have to be careful. Most of the plants use the screening part of five, and then even if they did then the full PRA on what they capped in, but some of the plants then just use the screening part of five and then they use the five for the analysis, and then they made a lot of approximations, and I just can't speak to that.

MEMBER ROSEN: I don't think, to answer your question directly -- it's just a thought; it's just my own insight, my own opinion -- I don't think there's a down side to this. I think there's a lot of --

CHAIRMAN APOSTOLAKIS: That was my conclusion from what you guys were saying.

MEMBER ROSEN: There's a lot of up sides to having standards. They're not perfect now, and smart people can point to things that are wrong with them, and should, and the standards committees will take that under advisement and over time they'll be improved.

Has the IAEA done anything like this?

CHAIRMAN APOSTOLAKIS: I think they had one for internal events, but not --

MR. BUDNITZ: Yeah, but it's not like this.

By the way, I have a comment to make which I think if you don't know about it, it will illuminate you. The ASME committee on which I sit, you know, the ASME committee that worked on the PRA standard, is right now in the process of developing modifications to some of the requirements based on feedback they've gotten from both the NRC and the industry which would result, once the process is done in perhaps a year, in a revision to the standard that will improve it in areas where either in the first round or in its use various requirements have caused confusion or perhaps they're not complete enough or perhaps there's a suggestion how to improve it.

And that thing -- I don't know if it's a year away or not, but it's roughly -- is an example of how in its first round -- it will happen to us, too -- people will use it and through using it prove the standard, just what you want.

And we've made that commitment. Okay?

CHAIRMAN APOSTOLAKIS: Okay.

MEMBER POWERS: Steve, let me come back and comment a little bit about peer review. I think it's really not a comment on the quality of peer review that's done with the PRA. It's a comment on Peer review that is a method of assuring technical

quality.

And what I find, maybe a little background. My current employer, I was asked what methods were for assessing the quality of technical work, and so I went off and looked at a whole bunch of methods to do that. One of them was peer review.

And I looked at the literature of this, and you find that people who have studied peer review come back with things like peer review is excellent; it can be used for just about anything. The problem is it's irreproducible and quixotic.

MR. BUDNITZ: And?

MEMBER POWERS: Quixotic.

MEMBER KRESS: Oh, no.

MEMBER POWERS: And inherently the difficulty is if I take the people on the right side of the table and ask them to peer review a product and I take the people on the left side and ask them to review the same thing, I don't get the same result. Okay?

MEMBER WALLIS: You need to take 59 peer review groups.

(Laughter.)

MEMBER ROSEN: Yes, and we will.

MEMBER SHACK: And take the 95-95 --

MEMBER ROSEN: We will after 108 years or something like that, 118 years.

MEMBER SHACK: Well, keep that in mind the next time you remember we've got to send these codes out for peer review.

MEMBER KRESS: Dana, if you were asking the peer reviewers a simple question like is this PRA, let's say, acceptable for this purpose, yes or no --

MEMBER ROSEN: That's not a simple question. You've got to ask a very targeted question.

MEMBER KRESS: That's a pretty simple question.

MEMBER ROSEN: You have to ask a simpler one than that.

MEMBER POWERS: Most of the studies --

MEMBER KRESS: You're unlikely to get the same answer from --

MEMBER POWERS: Most of the academic studies on peer review look at, choose as their object of study situations that are very, very simple. Is this proposed piece of work meriting funding?

Okay. That's a pretty straightforward question.

MR. BUDNITZ: Or publication.

MEMBER POWERS: Or publication, but most

of them it turns out where they've gone off and they've studied it, you know, they've given multiple committees never 59, Graham, but three have been done.

And what they find, by the way -- I mean, some of this stuff is just fascinating -- is I take those three guys and they're my peer review team, and I send everything to them consistently, I get a consistent result, internally consistent result, that is, if they funded Project A and did not fund Project B, when I put in A prime, they'll fund it, and when I put in B prime, they will not fund it.

MEMBER WALLIS: I think we're talking about reviewing proposals. This is a very different business from reviewing something that is essentially state of the art. You'd expect there would be much more uniformity in the quality expected from an engineering job than there would be in whether or not you should fund some strange idea which might appeal to somebody and not appeal to somebody else.

