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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
PROBABILISTIC RISK ASSESSMENT SUBCOMMITTEE

+ + + + +

TUESDAY

JANUARY 28, 1997

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

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

COMMITTEE MEMBERS:

GEORGE E. APOSTOLAKIS	Chairman
JOHN J. BARTON	Member
IVAN CATTON	Member
MARIO H. FONTANA	Member
THOMAS S. KRESS	Member
DON W. MILLER	Member
DANA A. POWERS	Member
WILLIAM J. SHACK	Member



1 ACRS STAFF PRESENT:

2 MICHAEL T. MARKLEY

3 PAUL BOEHNERT

4 AMARIJIT SINGH

5 MEDHAT EL-ZEFTAWY

6 JOHN T. LARKINS

7

8 ACRS FELLOW PRESENT:

9 RICHARD SHERRY

10

11 ACRS CONSULTANT PRESENT:

12 EDWARD ABBOTT

13

14 ALSO PRESENT:

15 MARK CUNNINGHAM

16 TOM KING

17 B. JOHN GARRICK

18 GARY HOLAHAN

19 WAYNE HODGES

20 BOB JONES

21 GARETH PARRY

22 MICHAEL CHECK

23 MARK RUBIN

24

25

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## A-G-E-N-D-A

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

(8:36 a.m.)

CHAIRMAN APOSTOLAKIS: The meeting will now come to order. This is a meeting of the ACRS Subcommittee on Probabilistic Risk Assessment. I am George Apostolakis, Chairman of the Subcommittee.

ACRS members in attendance are: John Barton, Ivan Catton, Mario Fontana, Tom Kress, Don Miller, Dana Powers, and Bill Shack.

We will have in attendance John Garrick who is a Member of the Advisory Committee on Nuclear Waste, and Ed Abbott is here, and he's an ACRS Invited Expert.

ACRS Senior Fellow in attendance is Richard Sherry.

The purpose of this meeting is to continue our discussion of the NRC staff's approach to codify risk-informed and performance-based regulation through development of Standard Review Plan sections and associated regulatory guides.

The Subcommittee previously met to discuss these matters on October 31st, November 1st, 21st and 22nd, 1996. The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate, for deliberation by the full Committee.

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1 Michael T. Markley is the Cognizant ACRS Staff  
2 Engineer for this meeting.

3 The rules for participation in today's meeting  
4 have been announced as part of the notice of this meeting  
5 previously published in the *Federal Register* on January  
6 16, 1997.

7 A transcript of the meeting is being kept and  
8 will be made available as stated in the *Federal Register*  
9 Notice. It is requested that speakers first identify  
10 themselves and speak with sufficient clarity and volume so  
11 that they can be readily heard.

12 We have received no written comments or  
13 requests for time to make oral statements from members of  
14 the public.

15 We will proceed with the meeting and I call  
16 upon Mr. Rick Sherry to begin.

17 MR. SHERRY: Thank you, George. What I'd like  
18 to present today is some work that I've been doing on an  
19 approach to calculating plant-specific risk, in particular  
20 the individual early fatality frequency based on -- or  
21 derived from the LERF.

22 And the outline for the presentation is, first  
23 of all, I'd like to present a simple relationship between  
24 the LERF and the individual early fatality frequency,  
25 provide a definition that I use for the LERF, compare the

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1 results using this simple relationship with PRA results of  
2 NUREG-1150, and from AIPE PRA.

3 And compare the Reg Guide LERF definition with  
4 the definition of LERF that I'm using, and then present  
5 some summary and conclusions.

6 MEMBER POWERS: Rick, can you explain why  
7 you're focusing on early fatalities? Does that mean just  
8 a selection or is it --

9 MR. SHERRY: Generally, past studies have  
10 indicated that the individual early fatality risk is the  
11 one it's controlling. And at least all cases that I've  
12 seen, that's been true.

13 MEMBER POWERS: When you compare your results  
14 with those of other PRAs that use some sort of evacuation  
15 strategy, is that strategy that's been involved in the  
16 PRAs consistent with the recommendations that are now  
17 being given to licensees concerning evacuation versus  
18 sheltering strategies?

19 MR. SHERRY: I'm not sure what the latest  
20 recommendations are. The emergency plans which are  
21 implemented in the PRA are those that are included in the  
22 -- at that time at least -- current emergency plans for  
23 the station. Which generally involve evacuation.

24 MEMBER POWERS: Well, you see evacuation out  
25 to some relatively short distance and then you see a

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1 keyhole strategy where you get downwind evacuation, and  
2 typically the PRA models don't think like MAACS. You  
3 evacuate or you don't, and so they're not reflecting the  
4 current strategies.

