

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

Title: BRIEFING ON REPORT AND PLAN FOR IMPLEMENTATION  
OF PRA WORKING GROUP REPORT

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**BRIEFING ON REPORT AND PLAN FOR IMPLEMENTATION  
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**PUBLIC MEETING**

**Nuclear Regulatory Commission  
One White Flint North  
Rockville, Maryland**

**Monday, January 31, 1994**

The Commission met in open session,  
pursuant to notice, at 10:00 a.m., Ivan Selin,  
Chairman, presiding.

**COMMISSIONERS PRESENT:**

**IVAN SELIN, Chairman of the Commission  
KENNETH C. ROGERS, Commissioner  
FORREST J. REMICK, Commissioner  
E. GAIL de PLANQUE, Commissioner**

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STAFF SEATED AT THE COMMISSION TABLE:

SAMUEL J. CHILK, Secretary

KAREN CYR, Office of the General Counsel

JAMES TAYLOR, Executive Director for Operations

THOMAS MURLEY, Director, NRR

ROBERT BERNERO, Director, NMSS

EDWARD JORDAN, Director, AEOD

ERIC BECKJORD, Director, Office of Research

ASHOK THADANI, Director, Division of System Safety and  
Analysis, NRR

MARK CUNNINGHAM, Chief, PRA Branch, RES

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

10:00 a.m.

CHAIRMAN SELIN: Good morning, ladies and gentlemen.

We're pleased to welcome representatives from the staff to brief the Commission on the final report of the probabilistic risk assessment working group and the status of the PRA implementation plan. Last week we were briefed by the regulatory review group on their implementation plan which included a number of recommendations to increase the use of risk assessment in the regulatory process. Very welcome recommendations, I would add. When asked about some of the PRA-related points, they graciously and courageously said that you'll answer all these questions today.

I do sense from the SECY and from the working papers that the staff is moving rapidly forward to implement improved and increased applications of risk assessment methods throughout the agency for which you are to be commended.

Copies of the viewgraphs are available.

Commissioners?

COMMISSIONER de PLANQUE: No.

CHAIRMAN SELIN: Okay. Mr. Taylor?

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1 MR. TAYLOR: Just a few remarks, sir. As  
2 you noted, the purpose of this briefing is to  
3 demonstrate our progress and our plans for expanded  
4 use of PRA in the agency's business. As you  
5 mentioned, sometime earlier I'd established a working  
6 group which was really set up to improve the quality,  
7 the consistency and the coherency within the staff in  
8 the use of PRA for our decision making process. You  
9 have seen the final report of this working group and  
10 subsequent to the issuance of the report I received a  
11 letter from the four major office directors supporting  
12 the development of a PRA implementation plan for  
13 expanded use within NRC. You will hear more about  
14 that today.

15 I will also note that NUMARC has formed a  
16 regulatory threshold working group to address the  
17 application of PRA to regulatory activities. The  
18 staff has already begun to interact publicly with this  
19 group and further interactions are planned. We're  
20 also working with them to better define data  
21 requirements to support expanded use of PRA and  
22 there's some work going on with INPO in that area too.

23 All of these activities are to use the  
24 risk bases and it is important that they be integrated  
25 into a common plan within the agency. You'll hear

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1 more about that in the briefing today.

2 I'll now ask Mark Cunningham, who is the  
3 leader of the working group, to start the formal  
4 presentation.

5 MR. CUNNINGHAM: (Slide) Could I have  
6 slide 2, please?

7 There's two elements to our presentation  
8 today. The first is the summary of the working group  
9 activities over the last year and a half or so. The  
10 second is the discussion of what's going to come in  
11 the PRA implementation plan developed.

12 (Slide) Slide 3, please.

13 The working group was initiated by Mr.  
14 Taylor in response to an ACRS letter in July of 1991.  
15 The ACRS letter itself raised issues of inconsistency  
16 and unevenness in the staff's present uses, or present  
17 uses at the time, of PRA. The group was then  
18 established with three objectives. The first was to  
19 develop guidance on consistent and appropriate uses of  
20 PRA. The second was to identify knowledge and skills  
21 necessary for the various types of PRA uses in the  
22 Agency, and the third would be to define improvements  
23 in PRA methods and data that would be needed for the  
24 types of PRA uses in the Agency.

25 (Slide) Slide 4, please.

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1           The working group was an interoffice  
2 group. I chaired the group and represented the Office  
3 of Research, Pat Baranowsky represented AEOD, Bill  
4 Beckner, NRR, Pat Rathbun, NMSS. In addition, we had  
5 a number of people from throughout the staff helping  
6 us do that, as well as contractors from two national  
7 labs and three universities.

8           (Slide) Next slide, please.

9           As the work proceeded, we had two sets of  
10 review. First was by a set of external reviewers and  
11 then we had the ACRS review. We had four external  
12 reviewers: John Garrick from PLG; Doctor Bernard  
13 Harris from the Statistics Department at the  
14 University of Wisconsin; Ralph Keeney from USC; and  
15 Herb Kouts. These four people reviewed three versions  
16 of the report and we met with them on four different  
17 occasions. They had many, many comments on what we  
18 had written. Most of these, the vast majority were in  
19 the details to make sure that we got the statistical  
20 terminology correct and some of what we had written  
21 and things like that.

22           The most significant general comments came  
23 down to a very few though. The first was in a sense  
24 related to the scope of the working group. We had a  
25 lot of discussions with them on the need for a

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1 statement on the greater general principles of how and  
2 why PRA should be used in the Agency. They were very  
3 concerned that if we did not have that type of a  
4 general statement that it was hard for them to judge  
5 whether or not what we were doing in the working group  
6 was on the right track or not.

7 The second general comment dealt with  
8 interactions with industry. They noted that in many  
9 parts of the industry they had developed very mature  
10 PRA capabilities and they were concerned that we were  
11 just not paying enough attention to those groups out  
12 there.

13 The third dealt with the issue of  
14 training. Doctor Garrick in particular made a comment  
15 on several occasions that PRA training cannot be  
16 removed from systems training. If you don't know the  
17 facility that you're trying to study, then all the PRA  
18 training in the world isn't going to help you very  
19 much. He also observed that many of his best people  
20 in consulting business were people who were systems  
21 people first, operators, that type of thing, who were  
22 trained then in PRA.

23 The final comments from these four  
24 individuals came in a November 10th letter and  
25 basically I think they were satisfied after the long

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1 discussions we had with what we came forward with in  
2 the working group report.

3 (Slide) Next slide, please.

4 We also had four meetings with the ACRS.  
5 Their comments were very similar to the general  
6 comments we received from the external reviewers. In  
7 our May meeting with them, May 1993, we spent a  
8 considerable amount of time on the issue of scope as  
9 well, again focusing on the issue of the need for a  
10 more general set of principles on how and why the  
11 Agency should be using PRA. They also got into the  
12 issue and made a comment about the need to interact  
13 more with the industry.

14 We went back to them in November with an  
15 update of the report. We discussed the further  
16 discussion we had with the external reviewers and  
17 basically told them that we had resolved all of our  
18 comments with the external reviewers. Mr. Thadani at  
19 the November meeting briefed them on the November 2nd  
20 letter from the office directors to the EDO. I think  
21 the combination of the two presentations led to a  
22 letter of November 10th which basically said the  
23 working group seems to have done a good job and we  
24 look forward to hearing about the PRA implementation  
25 and how we're going to proceed with this.

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1 (Slide) Next slide, please.

2 The next seven slides basically summarize  
3 the working group report. It was provided to you with  
4 SECY-93-330. It's going to be published here shortly  
5 as NUREG-1489.

6 We had two general recommendations, the  
7 first of which was very much related to the issue that  
8 I mentioned that came up both from the external  
9 reviewers and the ACRS, the need for a broader  
10 statement of principles on agency uses of PRA. Our  
11 recommendation then was to develop an integrated plan  
12 on the staff's risk assessment and risk management  
13 practices that would lay out the present structure of  
14 the Agency's risk assessment and the management  
15 practices and summarize the key elements of that work,  
16 as well as lay out plans for improving and expanding  
17 PRA use within the Agency. Then, as part of that, as  
18 part of the risk management aspect of that, to  
19 consider more formal decision analysis methods as part  
20 of our risk management practices.

21 The second general recommendation again  
22 resulted directly from the comments from the external  
23 reviewers in the ACRS. That was the need to improve  
24 the interactions with industry PRA users. Mr.  
25 Thadani, in a little bit, will talk about the work

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1 that he's had so far with the NUMARC steering group.

2 COMMISSIONER REMICK: Mark, a question.  
3 It's my assumption that in general NRC staff do not  
4 really perform PRAs to any extent. We are more  
5 reviewers and users. Am I correct or to what extent  
6 am I wrong on that?

7 MR. CUNNINGHAM: I think that's basically  
8 correct, yes. Most of the work the staff does is  
9 either reviewing PRAs or adapting existing PRAs to  
10 study a particular issue or something like that.

11 MR. TAYLOR: Of course, we sponsored  
12 NUREG-1150 and our staff was very much involved in  
13 overseeing that work. The work was principally done  
14 in Sandia, but --

15 DOCTOR THADANI: But I think if you're  
16 talking about large scale studies, plant PRAs, I think  
17 generally what you say is correct. But the staff does  
18 conduct a number of narrow studies evaluating specific  
19 issues, for example --

20 COMMISSIONER REMICK: Right.

21 DOCTOR THADANI: -- and understanding the  
22 significance of those issues. Operating experience is  
23 one example of that.

24 COMMISSIONER REMICK: But don't we in  
25 general, and this is not a criticism because I think

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1 it adds to what you're saying, the importance of the  
2 actual practitioners that people are doing on a day to  
3 day basis, and the people who review and use those in  
4 many cases, the importance of those interactions. I  
5 agree 1150 is a good example. Of course, WASH-1400  
6 are examples where the staff certainly made a major  
7 role. I think in the case you're talking about, don't  
8 we use existing PRAs though to do those narrow slices?

9 DOCTOR THADANI: We've done both actually.  
10 We've used existing PRAs and in some cases we've  
11 actually gone beyond. An example that comes to mind  
12 is recent work that we did on South Texas. We  
13 actually took Riskman, which is a tool that Pickard,  
14 Lowe and Garrick has developed and they use for PRAs.  
15 It covers about 30 or 40 PRAs done in this country  
16 basically and we've used that tool to do some  
17 independent studies ourselves. We bought it basically  
18 from Pickard, Lowe and Garrick.

19 At least what I see is this slowly growing  
20 hands-on activities within the Agency. It's growing  
21 slowly, but I think it's growing.

22 COMMISSIONER REMICK: Good. Good. But I  
23 assume you do agree with the recommendation here then,  
24 the need for the, let me say, the day to day  
25 practitioners that exist, the people that are doing it

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1 for their living and those of us who are more users  
2 and reviewers and the need for those people to  
3 interact because it is a rapidly changing technology.

4 DOCTOR THADANI: Absolutely. There's no  
5 question about that.

6 MR. CUNNINGHAM: (Slide) Slide 8, please.

7 The working group identified three areas  
8 for improvement in Agency PRA use, the areas of  
9 guidance, training and PRA methods and data bases.

10 (Slide) Slide 9, please.