It seems to me it's a different world, isn't it?

MEMBER POWERS: You could be correct. You could be correct. I can only quote to you, you know, what I know, I mean, what I've read about, this problem of quixoticness. But similarly, if I send A

and B over to this group of people, they'll fund B instead of A.

MR. BUDNITZ: Oh, but -- but-- but it's very important to recognize that peer review is limited by the state of the art of the community. I know a story about that, as probably most people in the room know.

There was a classic engineering mistake made in a bridge in the State of Washington in the '30s, I think it was, the Tacoma Narrows Bridge. That bridge was designed by a firm that was competent and thought to be at the time and peer reviewed by others.

But the state of the art somehow missed that failure mode which then bit them in the first year and it collapsed.

Now, there's no way that we can achieve perfection here, but what we're doing is we're trying to have assurance.

MEMBER POWERS: No, all I'm trying to do is achieve consistency.

MR. BUDNITZ: Well, I don't know what you mean by consistency. The fact is that when something is on the borderline --

MEMBER POWERS: Reproducibility.

MR. BUDNITZ: When something is on the

borderline, some people will make different judgments, but something that is obviously okay will be found, I think, by most people to be obviously --

MEMBER POWERS: You're going to go off and join and have gone off and have joined an organization that I think suffers this problem. They will say, "Okay, you people that have nuclear waste material. You've got this place you're going to put this nuclear waste. Do a performance assessment."

They do so and submit it to DOE. DOE has some people review it. They say, "Well, this performance assessment is fine, except you have to correct the following things."

It's sent back to the people. They correct those things. They submit it to DOE. DOE assembles another peer review panel. They review it, and they come up with another set. You're caught in an "infinite do" loop.

And that's an example of the inherent irreproducibility of peer review.

MR. BUDNITZ: All right, but that's only if it's true. If they first time they found 66 things wrong and the second time they found three, then they're converging. If the first time they found 66 things wrong and the second time they found 166 things

wrong, then they are diverging.

And you haven't mentioned which you think it is. It's my notion that the converging case is not only the most common, but almost always the case.

I mean, sure, there are other kinds of example. The Tacoma Narrows Bridge actually came down, despite having met the code and peer review.

MEMBER POWERS: As long as you're over in your organization, why don't you go look? Because I think you will find that --

MR. BUDNITZ: My organization, meaning?

MEMBER POWERS: Department of Energy.

-- that you will find that the peer review groups feel an obligation to find a roughly constant number of faults with something.

CHAIRMAN APOSTOLAKIS: Well, you know, it's the nature of PRA.

MEMBER WALLIS: Who else would you use? Who else would you use to review?

MEMBER ROSEN: In my experience now, you have six guys come onto the site. They stay there for a couple of weeks, and they're all PRA people from other utilities and maybe a consultant or two, but you go down their curriculum vitae. Each one of them you'd say, "I'd hire that guy as a PRA guy. I'd hire

that guy as a PRA guy."

These are good people, and then they come and give you a list of things to do, and you say, "Oh, my God, that's a long list. I want to see if this stuff is really bad in our PRA."

And you look at your PRA and you say, "Yeah, that's not so good, and here's the standard, and here's the peer review thing."

We need to fix that, George. So you send some guy over -- excuse me, George -- but you send him off to fix it, and then let's say two years hence if I was still there they'd send another team of six different guys back in, and they are quixotic, too, and they give me another list of facts and observations just as long as the prior one, and it doesn't include any of the other ones because the ones I found before have all been fixed, but they're also a whole new set, and they're also good things.

Am I ahead or am I behind? It wasn't reproducible. That's for sure, but I'm ahead, I think if I just found some more problems, and one of the things I know as a manager is I cannot fix problems I don't know about, and any problem I know about I think I can fix.

So when I'm told about a problem, I have

a whole new opportunity. So it's a good thing, not a bad thing, but it not be reproducible.

MR. BUDNITZ: But, Steve, I actually believe something different. Knowing the composition of those things is like going around with these PRA certifications to the plants. I find it unlikely or almost inconceivable that a second group would find an equally large number of things of comparable importance because the depth and detail to which those things are done is really very, very astounding to me.