5 MR. SHERRY: In that case I believe you're  
6 correct. I believe the MAACS calculations involve just --  
7 essentially a radially-outward evacuation at a defined  
8 evacuation speed. Current input evacuation speed.

9 MEMBER POWERS: In some hypothesized non-  
10 evacuation fraction?

11 MR. SHERRY: That's correct. The relationship  
12 I'm going to use is shown on this slide. The individual  
13 early fatality frequency is equal to the LERF frequency  
14 times an exposure index, which I'll define for you.

15 Alternatively you can use this and rearrange  
16 it to calculate a LERF goal, using the safety goal QHO  
17 divided by the exposure index. And the nominal value for  
18 the exposure index is 1/16 derived from essentially, the  
19 fact that the wind is blowing into one compass sector.

20 The exposure index that I'm using is shown on  
21 this slide. It's essentially the average probability that  
22 the wind is blowing toward an individual and hence, he  
23 will be exposed to the plume.

24 MEMBER KRESS: Rick? The dividing up of the  
25 area around the plant into sector, particularly into 16

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1 sectors, is an arbitrary choice -- 16 is an arbitrary  
2 number. They could have divided them into 20 or 80. And  
3 it seems a little strange that your exposure index comes  
4 out to be 1/16, to me. Do you have any comment on that?

5 MR. SHERRY: Well, it comes out to 1/16 since  
6 in most cases the wind roses which are provided are  
7 divided into 16 compass sectors. But I have seen cases  
8 where they are divided into 32 or some other number.

9 I have also seen indicated though, that the  
10 typical plume spread is about one --

11 MEMBER KRESS: That's what I'm looking for;  
12 some reason other than --

13 MR. SHERRY: About, what is it, 22 degrees --

14 MEMBER KRESS: -- just coincidence.

15 MR. SHERRY: -- or whatever --

16 MEMBER KRESS: Yes.

17 MR. SHERRY: -- is equivalent to 1/16? This  
18 exposure index is similar to the one that was developed  
19 for the genetic environmental impact statement for  
20 licensing renewal. Mine is slightly different in that I  
21 normalize by the population within one mile.

22 Looking at the exposure index for a number of  
23 plants, you'll see that there's not -- at least in this  
24 set of plants -- there's not a lot of variation. I think  
25 the peak value is about .08 and the smallest value about

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1 .04, so they all cluster around the 1/16.

2 I'm scrambling through the viewgraphs -- I'm  
3 looking for the slide with the definition of the LERF. I  
4 don't seem to see it. I'll just talk -- you have it in  
5 your handouts.

6 The LERF is defined in a manner in such that  
7 it accounts for the magnitude of the radionuclide release,  
8 and specifically the one I'm considering is the early  
9 fatality frequency magnitude of iodine release expressed  
10 as a release fraction.

11 It also accounts for the effectiveness of  
12 emergency protective actions. It differentiates between  
13 release categories where evacuation begins prior to the  
14 start of release and release categories or sequences,  
15 where the evacuation commences about the same time or  
16 after the start of release.

17 What you'll see on that slide is the summation  
18 of the release category frequency for those sequences  
19 where the iodine really is greater than ten percent. And  
20 I indicated early iodine release, the release which occurs  
21 nearer to containment failure, and that evacuation is  
22 delayed. Those are the ones that contribute to the LERF  
23 frequency, times a small correction factor for those  
24 people who fail to evacuate.

25 And they're accounted for in the second

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1 summation which considers the total iodine release --  
2 release categories with a total iodine release greater  
3 than ten percent. So that is basically the relationship I  
4 use for LERF -- my definition for Large Early Relief  
5 Frequency.

6 MEMBER POWERS: And this is the one that's  
7 most affected by a keyhold strategy? Because that becomes  
8 not a small correction term out there if you're not  
9 evacuating people where --

10 MR. SHERRY: And the wind direction shifts.

11 MEMBER POWERS: And the wind direction shifts.

12 MR. SHERRY: That's correct.

13 MEMBER POWERS: Also, I'm always puzzled by  
14 this iodine greater than ten -- restricting the summation,  
15 truncating out all those release categories that result in  
16 less than ten percent iodine. You make an argument later  
17 that that's a threshold effect.

18 MR. SHERRY: Well, let me show you the next  
19 slide; I think it bears on that. What this slide shows is  
20 the conditional individual early fatality risk plotted as  
21 a function of iodine release fraction. This is for the  
22 Surry, the 1150 study internal event initiators. And I  
23 have divided, or subdivided these points into three  
24 groups.