11 In the area of guidance development, the  
12 working group did a couple of things to get the ball  
13 rolling, if you will. One was we developed some  
14 general guidance for two types of staff PRA uses.  
15 It's screening and prioritizing issues and events,  
16 issues such as generic issues or operational events or  
17 LERs, that type of thing. Also, we developed guidance  
18 for performing more detailed analyses of specific  
19 issues or events. That is the ones that typically  
20 seem to be the more serious or significant issues we  
21 study in more detail. So, we developed some guidance  
22 for that as well. We also developed more specific  
23 guidance for two particular subsets of this, if you  
24 will, generic issue prioritization and generic issue  
25 resolution. These are intended as starting points for

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1 the people who do generic issue work to test this out  
2 and see how it works over the next year or so, I  
3 think, and try to eventually build this into their  
4 normal sets of guidance and expand, if you will, on  
5 the PRA aspects of it.

6 (Slide) Slide 10, please.

7 In addition to developing these particular  
8 types of guidance, we also made a number of  
9 recommendations for further work. One was to develop  
10 detailed guidance in the other subsets, if you will,  
11 of issue screenings and analyses. This could again be  
12 operational events analyses, things like that. We  
13 recommended the completion of the development of  
14 guidance for PRA uses in plant-specific licensing  
15 action. The issue that Mr. Thadani just mentioned on  
16 South Texas was a tech spec issue. There is -- we  
17 recommended expanding the guidance on how PRAs should  
18 be used in that process and in particular how IPES  
19 coming in could be used in that process. We  
20 recommended that guidance be developed on how IPES and  
21 IPEEEs could be used in the inspection process.

22 In the longer term, we recommended that  
23 the standard review plan be updated to reflect the  
24 perspectives developed on the PRA reviews done in the  
25 design certification. It's actually an activity that

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1 NRR had already started, but we supported eventually  
2 that the PRA get back into the SRP.

3 With respect to NMSS, we identified two  
4 principal areas in NMSS where risk assessment methods  
5 were being used, the high-level waste where they call  
6 it performance assessment but very much related to  
7 PRA, and in the area of the study of medical devices,  
8 certain medical devices. In the first area, in high-  
9 level waste, there was already some work underway to  
10 develop guidance on how they should perform their  
11 licensing reviews of these things and presumably the  
12 risk assessment guidance would be part of that. In  
13 the medical device area, this is something that's very  
14 new, so it's not clear how much guidance is really  
15 needed. Our basic recommendation in this area was  
16 that the people doing this work face many of the same  
17 problems that those of us on the reactor side of the  
18 house face in terms of basic PRA methods issues, and  
19 we try to make sure we keep talking to each other as  
20 we go along. We have a lot to learn from each other  
21 on that.

22 COMMISSIONER REMICK: I would assume a  
23 database also in those areas. It'd be a problem.

24 MR. CUNNINGHAM: Yes, that's right.

25 (Slide) Slide 11, please.

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1 In the areas of skills and training, the  
2 working group did a couple of things. First of all,  
3 we developed what we call a desk reference, if you  
4 will, on basic PRA terms and methods and the strengths  
5 and limitations of those methods. This is contained  
6 in Appendix C of the report and summarizes what  
7 somebody in the staff might expect to see in terms of  
8 concepts and models and methods in areas such as  
9 probability and statistics, reliability analysis and  
10 certainly a sensitivity analysis, that type of thing.  
11 In addition, we're planning to have some workshops  
12 this spring to the staff to introduce them basically  
13 to this document. After that we've been working with  
14 the people at TTC so that this information would  
15 basically be worked right into the PRA training  
16 program.

17 (Slide) Slide 12, please.

18 COMMISSIONER REMICK: Talking about the  
19 common use PRA terms, on one of the later slides I  
20 noticed on the same slide we used PSA and PRA. I  
21 wonder if the staff has given any thoughts, are there  
22 any advantages to try and to become more uniform in  
23 that. I kind of like risk being in there myself, but  
24 I must admit that most of the rest of the world seems  
25 to be going to PSA rather than PRA. Have you thought

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1 about whether there are advantages or disadvantages of  
2 trying to be consistent?

3 MR. CUNNINGHAM: We thought about it a bit  
4 in the working group and went towards the terms "risk  
5 assessment" and "risk management." PSA is something  
6 we share with people such as our European counterparts  
7 and things like that. Risk assessment and risk  
8 management are terms that you see in other parts of  
9 the federal government.

10 COMMISSIONER REMICK: Yes.

11 MR. CUNNINGHAM: In EPA and places like  
12 that. I guess our attitude was let's try to be a  
13 little more consistent with the rest of the  
14 government.

15 COMMISSIONER REMICK: Yes. Okay.

16 MR. CUNNINGHAM: So, you don't see PSA in  
17 the working group.

18 COMMISSIONER ROGERS: My impression is  
19 that many users of these terms outside the United  
20 States, when they're talking about PSA, really don't  
21 go the final step of looking at the health  
22 consequences.

23 MR. CUNNINGHAM: Yes.

24 COMMISSIONER ROGERS: That they just avoid  
25 that. That seems to be the more common approach in

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1 PSAs, to simply look at the on-site situation and  
2 ignore what the consequences off-site might be, and  
3 that they draw a distinction between PSA and PRA on  
4 that basis.

5 DOCTOR THADANI: Yes. Yes. In fact, I  
6 think typical level 1 and level 2, the systems  
7 analysis part and the containment performance part,  
8 people tend to call it safety analysis. It's when you  
9 get into consequences and it's numerical terms, that's  
10 when they tend to talk about risk.

11 COMMISSIONER REMICK: Yes, although they  
12 are inconsistent also. I've had a number of  
13 discussions at international about that and they talk  
14 about PSA levels 1, 2 and 3 and there is a tendency in  
15 some countries now to do the level 3 also. But  
16 there's a major inconsistency on whether they -- if  
17 they call level 1 and 2 PSA, they also call level 3  
18 PSA. I kind of lean in your direction. I kind of  
19 like the concept of risk and it is more consistent  
20 with use in other government agencies in the United  
21 States, but I must admit there are advantages the  
22 other way also.

23 MR. CUNNINGHAM: Yes.

24 DOCTOR THADANI: I might note that at the  
25 ACRS meeting, NUMARC briefed the ACRS also and NUMARC

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1 was asked actually why did they call their activity  
2 PSA activities and not PRA.

3 MR. TAYLOR: We're still working on that.

4 MR. CUNNINGHAM: Slide 12, please.

5 We had three recommendations in the area  
6 of PRA skills and training. The first was the need  
7 for the Agency to develop a comprehensive PRA training  
8 program. As it happened, while we were doing most of  
9 our work on the working group, the PRA training  
10 program was handled by the Office of Personnel and  
11 late last year the responsibility for this was  
12 reassigned to AEOD at the TTC. I think that will get  
13 at some of the issues that were raised, for example by  
14 Doctor Garrick, of bringing together the systems  
15 training and the PRA training. So, it's now AEOD's  
16 responsibility to develop this PRA training program.

17 Perhaps as a subset of that, we've  
18 recommended that for each particular type of use by  
19 the staff of PRA, that in a sense a minimum set of  
20 courses be designed and established that the person  
21 would have to go through.

22 We touched on the issue also of recruiting  
23 staff and even though we recognize we didn't have a  
24 whole lot of flexibility in that area. What we  
25 recommended was that we try to, to the extent that we

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1 could, focus on two particular critical PRA skills as  
2 we recruit. The first would be people experienced  
3 with practical experience in doing level 1 PRAs,  
4 focusing on doing PRAs so that we have some people in  
5 the staff who have gone through the rigors of doing  
6 something from scratch. The second critical area we  
7 defined was people experienced in statistics. In both  
8 of these areas, we focused on these areas I suppose  
9 because we didn't see that it would be very easy to  
10 train available staff to develop this type of  
11 expertise. We have a limited number of places where  
12 we could have somebody do a PRA and it's hard to turn  
13 an engineer into a true statistician. So, those are  
14 the ones in particular that we picked out.

15 COMMISSIONER REMICK: Incidentally, in the  
16 training area, my personal view is that this would be  
17 an excellent time not only to teach the techniques of  
18 PRA, but it seemed like it would be a ripe opportunity  
19 to also cover the safety goals, the Commission safety  
20 goals because I think there's a major misunderstanding  
21 of what is and what is not in the safety goals because  
22 they have changed over the years. Even, I notice in  
23 ACRS from time to time referred to what were drafts  
24 ten years ago of the safety goals, as if those are the  
25 safety goals today or the health objectives. I would

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1 also hope that in that -- and I think the safety goals  
2 help put those risks in some kind of a comparative  
3 risk perspective so that people doing it -- there is  
4 a tendency sometimes that any  $10^{-6}$  frequency should be  
5 stomped on and made  $10^{-7}$  and so forth.

6 Along that line, I would hope also that  
7 people would express the bases on which they  
8 determined the numbers. You see a lot of people  
9 throwing out numbers and it's not clear what  
10 initiators they're including, internal initiators.  
11 Are they including external initiators, which ones and  
12 so forth, a tendency sometimes of one country to be  
13 wanting to express lower numbers than another  
14 country's vendors and so forth. I think it's a whole  
15 area as this risk technology develops that people be  
16 more careful when they put down numbers identifying  
17 the bases or the assumptions that were made or what  
18 was included or what was not included.

19 In such a course, if I were to teach it,  
20 there are a number of things that I would bring to  
21 people's attention. There's some excellent books, one  
22 on accident facts put out by the National Safety  
23 Council to help put things in risk perspective. The  
24 American Cancer Society puts out cancer facts and  
25 figures on a monthly and yearly basis and I would sure

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1 ask people to rate the tolerability of risk document  
2 in the health and safety exec in the U.K.

3 So, my point is that I hope that in  
4 courses like that that people are not only taught the  
5 techniques, but also how do you put these numbers that  
6 you get in perspective to other risks of society.  
7 That's a personal view of mine and what I would  
8 include in such a course.

9 MR. JORDAN: Duly noted.

10 MR. CUNNINGHAM: (Slide) Slide 13,  
11 please.

12 In the area of recommendations on PRA  
13 methods, we had a few. The first was that there was  
14 guidance needed to be developed to the staff on  
15 adapting PRA methods and results. As we talked about  
16 a little bit ago, one of the things that the staff  
17 does a lot of is taking an existing PRA and trying to  
18 modify it somehow to fit some particular issue or to  
19 push in some particular issue. While there's a fair  
20 amount of guidance on how one does a PRA from scratch,  
21 there's very little guidance on how you would adapt  
22 something. So, we recommended that such guidance be  
23 developed. Also, we recommended the continued  
24 development of some of the PC-based PRA tools that the  
25 staff has now. Over the last year or two we've seen

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1 a considerable consolidation of the staff's tools in  
2 a sense down to one or two tools that we use basically  
3 for our level 1 PRA work and we think that that's very  
4 beneficial to getting everybody in the Agency using  
5 the same tools. What we're trying to do here now is  
6 make these tools a little more staff user oriented.

7 Very much related to that is developing a  
8 common set of PRA models that the staff can work from.  
9 Again in the past, different organizations tended  
10 sometimes to use different models with different data  
11 assumptions and things like that. We've been working  
12 over the last year or so to develop a common ground  
13 across NRR, AEOD and Research. Some of our  
14 recommendations are trying to clean that act up a bit,  
15 looking at an Agency-wide classification system for  
16 reactors, looking at the feasibility of what we call  
17 roll-up reactor PRA models which is permitting one PRA  
18 model that might be useable for somebody doing a very  
19 detailed calculation as well as somebody trying to do  
20 a very simple calculation in a short amount of time or  
21 something like that.

22 COMMISSIONER ROGERS: I really didn't  
23 quite understand that, that concept. I'm having a  
24 little trouble --

25 MR. CUNNINGHAM: Let's take a couple of

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1 examples, I guess. If you have somebody doing a  
2 generic issue resolution and working -- they want to  
3 use a PRA model, they may need to use a very detailed  
4 PRA model to get down to the basic events that they  
5 need to worry about and they have a year or so to work  
6 ont. So, they can afford the time to work with a  
7 detailed model. Somebody doing an events assessment  
8 may have a morning to figure out what the significance  
9 of an event is. So, they may need a very simple PRA  
10 model that they can just kind of put together.