I've been -- you know, I find it very --

MEMBER ROSEN: And to me. I verify or validate.

MR. BUDNITZ: So I would -- while it's possible, I don't think that scenario would play out. It could.

MEMBER ROSEN: I agree with you, but I'm just saying if it did play out, as I think Dana was suggesting with the word "irreproducible," that would be a good thing, not a bad thing. To me it's just a whole other list of things that you can fix.

MR. BUDNITZ: But if there was 66 and there was another 66, it would tell you that the first team isn't doing their job, I mean, as opposed to 66 and there are seven more, you know, or something.

MEMBER ROSEN: Well, maybe, but I think, you know, if there were 66 and the theme documented that I found them and documented that many, they're at exhaustion at that point.

MEMBER WALLIS: Well, you'd be concerned if the second group reversed the recommendation.

MEMBER POWERS: Yeah, that too. The irreproducibility is I send it to two teams at the same time, and they come up with a difference, and that could be the exhaustion feature.

Let me turn to another subject here.

MR. BUDNITZ: Sure. Talk about hazard.

MEMBER POWERS: It's a curiosity. Again, I will emphasize that on my third reading of this, and recognizing this level of resolution discriminator among the categories which had much more impact on me than anything else you said in this document, but I may be alone in that, that I come down and I look at some of the languages under these categories, and I don't understand the distinctions and differences you're drawing here.

Let's turn to page 63, HA-E1, and under Category 1 --

MR. BUDNITZ: HA?

MEMBER POWERS: HA-E1. It's on page 63.

MR. BUDNITZ: Thank you.

MEMBER ROSEN: It takes me a minute to thumb through here.

MEMBER POWERS: Okay. If we --

MR. BUDNITZ: My pagination is different than yours. HA-E1. Go ahead.

MEMBER POWERS: E1. It says under capability Category 1 -- this is an example. This happened several times in here -- "demonstrate the PSHA accounts for the effects of site topography, surficial geologic deposits, and site geotechnical properties."

Under Categories 2 and 3 instead of saying "demonstrate accounts for," it says "account in the PSHA for the effects of," and it's the same list of things.

What is the distinction which you're trying to do between account and demonstrate the account?

MR. BUDNITZ: Damned if I know.

MEMBER POWERS: This happened several times in this document.

MR. BUDNITZ: It may even happen several times. That's one that must have got buy us. I don't -- I've got to think about that. I don't see the

difference.

MEMBER POWERS: It looked to me --

MR. BUDNITZ: "Demonstrate that the PSHA accounts for something."

MEMBER POWERS: And account for something. In fact, Category 1 seems more stringent from the Category 2.

MR. BUDNITZ: They look to be the same. I plead guilty to that one. That one probably got by us. Let me make a note and fix that one.

MEMBER WALLIS: This is a peer review you're going through now.

MR. BUDNITZ: I don't mind it. We're going to take improvements for the next ten minutes.

MEMBER POWERS: Similarly if you look at HA-B3.

MR. BUDNITZ: B?

MEMBER POWERS: It says "as a part of the database used include a catalogue of the historically reported."

Two and three as part of the data collection "compile a catalogue."

I struggle with understanding. I mean they've clearly written down both.

MR. BUDNITZ: Oh, that's really --

MEMBER ROSEN: The words "include" and "compile" mean something different than -- there's a set of definitions up front, right?

MR. BUDNITZ: Well, actually "include" and "compile," in the one case, you don't have to do any work on your own. You just have to compile something that was there already. Here you've got to do new work.

MEMBER POWERS: If I could compile something, to include it. I mean I --

MR. BUDNITZ: No, that's a clear distinction.

MEMBER POWERS: Explain it to me again, please.

MEMBER ROSEN: I'm wrong; I'm wrong. There is no definition of "include" and "compile."

MR. BUDNITZ: These ones up front, no.

Well, capability Category 1 allows you to use an existing database. Read it "as part of the database used, include a catalogue."

Capability Category 2 and 3 require you to collect new data. It's part of data collection, not as part of a database used. It's really quite --

MEMBER POWERS: But I have to go out and collect the database that I use.