25 One group, the ones indicated by the red

1 diamonds, are for sequences where evacuation begins after  
2 the release starts. The green triangles are for sequences  
3 where the evacuation begins prior to the release start.  
4 And the circles indicate sequences where the release and  
5 the evacuation begin at roughly the same time.

6           The largest value that you would expect on  
7 this conditional risk is about 1/16, so somewhere around  
8 here should be the peak since the region here accounts for  
9 the probability that the wind will actually blow towards  
10 specifically individuals. So this here, in this area,  
11 represents about a peak of these.

12           So the distance between this area down through  
13 the value of each individual point, represents sort of the  
14 conservatism in my methodology because I assume that,  
15 given a release of magnitude greater than one, that  
16 probability of a fatality is one. So this represents the  
17 conservatism in my approach for release fractions greater  
18 than .1.

19           However, I also -- the approach I recommend  
20 neglects release fractions greater than .1, so all the  
21 risks contributed by points below .1 are not considered.  
22 So this I believe, more than compensates for neglecting  
23 the small risks contributed by lower release fractions.

24           I'd now like to show you the comparison  
25 between the simple methodology and PRAs, like 1150 and the

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1 Maine Yankee IPE PRA. The diamonds are the estimates  
2 produced by the simple methodology. The triangles are the  
3 95th percentile from the PRA distribution, and the squares  
4 are the means.

5 And I was encouraged by these results because:  
6 1) they are fairly close to the mean, and in some cases  
7 they're between the mean and the 95th percentile; in other  
8 cases they're slightly above the 95th percentile; and in  
9 all cases they're conservative in the sense that they are  
10 some factor, generally three or more above the mean.

11 MEMBER KRESS: Where is your 95 percentile for  
12 Maine Yankee?

13 MR. SHERRY: They didn't provide a 95th  
14 percentile. Another way to look at this is provided on  
15 this particular picture. In this case I calculate a LERF  
16 Goal by dividing the safety goal QHO  $3 \times 10^{-7}$  by the  
17 exposure index for each particular site.

18 MEMBER KRESS: Is it  $3 \times 10^{-7}$  now?

19 MR. SHERRY: That's the one I used. Okay,  
20 that's based on current accident rate information. That's  
21 about what you'd determine the --

22 MEMBER KRESS: In NUREG-1150 it's five.

23 MR. SHERRY: Right, that was based on the  
24 accident rate data as of 1986 on the safety goals issue.

25 MEMBER KRESS: So it's the safety goals that

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1 are times a variable thing.

2 MR. SHERRY: Well if you look at it that way,  
3 and I think that's the current way to look at it, but --

4 MEMBER CATTON: Is there something particular  
5 about the BWRs that makes this spread so large on Peach  
6 Bottom and Grand Gulf?

7 MR. SHERRY: Yes, two things. One is that  
8 the, in a lot of cases the radionuclide release is  
9 scrubbed by the suppression pool. But of even more  
10 importance is that in all the release categories,  
11 evacuation -- there were long warning times, and  
12 evacuation began well before the start of release.

13 So all you are seeing are fatalities from  
14 people who failed to evacuate -- the one-half of one  
15 percent of the population who doesn't evacuate. So that's  
16 why these numbers are low.

17 And that brings up a point. One of the main  
18 differences I think, in using a definition for LERF that I  
19 propose and the definition that's in the reg. guide which  
20 is essentially early containment failure with core damage,  
21 is that considering the timing of the release and the  
22 radionuclide magnitude can present -- you can come to very  
23 different conclusions about the early fatality risk.

24 Oh, let me go on with this. Anyhow, these  
25 squares are the goal, the LERF goal calculators as I

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1 stated, and the triangles are the LERF as-calculated using  
2 the formula I discussed.

3 MEMBER KRESS: We shouldn't compare the square  
4 to the LE that's in the reg. guide? They're different?

5 MR. SHERRY: No. In fact the next slide  
6 presents similar information but using the definitions in  
7 the reg. guide -- in this case the LERF criteria of  $10^{-4}$  --  
8 and a definition for LERF of early containment failure  
9 with core damage.

10 And I think if you compare these you'll come  
11 to the conclusion that the definition in the reg. guide is  
12 more conservative and sometimes substantially more  
13 conservative.