11 One of the ideas that came up about a year  
12 ago is that AEOD requested Research to look at the  
13 idea of having a detailed model that can be collapsed  
14 into successively simpler models while still retaining  
15 the fidelity of the model, if you will. So that's  
16 what it would have been up to.

17 CHAIRMAN SELIN: Generically, the roll-up  
18 model is a model that works at several levels where  
19 you can go into the details and calculate the  
20 parameters that you use at the higher level or you can  
21 just input the parameters without running the more  
22 detailed level.

23 MR. CUNNINGHAM: Right. Right.

24 CHAIRMAN SELIN: Whether it's a roll-up,  
25 whether it's an event model or an accounting system.

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1 If you have the detailed data, you can derive the  
2 higher level. If not, you can just posit them.

3 MR. CUNNINGHAM: Yes.

4 CHAIRMAN SELIN: You tend to use a lot of  
5 computer time when you run. It's very hard to  
6 sidestep the detailed models where you come in at a  
7 higher level.

8 MR. CUNNINGHAM: Yes. So, at the moment,  
9 we're kind of finishing something to look at the  
10 feasibility of using something like that. Again --

11 COMMISSIONER ROGERS: Well, I guess my  
12 problem is not that. I understood basically that  
13 idea, but just how you use it for screening with some  
14 confidence.

15 MR. CUNNINGHAM: It becomes then a much  
16 more subjective assessment at that point. If it's  
17 used for screening, maybe that's okay. That's one of  
18 the concerns. If you've got a morning to do  
19 something, then you have to recognize that that's how  
20 long it took and that's how much confidence. You  
21 should perhaps be a little more skeptical with the  
22 confidence and have a little less confidence in the  
23 answer.

24 CHAIRMAN SELIN: What I read this to say  
25 is you don't want different models for the rough and

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1 the detailed. You want to have the same model that  
2 you connect to a different level so you have some  
3 confidence --

4 MR. CUNNINGHAM: That's right.

5 CHAIRMAN SELIN: -- that you have the same  
6 inputs.

7 MR. CUNNINGHAM: That's right because the  
8 simple model isn't giving you something that would be  
9 inconsistent with the detailed model. That's right.

10 The last recommendation we had, and it's  
11 a little bit longer term thing, was develop what we  
12 call living or dynamic PRA models. There's efforts  
13 underway in AEOD to try to expand the capability of  
14 systems such as NPRDS so that the staff would get a  
15 great deal more data coming into the Agency. If you  
16 want to look at that type of information and watch for  
17 trends and that type of stuff, you may have to change  
18 the PRA models that you use to make them a little more  
19 dynamic rather than the kind of fairly static models  
20 that they are now.

21 CHAIRMAN SELIN: You know, in effect what  
22 you're recommending is that the staff would be very  
23 willing to use these if they had the tools and the  
24 knowledge to do them. So let's go to the tools and  
25 the knowledge. I believe, and that's probably true,

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1 but there seems to also be an organizational problem  
2 that people who have the tools and knowledge don't use  
3 them. There are people in the staff who can already  
4 do PRA but don't. So, it seems to me that there's got  
5 to be an organizational component as well that somehow  
6 we have a system that doesn't give incentives for  
7 people to use the PRAs. Maybe they take too long,  
8 they're too hard. People don't have enough time.  
9 They figure the bosses won't understand them. I don't  
10 know what the reasons are, but this is almost entirely  
11 sort of a scientific approach to sort of go level by  
12 level and build up the skills and the models and the  
13 capability. It's like the Field of Dreams, build it  
14 and the users will come.

15 It seems to me that we also have another  
16 problem which is that we don't take advantage of the  
17 skills and knowledge we already have. Do you disagree  
18 with that?

19 MR. CUNNINGHAM: No, I don't disagree with  
20 it at all. Certainly there have been organizational  
21 impediments to some of this. I think over the last  
22 year or so, somewhat independent of the working  
23 group, is that we've seen at the staff level a great  
24 deal more talking to each other across the offices,  
25 across AEOD, NRR and Research. There's a group that's

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1 composed of some of my technical staff and the AEOD  
2 technical staff and NRR staff working -- once a month  
3 they sit down and say, "How do we work through many of  
4 these problems so that we get to this common database  
5 and common set of models?"

6 As I said, a couple of years ago some of  
7 the tools that we had developed in Research for these  
8 PC-based PRA level 1 codes were mostly being used by  
9 our contractors to perform PRAs. Over the last year  
10 or so we've made a lot of progress so that the people  
11 doing the events analysis have gotten rid of some of  
12 their older tools and are now using the same tools  
13 that we've developed. So, we've seen some progress in  
14 that area, but certainly you're right, there could be  
15 an organizational aspect of this whole thing as well.

16 CHAIRMAN SELIN: Well, Mr. Taylor --

17 MR. TAYLOR: Yes. Mr. Thadani will  
18 continue. He'll tell you what we're planning in the  
19 Field of Dreams. Is that right?

20 DOCTOR THADANI: Yes.

21 CHAIRMAN SELIN: I may regret this  
22 metaphor.

23 DOCTOR THADANI: Once we get done what  
24 we're trying to do, one outcome of that is going to be  
25 clear attention to that issue, organizational issue,

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1 not just within an office, interoffice issues and how  
2 one goes about dealing with them.

3 CHAIRMAN SELIN: I have to say that on a  
4 broader level, whether it's regulatory review or  
5 other, is that many of the things that the staff has  
6 sort of dealt with in a desultory fashion over the  
7 years seem to be coming together now and I'm prepared  
8 to believe that that may also be true of PRA. There's  
9 been improvement in the instrumentation and control  
10 area, there's been improvement in carrying out some of  
11 the things everybody "knew" what to do about in terms  
12 of regulatory review, some improvements simplifying  
13 paperwork.

14 I'm not sure whether I'm asking a question  
15 or just sort of stating something to be careful about,  
16 that one should not assume that the problems are  
17 entirely lack of tools or lack of knowledge or lack of  
18 training, that generally people -- you know, this is  
19 a very smart staff. We're able to do a lot more than  
20 we do sometimes. Maybe you see improvement or maybe  
21 just sort of concerned leadership is starting to  
22 remove the organizational impediments and it is time  
23 to concentrate on the tools. I'm prepared to believe  
24 that. I also believe in the tooth fairy.

25 MR. CUNNINGHAM: (Slide) Next slide,

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1 please.

2 That basically concludes my part of the  
3 presentation on the working group. Mr. Thadani is  
4 going to proceed now to talk about where we go from  
5 here.

6 DOCTOR THADANI: (Slide) Could I have  
7 slide number 15, please?

8 Since the accident at Three Mile Island,  
9 the applications of PRA techniques at this Agency  
10 have, in fact, grown a fair amount, I would say. In  
11 one of the backup viewgraphs, in fact it's backup  
12 viewgraph 1, I have listed areas where currently we  
13 are in fact using PRA techniques. These applications  
14 range from fairly narrow individual tasks, operating  
15 events kind of assessments all the way up to some of  
16 the recent regulations, in fact, are actually based on  
17 risk-based considerations. Two of the recent  
18 regulations, 50.62, which was anticipated transients  
19 without scram, and then 50.63, which was station  
20 blackout, both were based on, as it turns out,  
21 consideration of the earlier subsidiary objective of  
22 the safety goal in terms of core damage frequency.

23 So, it's not to say that the Agency is not  
24 making use of these techniques. In fact, I think the  
25 Agency is making use of these techniques and that use

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1 has grown over the years.

2           There have been a number of  
3 recommendations that have come out recently. Mark  
4 described some of the work that the PRA working group  
5 did. Last week you were briefed on the  
6 recommendations in the reg. review group report. They  
7 all seem to say similar things. Mark has described  
8 what the working group said, but reg. review group  
9 recommended that we increase the use of PRA to provide  
10 flexibility and yet maintain the safety envelope and  
11 that opportunities are in fact there to be able to do  
12 that.

13           Commissioner Remick touched on the issue  
14 of safety goals. The regulatory analysis steering  
15 group has developed guidance on how the two particular  
16 implementable guidelines can be used. One is the core  
17 damage frequency  $10^{-4}$  per reactor year and the other  
18 is the large release, which the steering committee  
19 turned into containment performance, particularly  
20 trying to come up with how to deal with the potential  
21 for early containment failures. So, I think the  
22 safety goal steering group work, I think, provides  
23 very good framework, useable framework I would say, in  
24 making some of the decisions that I think we're going  
25 to have to be making in some of the areas that I'm

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1 going to cover.

2 (Slide) May I have viewgraph number 16,  
3 please?

4 COMMISSIONER REMICK: Ashok, I notice that  
5 in some of the responses to the decision criteria in  
6 the proposed regulatory analysis guidelines there were  
7 some arguments about what was proposed by the staff.  
8 Has the staff addressed those yet or is that something  
9 that must still be done?

10 DOCTOR THADANI: Eric may want to add to  
11 what I say. They're under review currently.

12 Now, while a number of these groups have  
13 made recommendations to enhance or increase use of  
14 these techniques, the industry has also shown a great  
15 deal of interest in parallel to go in the same  
16 direction. In fact, NUMARC has set up a working group  
17 that Mr. Taylor talked about early on. It's the  
18 regulatory threshold working group. There are two  
19 main reasons they did that based on my conversations  
20 with them. One was to provide a group that could  
21 communicate with the NRC management in terms of their  
22 thinking. The other was -- a goal they had was to  
23 improve generic applications in the regulatory arena  
24 and to utilize these probabilistic techniques as we go  
25 forward. As part of their activities, they're

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1 developing guidance on methods, data, quality and so  
2 on for these generic applications in particular. They  
3 have also indicated that the group, this working group  
4 will assist as we go forward, particularly with the  
5 early pilot studies, before any large scale  
6 applications. You heard a little bit about that last  
7 week regarding reg. review group recommendations.

8 We've had preliminary meeting with this  
9 NUMARC group. In fact, we're going to be meeting with  
10 them later this week to hear a little more about their  
11 priorities and so on.

12 Now, in any case, as a result of all these  
13 recommendations coming forward from various groups, it  
14 was obviously that one had to develop a cohesive  
15 integrated plan for a variety of reasons. One was to  
16 be more efficient about it, plus to make sure everyone  
17 understands what the Agency is thinking about doing  
18 and the direction it's taking and then to plan  
19 accordingly which means scheduled fee sources and so  
20 on have to be identified. So, it was clear as an  
21 Agency we had to develop a fairly solid plan as we go  
22 forward. That's the background.

23 But we also realize as we started, when I  
24 went and talked to the ACRS we just started to think  
25 about this whole issue. They said to me, "What you're

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1 talking about is a plan of a plan," and I said, "I  
2 think you're right. What I'm talking about is a plan  
3 of a plan. The real plan will take time and effort."  
4 But in their letter they came back and they said they  
5 were certainly pleased that the Agency is now taking  
6 on this task and recognized that it would not be easy  
7 but nevertheless it was the right direction to go to  
8 and that's what they reflected.

9           Having said that, we did not want any of  
10 the important activities to remain hanging just  
11 because we were working on developing a plan. So, a  
12 conscious decision was made that while we're working  
13 on the plan we will go forward in areas where there is  
14 consensus that we ought to go forward. Again, you  
15 heard some of those areas where we're going forward  
16 were discussed last week, reg. review group  
17 recommendations. There are other areas. I'll give  
18 you some examples where we're, in fact, going ahead.