MR. BUDNITZ: No, no.

MEMBER POWERS: That I included.

MR. BUDNITZ: No, you don't have to collect new data in Category 1. You just use it.

MEMBER POWERS: Well, I just have to sit there and think it up? I mean, I have to do something to it.

MEMBER ROSEN: Well, it may be in your FSAR. You don't have to do any new work. It's just a matter of opening the book to the page.

MEMBER POWERS: Or maybe you want to look and be sure that people understand the distinction

MEMBER ROSEN: Catalogue that historically reported geologically identified earthquakes is something that's going to be in your FSAR.

MEMBER POWERS: Compile a catalogue that historically reported geologically identified -- man, it's the same thing.

MEMBER ROSEN: I take your point.

MEMBER POWERS: It is exactly the same.

MEMBER ROSEN: I'm sure Bob does.

MR. BUDNITZ: Well, I see a distinction, but it's not a big distinction.

MEMBER ROSEN: You can take that into account as you move further towards completion of the

standard.

MEMBER POWERS: Do people have anymore questions?

MR. BUDNITZ: There may be things like that, and I'm not going to claim this thing is perfect.

By the way, just to tell you, all right?? And this is not mea culpa at all. Of course, there are going to be some stuff like that, and every one that you call to our attention I will write down, and we will account for it, not just these two or three here, but anybody else, because it could easily be that this will be confusing or the distinction isn't important or whatever.

MEMBER POWERS: In general, I mean, again, after I had read your words on the level of resolution and understood them and taken them to heart, I said, "Gee, I really don't need all of these separate categories here. I understand what he's doing, man. He's reminding me I can create PRAs of different levels of resolution, and that's okay with him."

And the fact that your requirements were the same under all three categories, that's fine. That's wonderful, in fact. It's just on different levels of resolution, and I became very happy with it.

MR. BUDNITZ: But I just want to insist. I said this before. There are three reasons why something can get to a higher capability: either a different levels of resolution or realism versus conservatism or plant specificity versus generic.

And any one of those makes it a higher category, and it's not only resolution. Okay? And I'm sure you understand. In seismic, for example, if you have generic knowledge that certain compact valves are five G valves, you can use that generic knowledge without needing plant specific, you know. All right?

So there's a distinction about plant specificity and about realism versus conservatism which are distinct from resolution. Okay?

MEMBER POWERS: Okay. I hear you on that, and it really hasn't come home to me as much as the resolution issue, but I think you're right on that. Also, having that, it's a two dimensional field that you have, three dimensional field that you have for deciding whether something is Category 1, Category 2, Category 3, and I think you're probably right on that.

The one that just came home to me made it all clear, made me quit quibbling with your words under each category was the level of resolution, and I became very happy at that point.

Do members have any other questions they want to pose to Bob?

(No response.)

MEMBER POWERS: Bob, let me say that this was a chore given to me by the Chairman I welcomed a little bit like a trip to the dentist, but in the end I saw that you had done a heroic job.

MR. BUDNITZ: Thank you.

MEMBER POWERS: And thoroughly enjoyed reading the material. It is one of those documents I will keep on my desk.

CHAIRMAN APOSTOLAKIS: But not your night stand.

MEMBER POWERS: Not my night stand. I give it back to you, Mr. Chairman.

CHAIRMAN APOSTOLAKIS: Thank you very much.

MR. BUDNITZ: Can I just say that I'll be thrilled when I can get it off of my desk.

(Laughter.)

MR. BUDNITZ: And I'm sure you understand.

CHAIRMAN APOSTOLAKIS: Any other comments from anybody?

I guess not. Thank you, Bob, for coming.

MR. BUDNITZ: Thank you.

CHAIRMAN APOSTOLAKIS: This has been a delightful exchange. I feel much better now that I know that I'm not constrained by this.

Okay. We'll recess until ten minutes past three, and are we ready to do the PNT?

PARTICIPANT: Yes.

CHAIRMAN APOSTOLAKIS: Okay. We don't need transcription anymore because it's all internal.

(Whereupon, at 2:54 p.m., the Advisory Committee meeting was adjourned.)