14 CHAIRMAN APOSTOLAKIS: Which reg. guide is  
15 this?

16 MR. SHERRY: The new reg. guide.

17 CHAIRMAN APOSTOLAKIS: 1061?

18 MR. SHERRY: Yes.

19 CHAIRMAN APOSTOLAKIS: So your numbers then,  
20 are right on the number they're using? They're using  $10^{-5}$ ,  
21 don't they?

22 MR. SHERRY: Yes, that's what I showed here.

23 CHAIRMAN APOSTOLAKIS: That's what you find.

24 Oh, I'm sorry.

25 MR. SHERRY: What do you see --

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1 CHAIRMAN APOSTOLAKIS: The estimated is the  
2 diamond. Where is the diamond? There are no diamonds.

3 MR. SHERRY: Well, this is a special point  
4 just for Maine Yankee, okay. This is the  $10^{-5}$  criteria --

5 CHAIRMAN APOSTOLAKIS: Of the guide, yes.

6 MR. SHERRY: The triangles are the LERF as  
7 calculated using the definition in the reg. guide, early  
8 containment failure with core damage. This is just a  
9 special point. This is the LERF that Maine Yankee stated  
10 that are calculated in their reg. guide using their  
11 definition for LERF. I just showed it here as a special  
12 point.

13 CHAIRMAN APOSTOLAKIS: So what's the message  
14 from this slide then? That the value of  $10^{-5}$  may be  
15 conservative for some plants?

16 MR. SHERRY: It's not only the value of  $10^{-5}$ ,  
17 it's their definition of LERF and use of  $10^{-5}$ . What's  
18 important is the difference between the goal and the  
19 calculated point in comparison to that shown on the  
20 previous slide. You'll generally see larger spacing on  
21 the previous slide.

22 There's a greater margin between the criteria  
23 and the estimated LERF using my methodology, indicating  
24 that mine is somewhat less conservative. But I just  
25 demonstrated that using this methodology in comparison to

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1 a PRA is, at least in all the cases I looked at, still  
2 conservative by at least a factor of three. So my  
3 conclusion is that this particular approach may be too  
4 conservative.

5 CHAIRMAN APOSTOLAKIS: Why is the reg. guide  
6 calculation of LERF greater for seismic events? If you  
7 look at Surry and Peach Bottom --

8 MR. SHERRY: Yes, in the NUREG-1150  
9 calculation the calculated risk for the seismic sequences  
10 exceeded the safety goals, using the old Lawrence  
11 Livermore hazard curve. Now, these points would be lower  
12 now using the revised Lawrence Livermore hazard curve, or  
13 if you use the EPRI curve.

14 CHAIRMAN APOSTOLAKIS: So in your case the  
15 same thing happens, right?

16 MR. SHERRY: In my case it's the same, yes.  
17 But again, it's because of the large seismic hazard.

18 Do I have until 9 o'clock?

19 CHAIRMAN APOSTOLAKIS: Yes.

20 MR. SHERRY: Okay. I only have a few more  
21 slides. An alternative approach to using the threshold of  
22 ten percent is one proposed by Dr. Kress in his draft  
23 paper I think you've seen, in which he proposes to develop  
24 a relationship between the individual early fatality  
25 frequency and the source term as a functional relationship

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1 in a power law type thing.

2 And I looked at that against some of the data  
3 and you can see for example, from one of the earlier  
4 slides I showed -- the one which had the colored groups of  
5 data on it -- that you can identify fairly consistent  
6 relationship between risk and the release fraction of  
7 iodine, with some exceptions.

8 And in looking at this closer, I think you'll  
9 -- I've come to the conclusion that there are a number of  
10 cases where other radionuclide groups -- in particular the  
11 ruthenium group and the lanthanum group -- become  
12 important in certain release category or certain sequence  
13 source terms.

14 And I believe that this approach is workable  
15 with the stipulation though, that rather than using iodine  
16 release fraction you use an iodine-equivalent release  
17 fraction where you translate the --

18 CHAIRMAN APOSTOLAKIS: What's the superscript  
19 "n"?

20 MR. SHERRY: This particular --  $N_{re}$ , is that  
21 what you're --

22 CHAIRMAN APOSTOLAKIS: Little "n".

23 MR. SHERRY: Little "n"?

24 CHAIRMAN APOSTOLAKIS: Yes.

25 MR. SHERRY: That's just the exponent on the

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1 source term.