19           (Slide) Could I have viewgraph number 17,  
20 please?

21           This viewgraph and the next viewgraph  
22 identify what I call the breadth of activities where  
23 PRA techniques would provide valuable insights not to  
24 be utilized. Again, these applications range from  
25 reassessing existing regulations such as Appendix J

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1 for example, to individual plant license amendments.  
2 The applications would cover all program offices and  
3 regions. We have had in the development of -- so far,  
4 the work we've done, we have coordinated with not only  
5 the program offices but regions as well and have got,  
6 I must say, fairly positive feedback from them.

7 In some cases, it's clear that we don't  
8 have to change what we're doing today. Our current  
9 uses is adequate. An example would be the advanced  
10 light water reactor, ABWR and System 80+, for example,  
11 the way they've used the probabilistic risk assessment  
12 to look at the design, understand strength, and we  
13 even see how results might compare to safety goals.

14 We used the PRA in the discussions for the  
15 COL applicant to have reliability assurance program,  
16 and you've heard about how we may have used or how we  
17 have used, in fact, the insights in ITAACs as well.

18 So, we've actually -- I think we've done  
19 probably a substantial amount and I can't think of  
20 what else we could have done with this in advanced  
21 light water reactor arenas, but then there are -- I  
22 think there are a number of other areas where we can  
23 do a lot more than we've been doing.

24 COMMISSIONER REMICK: We saw the nonsafety  
25 systems using the risk perspective there.

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1 DOCTOR THADANI: Yes, exactly. The whole  
2 issue of witness is also driven by these areas. I  
3 must just -- my caution would be, of course, as we go  
4 forward, we have to be very careful and understand  
5 limitations of these techniques and in some cases  
6 limitations of data, so that has to be recognized as  
7 we go forward. But we do have a lot of IPEs now and  
8 we should be able to do a lot more. Example would be  
9 in the area of inspections. Some of the reassessment  
10 of the regulations does seem appropriate.

11 Now it's also clear that the degree, and  
12 Mark kind of touched on this, the degree to which  
13 these techniques will be used in this agency depends  
14 on the staff expertise and understanding of both the  
15 strengths and the limitations of these techniques, has  
16 to be both, and the availability of regulatory  
17 guidance and tools. Guidance Marked talked about,  
18 some of the methods, but where we're still lacking --  
19 and tools like safety goals will help -- is the  
20 decision criteria. We don't have that written down  
21 anyplace. All these applications I've talked about  
22 have been to a large extent ad hoc and I think could  
23 be done better and that's where the documentation and  
24 the decision rationale guidance are I think very  
25 critical as we go forward.

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1           So the other implications, I think, also,  
2           and one that clearly would impact the industry, is  
3           going to be that one would need more information on  
4           IPes, for example. Today basically we don't require  
5           licensees to submit much more than fairly high-level  
6           information on results, but when you get down into  
7           real applications you do need things like the logic  
8           models, the trees, the event trees as well as the  
9           fault trees and so on. So a lot of that information  
10          is supposed to be on-site, so it should be there, most  
11          of it. It might require some manipulation to do some  
12          of the things.

13                 CHAIRMAN SELIN: I agree with that. In  
14          fact, I'd go a step further, that you can't do the  
15          license renewal the way we're talking about without  
16          having some of the results of the maintenance rule.  
17          You can't move from prescriptive to risk-based in  
18          regulation.

19                 There really are two points and I'd like  
20          to stress them now.

21                 Number one, it's kind of a deal that in  
22          order to -- you know, we are holding out the promise  
23          that, if we get this information, that we will use it,  
24          not to add but to replace certain kinds of restrictive  
25          regulation with more prescriptive regulation. We need

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1 to follow up on that.

2 DOCTOR THADANI: Yes.

3 CHAIRMAN SELIN: And the second, I think  
4 we're doing this, but I want to stress this. I want  
5 to stress this at the highest level so that it's  
6 understood throughout the Agency and throughout the  
7 industry. And the second is that building tools is  
8 not an excuse for not using the tools that we have,  
9 and I think that -- you know, the regulatory review  
10 group, we've got very positive -- we're moving  
11 forward. We know we can't go as far as we'd like  
12 until we build these tools, but we do have available  
13 tools for getting the information and so we can't be  
14 in the situation of letting the best be the enemy of  
15 the good.

16 We can make progress with the tools we  
17 have as we develop better tools. I think the  
18 Commission is prepared to make the investments in  
19 training and orientation these call for, but we also  
20 want to make sure that these are not used as an excuse  
21 for not doing better with what we already have.

22 DOCTOR THADANI: Yes. In fact, I think  
23 the NUMARC working group really is very important in  
24 that sense because they are also trying to develop  
25 what information base would be adequate for certain

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1 applications, and so I think that this whole thing  
2 seems to be moving in the right direction.

3 The other important -- Mark has covered  
4 it, but I want to emphasize -- is it's clear that the  
5 Agency as it goes forward with the kinds of  
6 applications we're thinking about would need not only  
7 additional training but I believe would need more  
8 people who are very competent in this technology.  
9 That's my own sense, but we're trying to develop the  
10 background information before one comes to a final  
11 conclusion.

12 (Slide) May I have viewgraph number --

13 COMMISSIONER de PLANQUE: Before you go  
14 on, would you expand a little bit more on what you  
15 have in mind with regulatory effectiveness evaluation?

16 DOCTOR THADANI: Yes. I'll use an  
17 example.

18 We issued 50.63, which is station blackout  
19 rule, in 1988. The intention was to make station  
20 blackout basically not a significant contributor to  
21 core damage frequency. When you see the IPEs coming,  
22 the results coming in, you find station blackout still  
23 pretty dominant, dominant in terms of contribution to  
24 core damage and in some cases probably risk as well.

25 The idea here is to sit back and see if

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1       there are areas where we should be perhaps looking  
2       again to see if we did well, but maybe not well  
3       enough. And vice versa, there may be areas where  
4       we've gone too far. Take a look. That's the sense.

5               (Slide) May I have viewgraph number 19,  
6       please?

7               As I said, it's clear. Many of the areas  
8       identified relate to activities of the program  
9       offices, but I did want to emphasize that there are  
10      many, many regional activities. Most of those  
11      regional activities could be done probably better if  
12      we were to utilize these insights from IPEs and so on.

13              What I have is -- they're backup  
14      viewgraphs. I'm not going to go through those, but,  
15      just for information, backup viewgraphs 2, 3, and 4  
16      talk about two aspects, basically. For example, if  
17      you're planning an inspection activity and you have an  
18      IPE, how you might -- before you conduct the  
19      inspection, what kind of information you might take  
20      from IPE in planning that inspection, identifying,  
21      let's say, an important system and what are the  
22      important failure modes and what are the important  
23      contributors to that system failure, looking at some  
24      experience at the plant.

25              Plan ahead of time and when you go through

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1 the inspection and you find deviations or violations  
2 or whatever have you, the findings now again can be  
3 prioritized in terms of their safety significance  
4 because you have the tool. You have the information  
5 base and the idea here is to take those findings and  
6 put them in some prioritized form starting with the  
7 most significant ones on down to the least  
8 significant. That is just an example of inspection.

9           There is no reason why similar thinking  
10 cannot be applied to many other activities. I mean,  
11 I have a problem at a plant and I may not meet the  
12 main condition for operation, for example, and I want  
13 to continue to operate. Again, our goal or focus has  
14 to be how safety significant is the issue at hand, and  
15 so this approach, particularly since we have plant-  
16 specific models through IPes, this approach could be  
17 applied to most of the decisions that we have to make  
18 as well as studies that we have to make.

19           And I must say, in our interactions with  
20 the regions, it was universal positive reaction,  
21 desire to do more, and so the time has come where all  
22 quarters seem to be moving together pretty well, I  
23 think.

24           (Slide) Could I have slide number 20,  
25 please?

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1           Now these charts that I went through have  
2 identified what I would call fairly broad categories  
3 of the applications. What we have done is within each  
4 broad category we have identified activities that one  
5 would have to go through. For example, I had one  
6 broad category, inspections, but, as I showed you,  
7 there's a lot more to that, so we've gone through and  
8 we've identified the activities that we think we ought  
9 to go forward with.

10           What's happened is it's a pretty large  
11 list of activities and so it becomes very important.  
12 And since it crosses, as I said, all the offices and  
13 so on, it becomes very important to understand some  
14 kind of interrelationships that exist in these  
15 activities and we need to make sure that we understand  
16 what common information needs would be to cover a  
17 large number of applications, so this requires putting  
18 together fairly substantial information on the  
19 activities and how we want to go forward and deal with  
20 them.

21           So we have -- this chart basically  
22 summarizes the kind of information we're putting  
23 together. That is, what are we doing today and where  
24 do we want to go? What is our objective? What  
25 approach will be used as we go forward? Would we be

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1 reviewing; as Commission Remick's earlier point? Are  
2 we going to review or actually do analysis ourselves?  
3 Do we have the decision criteria or don't we? What  
4 knowledge and skills are needed and so on?

5 So all the way through -- and even again,  
6 what's the regulatory impact? Is it the regulation or  
7 regulatory guide, the standard review plan? What is  
8 it that has to be modified? So, we're trying to put  
9 together this information.

10 You see the last two bullets. The focus  
11 there was to improve communication and understanding  
12 as to where we're going, and it's very important for  
13 us. That's why this is being worked with all the  
14 offices getting together and going forward and that's  
15 really important and that's part of the reason why it  
16 takes longer too.

17 (Slide) Viewgraph number 21, please.

18 I have basically covered this in terms of  
19 the process, but I indicated we've had one meeting  
20 with the ACRS. We plan to have more meetings with  
21 them. They have indicated tremendous interest in this  
22 activity.

23 And as I said, we've had one meeting with  
24 NUMARC. We plan to meet with them later this week to  
25 get more information from them.

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1 (Slide) May I go to viewgraph number 22,  
2 please?

3 Once we have this whole list of activities  
4 and what it takes to do and so on, we're going to  
5 prioritize these and get the offices together. I  
6 expect we will have a reasonable plan that would have  
7 schedules and resources, general schedules and  
8 resources identified in April, but that still needs to  
9 go through.

10 Each office director then has to implement  
11 and decide what activities will get maybe not done,  
12 given some other constraints and so on, so then we  
13 expect the office director would make decisions and  
14 develop an operating plan just as we did with the reg.  
15 review group recommendations and so on. And once the  
16 office director makes that decision, then that of  
17 course has to be reflected in terms of what are the  
18 real needs now since that decision has been made.  
19 That's the thrust, but there are some important things  
20 that have come out as a result of our thinking about  
21 these issues.

22 (Slide) If I may have viewgraph number  
23 23, the last Commission policy statement on risk  
24 assessment came out in January of 1979. There have  
25 been other policy statements, safety goal policy,

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1 severe accident policy, which clearly reflect much  
2 greater reliance on these techniques. We have made a  
3 lot of progress in the last 14 years, 15 years, both  
4 in terms of methods and data and some of the  
5 applications I had talked about.

6 We do think it would be a good idea to  
7 consider a policy statement. The purpose of the  
8 policy statement would be to reflect the Agency's  
9 commitment to this increased use of these methods and  
10 insights into regulatory activities, clearly recognize  
11 and understand limits and strengths as well of these  
12 techniques and what's the status in terms of methods  
13 and so on today, also to encourage the industry to go  
14 with what I would call maintain their PRAs and update  
15 them to really reflect the plants as they are. And we  
16 think that, if one were to go forward on this  
17 approach, this would also allow opportunity for  
18 members of the public to give us their views and  
19 comments on these thoughts.