2 MEMBER KRESS: It's an empirically observed  
3 relationship made as both (indiscernible) improve.

4 MR. SHERRY: For that Surry --

5 CHAIRMAN APOSTOLAKIS: We know "n"?

6 MR. SHERRY: For that Surry data, "n" was  
7 about 0.9.

8 MEMBER KRESS: So you might make it one.

9 MR. SHERRY: This is information taken from a  
10 Brookhaven report which gives weighting for a number of  
11 the radionuclide groups to indicate their relative  
12 importance to early fatality risk based on equal release  
13 fractions. And --

14 MEMBER POWERS: Now, my understanding of these  
15 numbers --

16 MR. SHERRY: These are from Albert originally,  
17 I believe.

18 MEMBER POWERS: Okay, they are Albert's  
19 numbers?

20 MR. SHERRY: Yes, then Brookhaven used them to  
21 create this.

22 MEMBER POWERS: Okay. Then they are numbers  
23 that say, what is the impact given that I have a ten  
24 percent release of each of these elements alone? All by  
25 itself.

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1 MR. SHERRY: I'm trying to remember. I  
2 thought he actually used a specific source term and then  
3 varied the release fraction of individual groups. I have  
4 to look at it again, but I didn't think he looked at them  
5 individually.

6 MEMBER POWERS: It's always a mystery exactly  
7 what they do in these things. I do know that -- he did  
8 the work for me, actually, and when I got it I didn't know  
9 exactly what I had. But I do know that the problem comes  
10 about in using these equivalencies because of a threshold  
11 effect in early fatalities.

12 That you were far better off -- it's far  
13 easier to come up with an equivalence, an ident  
14 equivalence for things like latent cancer, than it is for  
15 fatalities. Just because of this we're never going to  
16 have a ten percent release fraction of cerium by itself.  
17 If we get a ten percent release fraction of cerium we're  
18 going to have everything else.

19 And then how you extract cerium and its iodine  
20 equivalency becomes a little bit a procedural call. And  
21 also, since we very seldom get a ten percent release  
22 fraction of cerium what you typically get is nine percent  
23 iodine and half-a-percent of cerium. Now what do you do?

24 Cerium may have been a bad choice; suppose I  
25 picked half-a-percent strontium? Does it trigger your ten

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1 percent case or not?

2 MR. SHERRY: In the threshold model if you  
3 will, I have basically just been using the iodine release  
4 fraction without adjusting it to account for any increased  
5 releases of ruthenium, lanthanum, or any of the other  
6 species.

7 I believe that there's sufficient amount of  
8 margin between the, sort of maximum possible value you  
9 could get and the one calculated in the PRA, you know,  
10 because of other factors -- plume meander, sheltering --  
11 things that reduce the probability of a fatality to an  
12 individual even when exposed to a certain release.

13 MEMBER POWERS: Well, I wouldn't --

14 MR. SHERRY: Do you understand what I'm  
15 saying?

16 MEMBER POWERS: No, I don't. I'd just comment  
17 that I worry a lot about getting to the point that we  
18 cannot accommodate technical changes in our understanding  
19 of the source term. Because I've spent a lot of time  
20 worrying about ruthenium because I think its releases can  
21 get very large in very severe accidents; much larger than  
22 had been anticipated up till now. Because we just didn't  
23 do the chemistry right.

24 MR. SHERRY: Let me answer that by saying I  
25 think that there is a way that you could -- there's a

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1 straightforward way to go to a threshold model, okay, but  
2 instead of basing it on, for example, ten percent iodine,  
3 they could be on, for example, 20 percent this iodine  
4 equivalent. Where now you consider all the species that  
5 are being released.

6           The approach that I would use if I was just  
7 using ten percent iodine is, look at the other groups to  
8 see if they are approaching a level where they would  
9 contribute significantly to early fatalities. And then  
10 perhaps if your iodine release is eight percent and you  
11 have a relatively larger ruthenium release, add that  
12 frequency of that release category into the hopper.

13           Okay, let me finish up. I believe the  
14 simplified approach provides a reasonable and a realistic  
15 way -- or reasonably realistic way for estimating  
16 individual early fatality frequency, and I believe it  
17 provides a definition for the large early release  
18 frequency which considers the important characteristics of  
19 the source term; important to outside risk, namely the  
20 magnitude of the source term and the timing of the release  
21 relative to the time when emergency protective actions can  
22 be taken.

23           MEMBER KRESS: And you could also derive an  
24 acceptance value directly from the safety goal.

25           MR. SHERRY: Yes, using this approach you

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1 could do that.

2 MEMBER KRESS: So that it would automatically  
3 incorporate safety goal considerations in any sort of  
4 regulatory analysis --

5 MR. SHERRY: Right, and it can be developed,  
6 at least to the extent where you're accounting for the  
7 site-specific characteristics of population distribution  
8 and wind patterns.

9 And I mentioned that I believe that this  
10 approach that I'm recommending is less conservative than  
11 the approach that's proposed in the regulatory guide based  
12 on early containment failure frequency, but I think it's,  
13 at least in all the cases I have looked it, it's still  
14 conservative in the sense that it overestimates the early  
15 fatality risk.

16 MEMBER KRESS: Could one view the conservatism  
17 in the reg. guide as being in a sense, defense-in-depth  
18 related because it tends to say, while we're not sure how  
19 good the suppression pool is, for example, we give credit  
20 for its effect on failure of the containment, but we'll  
21 not give that much credit for its scrubbing and fission  
22 products? And we're not quite sure how effective an  
23 evacuation strategy might be so we'll not worry about  
24 that.

25 Could you view their definition with that

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1 conservatism as being a preservation of some level of  
2 defense-in-depth?

3 MR. SHERRY: Well, I guess you could but I  
4 don't think I would, because these features -- scrubbing  
5 suppression pools, time characteristic of accidents -- are  
6 modeled in PRAs. And in that sense they, you know, they  
7 are uncertain only to the extent that the PRA is  
8 uncertain. They're not unknowns, okay, and I think you  
9 should try to match, as best as possible, the results from  
10 the risk assessment -- the detailed risk assessments.

11 MEMBER KRESS: Thank you.

12 MR. SHERRY: That concludes my presentation.

13 CHAIRMAN APOSTOLAKIS: Thank you very much,  
14 Rick. Okay, now we go to the NRC staff presentations.  
15 First one is on the discussion and purpose of the meeting  
16 -- which is a good idea. And we have Gary Holahan, Tom  
17 King, Bob Jones, and Mark Cunningham. All new faces.

18 MR. HOLAHAN: Same old story.

19 MR. KING: What we thought we'd do in the  
20 first 45 minutes or so is provide an overview on what's  
21 happened since the last time we met, which I think was  
22 back in late November. Since that time, several things  
23 have occurred that have influenced the current version of  
24 the reg. guide in our schedule and plans to where we're  
25 going.

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1 First thing is, we received a 3-month  
2 extension from the Commission to get this whole package of  
3 reg. guides and SRPs. They're now due to the Commission  
4 the end of March. That's still -- we're still on a tight  
5 schedule to meet that because there's a lot of things that  
6 have to happen, and we'll talk about schedule a little  
7 bit.

8 We've also had meetings with the office  
9 directors and the new Deputy EDO, Ed Jordan, regarding  
10 these reg. guides, and discussed the technical content and  
11 approach and philosophy behind them, and that's been  
12 factored into the latest draft.

13 We received an SRM from the Commission on the  
14 four policy issues that we had sent up back in October  
15 that we had discussed with the committee six months or so  
16 ago. We received input from OGC, the legal staff, which  
17 we've tried to factor in.

18 And based on all that we've come up with some  
19 revised documents. The first general reg. guide and its  
20 SRP have been provided to the committee and the rest will  
21 be shortly.

22 MEMBER KRESS: Do the Commissioners basically  
23 agree with you on those policy issues?

24 MR. KING: Basically, yes. I've got a slide  
25 or two -- we'll talk about that -- but basically, yes.

1           What we want to do today is concentrate on the  
2 general reg. guide and SRP; talk about the approaches, the  
3 changes -- we're going to summarize the changes we've made  
4 -- and then spend most of the day going through those  
5 step-by-step so you can review the content and where they  
6 stand.

7           This morning we'll do the reg. guide, this  
8 afternoon the SRP, then at the end of the day we'd like to  
9 come back and sort of get a sense of the committee as to  
10 if you have any major problems. At this point we're not  
11 looking for editorial changes; we're looking for any major  
12 problems with the approach, the philosophy, the guidance.

13           Just to refresh your memory, we're working on  
14 these reg. guides and SRPs as a result of the Commission's  
15 August '95 policy statement on the use of risk  
16 information.

17           And we believe these reg. guides will help  
18 encourage submittals from licensees that utilize risk  
19 information because they will provide a consistent process  
20 and an acceptable approach for licensees to submit  
21 applications for the staff to review them, to make plant-  
22 specific changes to the current licensing basis that  
23 utilize risk as well as the traditional engineering  
24 evaluations.

25           MEMBER KRESS: Have you had any input from the



1 industry on that --

2 MR. KING: None.

3 MEMBER KRESS: -- that gives you that belief?

4 MR. KING: None of these have been released to  
5 the public at this point. We had asked the Commission  
6 whether we should go ahead and give an early release; the  
7 answer was "no".