20 If we were to go forward with this policy  
21 statement, which we recommend we do, I think we can  
22 probably meet the schedule that we've proposed here.  
23 We are meeting with the ACRS, I think, February 11th,  
24 and we would talk to them about the content of this  
25 policy statement and so on. We hope to get it out for

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1 public comment, get public comments and try to  
2 finalize it by the end of this fiscal year basically  
3 is what we hope to do.

4 (Slide) May I have chart number 24,  
5 please?

6 Now, as I said, we don't want the  
7 development of plant to hold back progress in a number  
8 of areas. These are just some examples of areas where  
9 we're moving ahead. You heard from the reg. review  
10 group, the issue of Appendix B, quality assurance, and  
11 talked about initiating pilot study this September.  
12 Here we're going to use PRA techniques to develop  
13 relative importance of components and so on,  
14 components that appear in Q lists, for example, and  
15 try to understand their relative significance. And we  
16 would, of course, also try to identify how PRA  
17 insights can in fact be used in that approach.

18 We have actually moved forward  
19 substantially in the area of looking at the  
20 containment leakage testing requirements, Appendix J.  
21 It's quite expensive. The tests that they have to do  
22 are very expensive, particularly what's called type A  
23 test, the integrated leak test for containment.  
24 That's almost always a critical item when they start  
25 up after an outage. They have to finish all the work

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1 and then run the tests. That's always critical and  
2 takes time. It costs, I'm told, somewhere around \$1.5  
3 million to \$2 million to do such a test.

4 Anyway, so there's a lot of interest to  
5 see if we can't revise the frequency of those tests  
6 that are required. What we're doing is we're trying  
7 to ascertain if one relaxes that what would be the  
8 risk significance of those relaxations. That's -- I  
9 think we're pretty far along and it looks like we can,  
10 in fact, relax the testing requirements there.

11 Another example is the generic letter 89-  
12 10 on the motor-operated valves. Here again what  
13 we're doing is we're using approaches to understand  
14 which valves are more important than others. So, the  
15 idea here is prioritize. The valves that are most  
16 important you demand the most off. That is do they  
17 have to be tested and can you accept analysis only?  
18 Maybe testing is the way to deal with those valves,  
19 where as less important valves, analysis would be good  
20 or you can, in fact, wait for that information to come  
21 in because they're not so significant in terms of  
22 safety.

23 So, we are going ahead and we're, in fact,  
24 making a fair amount of progress in some of these  
25 areas. South Texas tech spec project, in fact safety

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1 evaluation report is about to get out on that. So,  
2 we're basically finished. That project was very  
3 helpful to us because we spent a lot of time. But it  
4 was worth it because we developed some thinking on how  
5 should we deal with some of these technical  
6 specifications. Two pieces, frequency of testing,  
7 which is relatively easy to deal with I think, and the  
8 allowable outage times for the two elements. That's  
9 a little more difficult. But what this did was we  
10 developed tools that now we can use in other areas and  
11 go forward.

12 As I said, we're going to continue to work  
13 with NUMARC and try to make sure we have joint  
14 understanding of priorities and so on.

15 Basically that's the end of my briefing.

16 CHAIRMAN SELIN: I'm very pleased at what  
17 I've heard today. I like everything I've heard. I  
18 particularly like the level it's coming from because  
19 in the past, to be blunt about it, when we got concern  
20 about PRA, we set up a fairly low-level working group  
21 as if that would solve the problem. It's good to see  
22 management coming forward and saying, "No, this is our  
23 problem and we need to lead on this." I'm very  
24 pleased at that.

25 A couple of questions to do with the plan.

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1 That is as you think ahead, since you don't have a PRA  
2 project, you know we have a regulatory project of  
3 which PRA is a part, you have to think very hard about  
4 how we know how we're doing, how should this be  
5 managed and how should we get some sense of how we're  
6 doing against our objective. First of all, I'd like  
7 you to consider that there might be somebody in the  
8 EDO's office, in AEOD to keep score on the project.  
9 The second is that you have to realize that there are  
10 at least five or six aspects. How are we implementing  
11 probabilistic thinking in the regs? How are we doing  
12 this in licensing? How are we doing this in  
13 inspection? How about some of the major projects like  
14 the IPEs and how are we doing building up our support  
15 basis? So, if we're going to say we're doing pure  
16 expectations, we're doing pretty well. One has to  
17 look through the same things we look through for other  
18 reasons but from a slightly different cast.

19 Finally, I would like to just leave one  
20 admonition. That is, beware the phantom probability,  
21 the desire to hypothesize in number to go into a  
22 calculation where we pick a probability sort of out of  
23 the hat and then do calculations to three degrees of  
24 accuracy based on those. If we don't know the  
25 probabilities, let's work backwards and say, how

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1 probable would this have to be for us to be concerned  
2 about it? Very often the answer is that that's way  
3 below our level of interest or our concern.

4 We're getting tendencies, we had one in  
5 the vehicular protection, to put probabilities where  
6 they don't even make sense let alone to come up. How  
7 likely is an attack on a power plant? It depends on  
8 what we do in the power plant. It's a game theory  
9 kind of thing, not a calculation. So, make sure we  
10 follow the basic rule to systems analysis. Start what  
11 you know about, which in many cases is the event trees  
12 and the engineering, and solve for what we don't know  
13 instead of always going through the same point. Also  
14 beware the -- you know, we do have to remember that  
15 defense in depth is in some ways not consistent with  
16 the PRAs. But in another way we require that certain  
17 conditional probabilities not get above the certain  
18 level regardless of other probabilities in the chain.

19 But basically, it is just first rate and  
20 particularly taken in conjunction with the regulatory  
21 review group presentation, that maybe we are on the  
22 right track.

23 Commissioner Rogers?

24 COMMISSIONER ROGERS: Yes. I wanted to  
25 just compliment the working group because I thought

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1 the report was really first class. I wanted to  
2 particularly compliment you on the Appendix C, which  
3 I haven't really mastered yet but looks to me like a  
4 very fine and complete job, very scholarly and yet  
5 concise. I just thought that looked to me like a  
6 really fine piece of work that I think is going to  
7 stand us all in good stead in the future. I think it  
8 is something that's going to be a well worn document  
9 in this Agency.

10 I would like to comment or perhaps ask  
11 some questions on the study of the survey of staff  
12 experience and contractor experience and training that  
13 was in Appendix A. I must say I was somewhat troubled  
14 by the numbers that I saw in there. I'm not sure  
15 exactly what they mean in some cases. I know that we  
16 have to view this whole area in the context of what  
17 has been common engineering education and practice in  
18 the past which very often has not placed much emphasis  
19 on probability and statistics.

20 I think you've touched on that, Mark, in  
21 your remarks and I know it very well as an engineering  
22 educator that probability and statistics have not been  
23 part of the standard engineering curriculum in most  
24 programs. Some have put some in and some have not.

25 I think that part of our difficulties in

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1 the Agency has been a lack of grounding in the  
2 fundamentals of probability of statistics and  
3 therefore I've been a bit -- I looked with interest on  
4 the formal training and formal education that  
5 contractors or staff have had and it's pretty meager.  
6 The report comments on that and says many of the  
7 contractors developed their PRA skills through  
8 experience. As with the staff, the percentages of the  
9 contractors with formal education in PRA-related  
10 subjects was low. Now, PRA itself is a more modern  
11 development and one would not expect to find that  
12 necessarily in the skills of formal training. But you  
13 included probability and statistics as part of that  
14 question, I believe, when you asked it and if there  
15 was some training in probability and statistics  
16 formal, then I imagine somebody would have answered in  
17 the affirmative on that question. Is that right or  
18 not?

19 MR. CUNNINGHAM: Yes, I think that's  
20 right.

21 COMMISSIONER ROGERS: And so, there's  
22 where my concern is. I am concerned about our  
23 training programs because when you're talking about  
24 fundamental concepts, there's some time needed for  
25 really understanding those and working through them.

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1 Time is not always available in the pace of what is  
2 called a training course versus a fundamentals course  
3 at a university level. Therefore, I'm somewhat  
4 concerned about not only the lack of that in our  
5 staff, but also in our contractors, which seems to  
6 show up in that survey. I wonder if you could comment  
7 on that.

8 MR. CUNNINGHAM: Well, I guess I would go  
9 back to one of your original points. Many of us in  
10 the staff here and many of the contractors that work  
11 in PRA are trained in the engineering disciplines and  
12 one of the things certainly that we've found is that,  
13 for example, and when we were working on NUREG-1150,  
14 getting people who were mechanical engineers, thermal  
15 hydraulic experts to discuss their knowledge in terms  
16 of probabilities, exceedingly difficult. We had a  
17 hard, hard time getting people to do that. They just  
18 had not really even been introduced to the concepts of  
19 thinking in terms of probabilities.

20 So, I think that is, in a sense, one of  
21 the common problems we ran into was that most of us  
22 here are engineering trained and don't see that and  
23 don't get exposure very much to probabilities.

24 COMMISSIONER ROGERS: Well, I think that  
25 when we're talking about the training and courses that

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1 are required here, I would ask that there be  
2 particular care provided in getting those basic  
3 fundamental concepts understood because once you start  
4 in on turning the crank on PRAs, I'm sure you can go  
5 through it pretty well in a mechanistic way. Of  
6 course, the engineering experience is very important,  
7 as was pointed out by Doctor Garrick. That's very  
8 important in carrying these things out. Knowing  
9 statistics and probability isn't going to help you at  
10 all if you don't know anything about a plant. On the  
11 other hand, you can sometimes get into trouble if you  
12 don't understand the fundamental limitations of the  
13 concepts of probability and statistics. There I would  
14 hope we would pay particular attention to giving  
15 enough time to whatever part of the training program  
16 is involved there, either through use of university  
17 courses or whatever. But it's a different kind of  
18 activity from what I would call training in the how to  
19 do its of PRAs.

20 MR. JORDAN: Commissioner Rogers, maybe I  
21 can help there. We are facing that and we're trying  
22 to develop the understanding of what the training  
23 needs are office by office and for the various levels  
24 of practitioners, I'll call them, in PRA and the  
25 combination of formal courses through universities,

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1 revision of the existing training center courses that  
2 the Office of Personnel developed through INEL and our  
3 own systems courses. We want to make an integral set  
4 out of that so that the offices can pick and choose  
5 from what level of practitioner is warranted and that  
6 they have the adequate groundings in probability and  
7 statistics, reactor systems, the probabilistic risk  
8 analysis applied to reactors all assembled. So, it is  
9 a very strong goal and we don't have to wait for more  
10 planning to do that. That's underway right now.

11 COMMISSIONER ROGERS: Well, I'm glad to  
12 hear that. I do think that people using probability,  
13 probabilistic concepts really need a thorough  
14 grounding in the basic concepts and they need time to  
15 get accustomed to it because, as you said, most  
16 engineers don't think in probabilistic terms. I think  
17 electrical engineers very often have been exposed to  
18 this because of the kinds of systems they've been  
19 dealing with. But generally, mechanical, chemical  
20 engineers, civil engineers don't think in those terms  
21 or haven't been educated in those terms. There are  
22 exceptions, of course.