8 The scope of the reg. guides -- there's the  
9 general guidance which consists of draft guide 1061 and  
10 its SRP which you have in your hand. We're going to cover  
11 it today. The other ones, where they stand is, we're  
12 shooting by February 6th to get you copies of the in-  
13 service testing draft guide and SRP, the tech spec draft  
14 guide and SRP, and the graded QA which is just a reg.  
15 guide only.

16 The in-service inspection reg guide and SRP is  
17 now scheduled to go to the Commission in May, so that  
18 package -- we'll not be asking for review at this time;  
19 that will come at a later date.

20 CHAIRMAN APOSTOLAKIS: Again, let me display  
21 my ignorance here. Of all these documents, what's the  
22 most important one?

23 MR. KING: The one you're looking at today.

24 CHAIRMAN APOSTOLAKIS: The 1061?

25 MR. KING: Yes. And its SRP.

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1 CHAIRMAN APOSTOLAKIS: But if I were to  
2 compare the reg. guide with the SRP, the reg. guide is  
3 really the important document?

4 MEMBER KRESS: And the other reg. guide  
5 supposedly will be consistent?

6 MR. KING: Yes, yes.

7 CHAIRMAN APOSTOLAKIS: Like last time there  
8 were also verbatim copies, right?

9 MR. KING: In some places they'll be verbatim-  
10 consistent, yes. We had also sent you some time ago, a  
11 NUREG -- what we call NUREG-1602 which was really sort of  
12 the attributes of a PRA that we felt were necessary to  
13 have the proper scope of quality.

14 Although that's undergoing some editorial  
15 changes the basic content has not changed and we did not  
16 resubmit that to the committee. I thought we had reached  
17 an understanding before that you didn't want to see that  
18 again in any formal sense. It's going to be a reference  
19 document in the reg. guide.

20 CHAIRMAN APOSTOLAKIS: My impression was that  
21 you told us not to review it. Is that the correct  
22 impression?

23 MR. KING: I think we sent it to you for  
24 information. We weren't particularly asking for a letter  
25 on it, that's true.

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1 CHAIRMAN APOSTOLAKIS: Because someone said at  
2 that meeting that -- at one of the meetings that  
3 essentially all the information that's in NUREG-1602 that  
4 is necessary to understand the reg. guides and the SRP, is  
5 also in the reg. guides and the SRP. So it's a reference  
6 document but you really don't need to read it. Is that  
7 correct?

8 MR. CUNNINGHAM: Yes. What we said was that  
9 anything that would be in the form of guidance to  
10 licensees we pulled up into the reg. guides so that the  
11 NUREG does not have guidance in it; it's more technical  
12 information, if you will. And so it's one step removed  
13 from the regulatory guides and things like that.

14 CHAIRMAN APOSTOLAKIS: So the committee will  
15 not review this? Or is it up to us? I don't understand.

16 MEMBER CATTON: What do you mean by "this"?

17 CHAIRMAN APOSTOLAKIS: NUREG-1602.

18 MR. KING: We're not asking for a review and a  
19 letter on it. We provided it for information. We had  
20 gotten some comments before, months ago, from the  
21 committee. If you want to add it to your list of things  
22 you want to review and address in a letter, that's up to  
23 you. But we're not asking for it at this time.

24 MR. HOLAHAN: But I would say in the context  
25 of what we're trying to achieve here, to put out guidance

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1 on risk-informed regulation, it's not necessary. It's not  
2 necessary to get the committee's views on 1602.

3 CHAIRMAN APOSTOLAKIS: Okay.

4 MR. KING: Okay. The reg. guides and SRPs  
5 basically have four objectives: they describe the overall  
6 approach/expectations/process; they provide principles and  
7 guidance for both the deterministic and probabilistic  
8 analysis and integrated decision process; they describe a  
9 performance-based implementation strategy that we would  
10 expect licensees to use in implementing changes; and they  
11 provide guidance on what information should be submitted  
12 for review.

13 As we discussed before, the use of the reg.  
14 guide and SRP is voluntary for licensees. They don't have  
15 to use this if they don't want to, but the staff still  
16 intends to give priority to applications that come in and  
17 follow this process, particularly those that are asking  
18 for burden reduction.

19 Clearly, if someone comes in with a safety  
20 issue, whether they follow this process or not we're going  
21 to give it high priority, but the burden-reduction ones we  
22 would expect to follow this process.

23 As I said earlier, you have the general reg.  
24 guide and SRP. Now, there are three appendices we're  
25 working on for the general reg. guide which were not

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1 included in the package to you. They'll be coming later.  
2 For the purposes of looking at the overall approach and so  
3 forth they're not necessary, but you will be getting  
4 those.