23 That comes to this whole question of the  
24 limitation of PRAs. We've heard great words said time  
25 and time again now about being very cautious about the

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1 use of PRAs and their limitations. I think one ought  
2 to think of this a little bit differently. If you  
3 look on your slide B-6 on PRA limitations, the two  
4 major bullets, potentially important factors impacting  
5 risk may not be included, and the potential for  
6 misunderstanding of results, without looking at the  
7 subheadings, those are equally applicable to  
8 deterministic analyses. In fact, it seems to me that  
9 almost every one of the limitations which we've  
10 discovered in the use of PRAs, in fact, are embedded  
11 in not explicitly but sometimes implicitly in  
12 deterministic calculations. We tend to think the  
13 deterministic calculations are much sounder and better  
14 based than they often are. There are assumptions in  
15 the input data, there are assumptions in the model  
16 that's used and ultimately the results have  
17 uncertainties in them as a result of those  
18 assumptions. But we tend to forget about those very  
19 often. PRA tends to force you to think about those.

20 MR. CUNNINGHAM: Yes.

21 COMMISSIONER ROGERS: It gets them up to  
22 the top and you're forced to deal with them at a very  
23 early stage. Now, the techniques, of course, do rely  
24 on data, the probabilistic data in some ways and you  
25 have to have that. But the basic analysis of the

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1 system that comes out by doing a PRA, it seems to me,  
2 is much more comprehensive, has much more powerful and  
3 comprehensive than the deterministic techniques would  
4 allow you to do. I think that while I certainly don't  
5 suggest that one should not be cautious, I think that  
6 many of the difficulties or many of the cautions that  
7 one has to be aware of in using PRA were really there  
8 all the time that we weren't paying enough attention  
9 to when we were doing deterministic calculations.

10 So, we're really starting to get faced --  
11 we're facing reality here rather than physical  
12 modeling that sometimes can be deceptively beautiful  
13 and complete.

14 So, I wouldn't de-emphasize that PRA has  
15 limitations, but I'm not so sure those limitations are  
16 so different from deterministic analyses. I'd draw an  
17 analogy here between in some ways the power of PRA  
18 versus deterministic calculations to the difference  
19 between statistical mechanics and kinetic theory in  
20 understanding gas behavior or the difference between  
21 classical mechanics and quantum mechanics in other  
22 physical systems. It's a much more sophisticated  
23 powerful tool that of course can give you wrong  
24 results. You know, garbage in, garbage out.

25 But I think that our caution in moving

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1 into this is well founded, but this is clearly in my  
2 view the way to go. It represents a much more  
3 sophisticated and complete way of looking at an entire  
4 complex system such as a nuclear power plant and  
5 offers much greater power than what we've had before.

6 DOCTOR MURLEY: Could I comment on that?

7 COMMISSIONER ROGERS: Sure.

8 DOCTOR MURLEY: I agree exactly,  
9 Commissioner Rogers, with what you just said. There's  
10 one, to my mind, overriding limitation that we have to  
11 always keep in mind and that is that a PRA right now  
12 is not a complete model of risk. It cannot model well  
13 the way that plants are managed and operated. That is  
14 the human aspect. All we have to do is test how would  
15 one have tried to predict the chances of a Chernobyl  
16 type happening using a PRA, for example. But that  
17 shouldn't overshadow the great strengths that we can  
18 draw from PRA.

19 I think the staff just has to recognize  
20 what its limitations are and not push it into that  
21 area. Unfortunately, I think to some extent we are  
22 being pushed that way because there are some people  
23 who are believing these bottom line IPE numbers that  
24 come in. From that they're drawing the inference that  
25 because the numbers are so low they're well below what

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1 we should be interested in in NRC and that there are  
2 certain systems and certain valves, for example, that  
3 we don't have to pay attention to. I think that's  
4 pushing it beyond what it can really do.

5 COMMISSIONER ROGERS: I think the danger  
6 is the bottom line number, everything being wrapped up  
7 in one number that you can carry around with you and  
8 quote, that that's where the danger is because, as  
9 you've pointed out, the human factors aspect of this  
10 is very difficult to include in a meaningful way and  
11 can upset the whole thing from a reality point of  
12 view. A very low probability situation can, in fact,  
13 be brought about through human intervention in the  
14 wrong way and that's not in the calculation. On the  
15 other hand, the discipline that it imposes on your  
16 thinking and analysis, I think, is extremely powerful.

17 DOCTOR MURLEY: Yes.

18 CHAIRMAN SELIN: Commissioner Remick?

19 COMMISSIONER REMICK: I certainly  
20 associate myself with the comments made on the PRA  
21 limitations both by Commissioner Rogers and Doctor  
22 Murley. I've been frustrated in the past in cases  
23 where PRAs have attempted to elucidate the  
24 uncertainties and people raise the question how can  
25 you possibly make a decision in face of these

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1       uncertainties.

2                   Going back to what Commissioner Rogers  
3       said, the uncertainties have always been there, it's  
4       just PRAs, we attempt to identify them and see what  
5       they are. But those have always been there. We've  
6       had to make decisions and we'll continue and I think  
7       there's some balance between the insights we receive  
8       from a risk assessment and deterministic engineering  
9       judgment that we have to make. But I think we get  
10      better insights by having different tools.

11                   I also would join in saying I think it has  
12      been a tremendous effort that you have. It's a  
13      tremendous step forward and I would like to see the  
14      effort continue. In fact, one of the questions I have  
15      is when will the report be published in NUREG form?

16                   MR. CUNNINGHAM: It will probably be in  
17      the month of February. There are a couple of last  
18      minute glitches on it, but it should be out in  
19      February.

20                   COMMISSIONER REMICK: The reason I have an  
21      interest, some of you might know that I, on the behalf  
22      of IAEA, have been chairing some small working groups  
23      of different countries discussing the regulatory uses  
24      of things like safety goals and where probabilistic  
25      risk assessment fits in with that. Part of that is

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1 giving examples of some of the things we're doing in  
2 the NRC and this is an excellent document laying out  
3 some excellent examples of how it is being used and  
4 the safety goal being used.

5 I think we have come a long way in PRA,  
6 just in my limited time of observation. It hasn't  
7 been too awfully long when there was reluctance, if  
8 I recall, IBM-5520 display writers, of people  
9 accepting those rather than typewriters. I certainly  
10 wouldn't say in a public forum, but we even see those  
11 on our attorneys desks now. They all have computers  
12 and so forth.

13 It hasn't been too long ago that I think  
14 there was some reluctance to think about enhancing our  
15 internal analytical capability and getting more work  
16 stations and so forth. I think that's generally  
17 accepted and the uses are growing and we're seeing  
18 greater and greater opportunities for use.

19 And I see the PRA. I've been really  
20 impressed with the increasing use that we are making  
21 as documented in this report. But as I mentioned at  
22 the meeting we had the other day with the senior  
23 management review, the results of EPA are being  
24 discussed in those decisions and so forth. Did I say  
25 IPA? I meant IPE if I said otherwise. I see more and

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1 more uses. So, I've been quite impressed.

2 One observation that I would make. If  
3 there's inferred criticism, it goes on this side of  
4 the table, that side of the table. I think the  
5 Commission deserves a lot of credit for issuing  
6 something called a safety goal in which, in the case  
7 of reactors, the Commission has tried to identify a  
8 goal in risk to the public perspective which the staff  
9 is incorporating more and more in its activities.

10 What I still see as I look broadly at the  
11 Agency is some kind of overriding risk perspective  
12 from which we do things in various offices. We've  
13 been kind of forced into doing it more in the reactor  
14 area. But even there, one of the things I've been  
15 stressing as we talk about taking dose limits out of  
16 Part 100 and putting them in Part 50, raising the  
17 question when we do that do we just transfer the  
18 numbers or should we be looking at it from a risk  
19 perspective?

20 Also, when we compare whole body doses and  
21 doses to the thyroid, is there a consistent risk  
22 perspective in those numbers as those ratios now exist  
23 in our regulations compared to our current knowledge  
24 through ICRP guidelines, guidance and so forth in  
25 those areas. When we now talk about setting radiation

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1 protection standards, whether it's low-level waste or  
2 high-level waste or maybe it's in medical uses or  
3 whatever, I don't see us having some kind of an  
4 overall risk perspective from which we then set what  
5 I would call a subsidiary radiation protection  
6 standards to dose standards. We're still continuing  
7 what happened over many years and that is at different  
8 times by different people for different purposes we  
9 established doses. If you look at those, which I have  
10 done a number of those, we have a range of risk,  
11 actually narrower than I might have expected, but we  
12 aren't trying to come down to kind of a -- across this  
13 Agency at least, some kind of a consistent perspective  
14 from which we do things in all of our various  
15 activities.

16 Now, I think it can be done because we're  
17 talking about risk to the public. I don't see that  
18 consistency yet and, as I say, that's not anymore a  
19 criticism of you folks than it is for those on this  
20 side of the table. It is something that long-term I  
21 would like to see done in the Agency. I don't know if  
22 it can be done in the policy statement that you  
23 referred to, but I would certainly welcome attempts  
24 that we try to do this.

25 If I look back at the time of the

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1 formulation of the safety goals, there was a lot of  
2 concern that if this Agency ever came out of anything  
3 that addressed public risk, it would be slapped down.  
4 That's something for Congress to do. But I don't  
5 think Congress will ever actually do it. It's a very  
6 difficult question. There were people on several  
7 times said, if you put out a risk goal, it will shut  
8 down all existing reactors because how are you ever  
9 going to prove that they beat it? But we've come over  
10 those and we do find useful purposes. But I still say  
11 that we don't have a completely consistent approach  
12 across our various offices. I think it's growing, but  
13 I think we have a ways to go yet.

14 But I won't take away from your current  
15 effort. I think it's an outstanding effort. I look  
16 forward to it being published and I agree with  
17 Commissioner Rogers. I think it's going to be a  
18 greatly used document. I have not completed the  
19 Appendix C either but have found extremely interested  
20 just in some of the definitions and so forth in there  
21 that are very helpful and the stressing of consistency  
22 and talking about risk versus core damage frequency or  
23 conditional containment failure probability not  
24 confusing risk in using those terms. All those things  
25 are very helpful.

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1                   So, I compliment you on your effort and  
2 encourage you to continue.

3                   CHAIRMAN SELIN: Commissioner?

4                   COMMISSIONER de PLANQUE: Well, I too  
5 think it's an excellent report and I think we clearly  
6 need to move in this direction. It's a tool that we  
7 have to take advantage of. So, I compliment you on  
8 all your efforts in this direction.

9                   I would like to say I strongly support  
10 everything that Commissioner Remick just said about  
11 the consistency of risk. I too have seen this problem  
12 where different risk levels have been used or  
13 different dose levels have been used without much of  
14 an attempt to get consistency overall. This certainly  
15 is a tool that can help us in that regard. Sometimes  
16 I think just sitting down and looking at all the  
17 values that we've chosen across the Agency in various  
18 applications would help as well, just to see it all  
19 laid out in front of us.

20                   I think Commissioner Rogers sort of  
21 alluded to this and others did too. Not only are  
22 there organizational obstacles to this and training  
23 obstacles to this, but maybe some of it can be  
24 characterized as a cultural resistance. I think many  
25 people who cut their teeth on slide rules, and I have

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1 to admit to being one of them, resisted hand-held  
2 programmable calculators for awhile, until they truly  
3 understood what the value was and what the benefit  
4 was. So, for that reason, I would strongly suggest  
5 that when you look into the training requirements  
6 here, that it be heavily stressed that those who are  
7 going to use this really understand what it is,  
8 understand the very basics and really recognize the  
9 value of the tool.

10 It reminds me of some students today who  
11 are given software packages on statistics and because  
12 they can run all these statistical programs they think  
13 they understand statistics. When you look at the  
14 analysis that they've presented, it's clear they  
15 don't.

16 So, it's extremely important that if this  
17 is going to work that that basic understanding, I  
18 think as Commissioner Rogers well expressed, really be  
19 there.

20 This brings me to the next issue and that  
21 of resources. Since it's so important that any  
22 training in these areas be done well, if this is going  
23 to succeed, I would suggest in planning for the plan  
24 that you really look very carefully at the resources  
25 that are going to be needed and do a very honest

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1 evaluation of what's really needed to achieve the  
2 goals that you have in mind.

3 I just have one question about the policy  
4 statement that you've proposed. Do you intend to run  
5 this by the Commission before you get to the October  
6 level? Are we going to get a peak at this before  
7 you --

8 DOCTOR THADANI: Yes, indeed. Yes,  
9 indeed. We would hope to prepare a paper on this and  
10 pass it up. Yes, by April we had hoped to get a paper  
11 up. It won't get out until you see it.

12 COMMISSIONER de PLANQUE: Okay. Very  
13 good. Well, I'm curious to see it and I really look  
14 forward to it. So, congratulations. Thank you.

15 CHAIRMAN SELIN: Thank you very much.

16 (Whereupon, at 11:35 p.m., the above-  
17 entitled matter was concluded.)  
18  
19  
20  
21  
22  
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24  
25

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TITLE OF MEETING: BRIEFING ON REPORT AND PLAN FOR IMPLEMENTATION  
OF PRA WORKING GROUP REPORT

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: JANUARY 31, 1994

were transcribed by me. I further certify that said transcription  
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# **STATUS OF PRA IMPLEMENTATION PLAN DEVELOPMENT**

**Presentation to the Commission  
Mark Cunningham, Chief  
Probabilistic Risk Analysis Branch, RES  
Ashok Thadani, Director  
Division of Systems Safety and Analysis  
January 31, 1994**

# **ELEMENTS OF PRESENTATION**

- I. Summary of PRA Working Group Activities**
- II. PRA Implementation Plan Development**



# **Summary of PRA Working Group Activities**

## **Objectives**

- **To develop guidance on consistent and appropriate uses of PRA within the NRC;**
- **To identify knowledge and skills necessary for each category of staff use; and**
- **To identify improvements in PRA methods and associated data necessary for each category of staff use.**

## **PRA Working Group (Continued)**

### **Membership**

- **Mark Cunningham, RES**
- **Patrick Baranowsky, AEOD**
- **William Beckner, NRR**
- **Patricia Rathbun, NMSS**

## **PRA Working Group (Continued)**

### **Review Process**

- **External reviewers**

**Four meetings with:**

- **Dr. B. John Garrick, President, PLG Inc.**
- **Dr. Bernard Harris, Professor, Department of Statistics, University of Wisconsin**
- **Dr. Ralph L. Keeney, Professor, Department of Systems Management, University of Southern California**
- **Dr. Herbert J. C. Kouts, Defense Nuclear Facilities Safety Board**

**Final comments: November 10, 1993 letter**

## **PRA Working Group (Continued)**

- **Advisory Committee on Reactor Safeguards**  
**Four meetings with ACRS**  
**Final comments: November 10, 1993, letter**

# **PRA Working Group (Continued)**

## **Summary of Final Report**

### **(SECY-93-330, NUREG-1489)**

#### **General Recommendations**

- **Develop integrated plan on staff's risk assessment and risk management practices**
  - **Define the present structure of the agency's risk assessment and risk management practices,**
  - **Summarize the key elements of the staff's work**
  - **Lay out plans for improving and expanding PRA uses within the agency, and**
  - **Investigate formal decision analysis methods for use in risk management practices**
- **Improve interactions with industry PRA users**

# **PRA Working Group (Continued)**

## **Areas for Improvement**

- **Guidance**
- **Training**
- **PRA methods and data bases**

## **PRA Working Group (Continued)**

### **Use Guidance: Results and Recommendations**

**Developed general guidance for two types of staff PRA uses:**

- **Screening and prioritizing issues or events**
- **Performing more detailed analyses of specific issues or events**

**Developed more specific guidance for two particular staff PRA uses:**

- **Generic issue prioritization**
- **Generic issue resolution**

# PRA Working Group (Continued)

## Use Guidance: Results and Recommendations (Continued)

Recommendation	Responsible Office
Develop detailed guidance (including decision criteria) for issue screenings and analyses.	AEOD, NRR, RES
Complete development of guidance for PRA uses (including IPEs and IPEEEs) in plant-specific reactor licensing issues.	NRR
Develop guidance on how to use IPEs and IPEEEs in risk-based inspection process.	NRR
Update standard review plan to reflect advanced reactor PRA review process.	NRR
Maintain close coordination between high level waste performance assessment process and reactor risk assessment process.	NMSS
Maintain close coordination between medical device PRA and reactor risk assessment process.	NMSS



# **PRA Working Group (Continued)**

## **PRA Skills, Training, and Methods: Results and Recommendations**

**Development of a desk reference on PRA terms and methods**

- **Summary of commonly-used PRA terms and methods (Appendix C)**
  - **Probability & Statistics**
  - **Accident Sequence & Reliability Analysis**
  - **Accident Progression and Risk Analysis**
  - **Expert Judgment**
  - **Uncertainty & Sensitivity Analysis**
- **Workshops for staff**

# **PRA Working Group (Continued)**

## **PRA Skills, Training, and Methods: Results and Recommendations**

<b>Recommendation</b>	<b>Responsible Office</b>
<b>Develop a comprehensive PRA training program, based on job and task analyses of major PRA uses.</b>	<b>AEOD</b>
<b>Develop minimum set of courses for specific PRA uses.</b>	<b>AEOD</b>
<b>Recruit staff with critical PRA skills</b>	<b>OP and Program Offices</b>

# **PRA Working Group (Continued)**

## **PRA Skills, Training, and Methods: Results and Recommendations**

<b>Recommendation</b>	<b>Responsible Office</b>
<b>Develop guidance for adapting PRA methods and results.</b>	<b>RES</b>
<b>Continue development of PC-based PRA tools and plant data base.</b>	<b>RES</b>
<b>Assess feasibility of agency-wide reactor classification system.</b>	<b>RES</b>
<b>Complete feasibility of “roll-up” reactor PRA models.</b>	<b>RES</b>
<b>Develop “living” PRA models and data base for staff use.</b>	<b>RES, AEOD</b>

# **PRA IMPLEMENTATION PLAN DEVELOPMENT**

# **RECENT RECOMMENDATIONS ON PRA APPLICATIONS**

- **PRA WORKING GROUP** - Assess current uses of PRA, to identify needed staff PRA knowledge and skills and needed improvements in PRA methods and data.
- **REGULATORY REVIEW GROUP** - Assess the feasibility of substituting performance-based requirements and guidance founded on risk insights for prescriptive requirements and guidance.
- **REGULATORY ANALYSIS STEERING GROUP** - Provide guidance to support proposed regulatory actions

# **NUMARC REGULATORY THRESHOLD WORKING GROUP**

**Objective: Promote the Use of Probabilistic Safety Assessment Technology and Other New Approaches to Regulation as an Aid to Focus Industry and Regulatory Attention and Resources More Effectively.**

**The Agency is currently moving ahead with several initiatives utilizing PRA techniques.**

# **CATEGORIES OF AGENCY PRA USE**

## **I. Regulatory Requirements**

**Advanced Reactor Reviews**

**Generic Issues**

**Regulatory Effectiveness Evaluation**

**Changes to Regulations, Requirements,  
and Guidance**

**Low- and High-Level Waste Facilities**

## **II. Event Assessment**

**Event Investigation**

**Event Study and Follow-up**

# **CATEGORIES OF AGENCY PRA USE (Continued)**

## **III. Enhancement of Existing Programs**

**Inspection**

**Operator Licensing**

**Senior Management Meetings**

**Plant-specific Licensing Actions**

**Nuclear Materials Licensee Reviews**

## **IV. Severe Accident Closure**

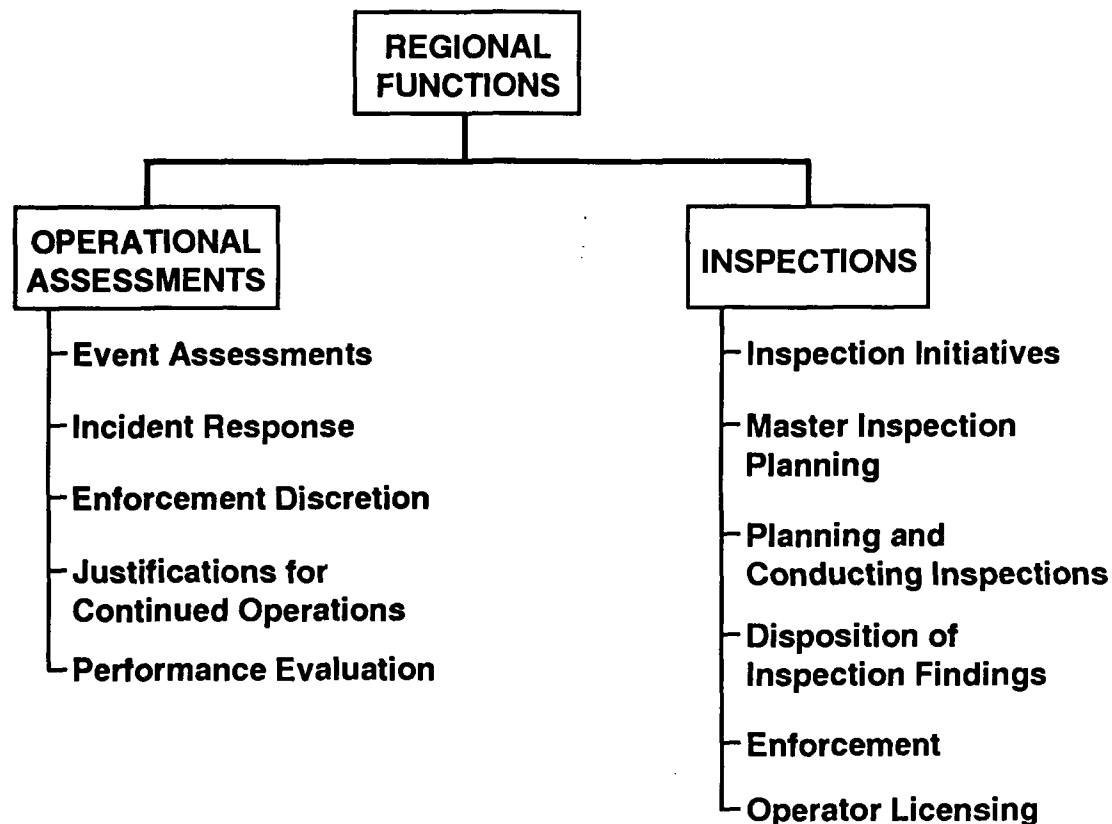
**Individual Plant Examinations**

**Containment Performance Improvement**

**Accident Management**



# REGIONAL APPLICATIONS OF RISK INSIGHTS



# **FEATURES OF A PLAN FOR PRA USE WITHIN EACH REGULATORY ACTIVITY**

- **Objectives**
- **Methods**
- **Guidance Development**
- **Training**
- **Regulatory Changes**
- **Needed PRA Tools and Data**
- **Organizational Responsibility**
- **Resource Requirements**

# **PROCESS FOR PLANNING FUTURE PRA IMPLEMENTATION IN THE NRC**

- **Identify regulatory activities in which use of PRA methods and insights should continue or be expanded;**
- **Interface with the ACRS and interested parties on the planned PRA activities;**
- **Develop an integrated approach for accomplishing goals and objectives for PRA use in each regulatory activity identified;**

# **PROCESS FOR PLANNING FUTURE PRA IMPLEMENTATION IN THE NRC (Continued)**

- **Prioritize regulatory activities requiring inter-Office coordination;**
- **Integrated plan:**
  - **Identify categories, schedules and resources, April 1994**
  - **Develop Office-level operating plans, June 1994**
- **Modify the NRC Five-Year Plan as needed.**

# **POLICY STATEMENT ON THE NRC'S USE OF PRA**

- **Declare the Agency's commitment to increased use of PRA methods and insights in its regulatory activities, recognizing strengths and limitations of PRA use.**
- **Provide an opportunity for public comment on the Agency's increased use of PRA.**

## **Milestones:**

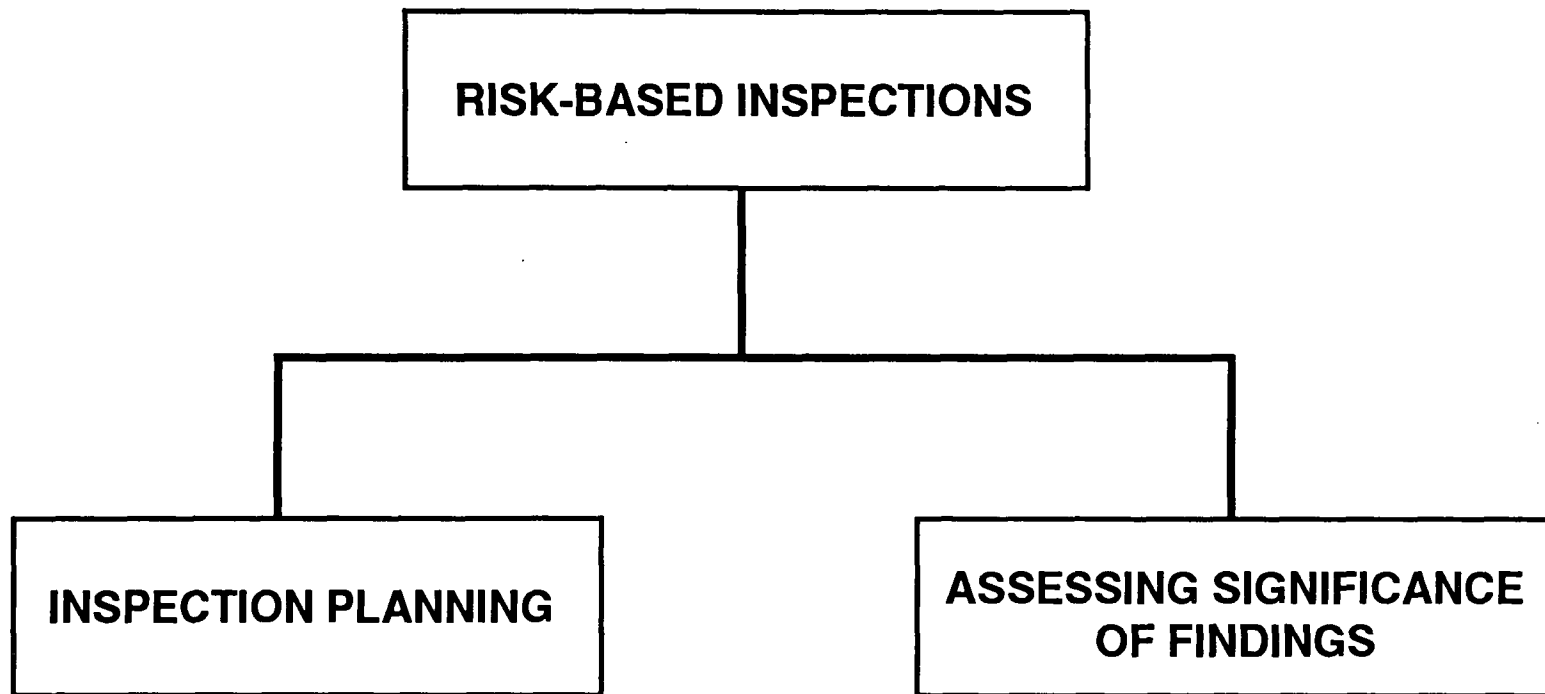
- **Discuss draft policy statement with ACRS in February 1994.**
- **Issue draft for public comment in April 1994.**
- **Discuss final policy statement with ACRS in August 1994.**
- **Complete the final policy statement by October 1994.**

## **During PRA plan development, continue on-going activities:**

- **Appendix B, Quality Assurance - Initiate pilot graded QA program in September 1994**
- **Appendix J, Containment Leakage - Proposed rule, late Spring 1994**
- **GL 89-10, Motor Operated Valves**
- **South Texas Project Technical Specifications**
- **Meeting in February 1994 with NUMARC to discuss priorities**

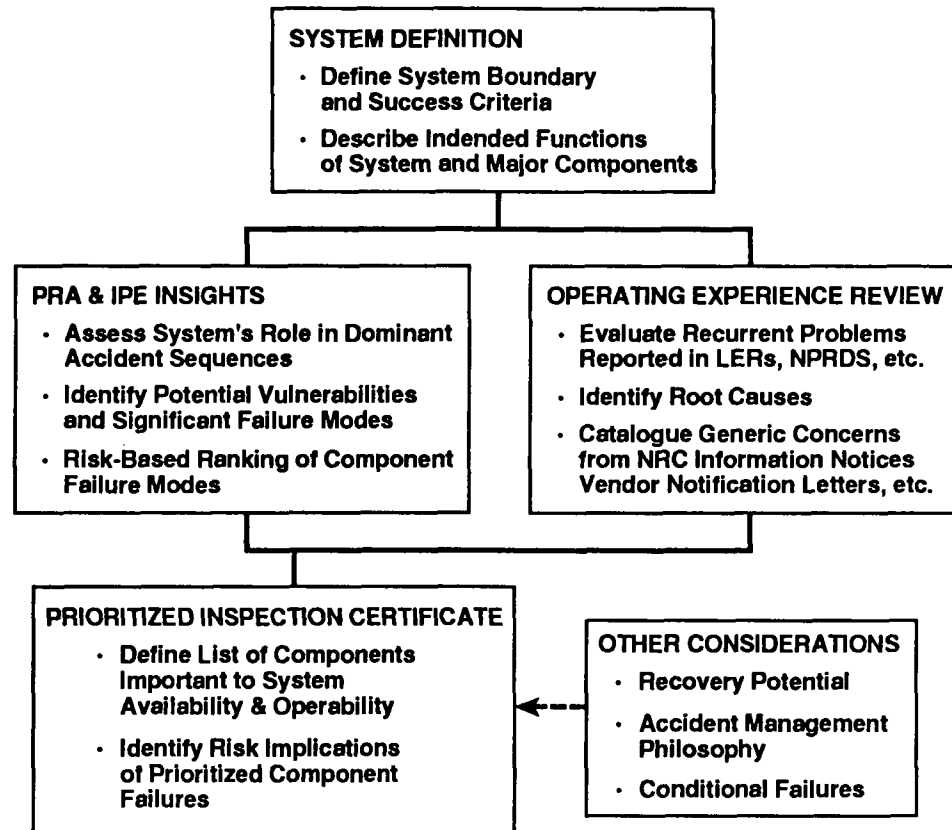
# **CURRENT NRC PRA ACTIVITIES**

- **LICENSING ACTIONS**
- **INSPECTIONS**
- **EVENT ASSESSMENTS**
- **SEVERE ACCIDENTS**
- **DATA BASE**
- **GENERIC ISSUES**
- **ADVANCED REACTORS**
- **SENIOR MANAGEMENT MEETINGS**
- **ACCIDENT SEQUENCE PRECURSORS**
- **REGULATORY CHANGES**

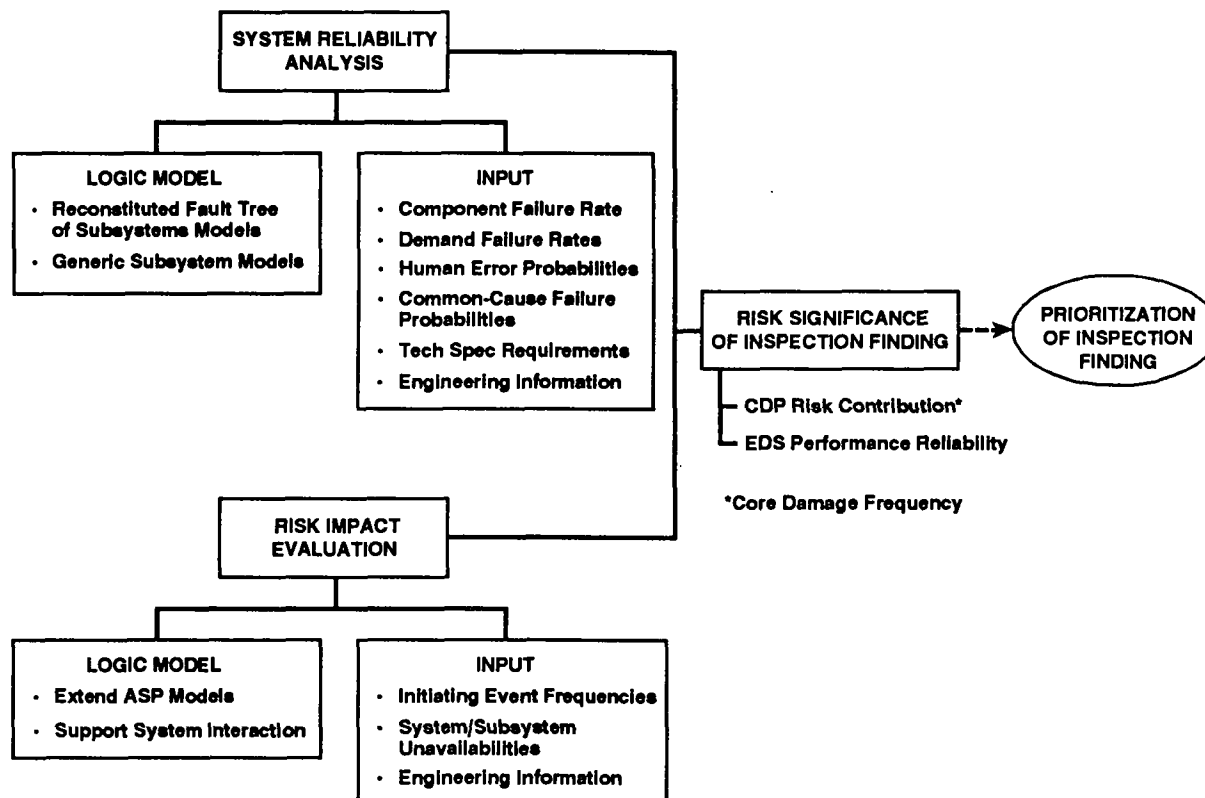




# RISK-BASED APPROACH TO INSPECTION PLANNING



# RISK-BASED APPROACH FOR ASSESSING THE SIGNIFICANCE OF INSPECTION FINDINGS



# **PRA STRENGTHS**

- **Integrated and systematic examination of design and operational features**
- **Incorporates system interactions and human-system interface**
- **Provides model for incorporating operating experience with the engineered system**
- **Process for explicit consideration of uncertainties in estimation**
- **Permits analysis of competing risks**
- **Permits analysis of new issues via sensitivity studies**
- **Provides a measure of relative importance of systems, components, etc.**
- **Provides quantitative measure of overall risk of the engineered system.**

# **PRA LIMITATIONS**

- **Potentially important factors impacting risk may not be included:**
  - **Accident initiators of very low frequency**
  - **Human performance and interactions with the system**
  - **Separate failures derived from a common event or condition**
  - **Physical processes resulting from the low frequency combinations of failures**
  - **Long-term health effects of potentially toxic materials**
- **Potential for misunderstanding of results**