5 MEMBER SHACK: Have those changed  
6 substantially from the earlier versions we saw?

7 MR. CUNNINGHAM: The appendices?

8 MEMBER SHACK: Yes.

9 MR. CUNNINGHAM: They're undergoing a little  
10 bit of change, yes.

11 MEMBER SHACK: So what we have really isn't  
12 representative?

13 MR. CUNNINGHAM: That's correct --

14 MR. KING: Yes, I wouldn't bother looking at  
15 what you have --

16 MR. CUNNINGHAM: I wouldn't read what you have  
17 now.

18 MR. KING: Right, right. The remainder of the  
19 material should be coming February 6th, that's our  
20 schedule, which will include the application-specific reg.  
21 guides, SRPs and the general reg. guide appendices.

22 As I mentioned earlier, they received office  
23 director-level review and we've gotten the Commission  
24 feedback and we'll talk about that separately.

25 What we're hoping to do today is update the

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1 committee on the changes that have been made, and review  
2 the content of the reg. guide and SRP, solicit feedback  
3 from the committee, but we're not asking for a letter at  
4 this time. But we would like at the end of the day to  
5 sort of get a sense of where the committee -- committee's  
6 views, individual member's views are on what you've heard.

7 MEMBER KRESS: Would a letter be useful to  
8 you? The presumption was it was generally favorable.

9 MR. KING: Well, if that's what it says that  
10 certainly wouldn't hurt.

11 CHAIRMAN APOSTOLAKIS: I thought we were  
12 supposed to finish our letter by the end of March.

13 MR. KING: Yes, well, what we really need --  
14 if you want to schedule a couple of minutes -- what we  
15 ally need is a letter by March 14th, which is about a  
16 week after your March full committee meeting. Because we  
17 owe a package to the EDO the 24th, and we would like to  
18 attach your letter to it and factor in anything that you  
19 say in your letter, if we can.

20 That's the schedule we're working to. We,  
21 again, are available to come to the full committee in --  
22 at your February full committee meeting and give a  
23 presentation on the material you have in hand now. At  
24 that time you should also get the rest of the package. I  
25 understand we have a subcommittee meeting scheduled

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1 February 20th and 21st to review the material you're going  
2 get on February 6th.

3 CHAIRMAN APOSTOLAKIS: So what's the idea  
4 then, of you coming to the full committee meeting in  
5 February if the subcommittee meeting is later? I mean, is  
6 there any reason for that?

7 MR. KING: It's only that -- to me, it's only  
8 that this is a large volume of material and maybe taking  
9 it in two bites is better than one bite.

10 CHAIRMAN APOSTOLAKIS: It's part of the  
11 process.

12 MR. KING: But it's up to you. If you'd  
13 prefer we don't come in February we won't come.

14 MEMBER MILLER: If there are things that the  
15 individual members of the subcommittee would like carried  
16 forward for discussion at that time, then it would be  
17 appropriate to discuss those. Other than that, it would  
18 be beneficial for the subcommittee chairman to provide a  
19 summary of things that might have been discussed here  
20 today, or where things are going.

21 CHAIRMAN APOSTOLAKIS: Are we missing any  
22 members?

23 MEMBER MILLER: Yes.

24 CHAIRMAN APOSTOLAKIS: Bob Seale.

25 MEMBER POWERS: The chairman.

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1 MR. KING: We can come back at the end of the  
2 day and see what would make sense for February, if you  
3 want to do that.

4 CHAIRMAN APOSTOLAKIS: Yes. Now, in general I  
5 would say -- when you say six or seven -- go with the 7th.  
6 Okay?

7 MR. KING: Okay. All right, as I --

8 CHAIRMAN APOSTOLAKIS: Let me -- so March 31st  
9 goes to the Commission --

10 MR. KING: Yes.

11 CHAIRMAN APOSTOLAKIS: -- but that's not the  
12 date when it is released for public comment, right?

13 MR. KING: No, the Commission would have to  
14 give its approval to go ahead and release it for public  
15 comment. What we'll have with the package that goes to  
16 the Commission is a proposed *Federal Register* Notice that  
17 announces the availability of these for comment, the 90-  
18 day comment period, a set of questions that we're  
19 specifically interested in getting feedback on.

20 CHAIRMAN APOSTOLAKIS: So what's the typical  
21 time between March 31st and when you release it?

22 MR. KING: To me, I'd allow a month. From the  
23 time the Commission takes action and then to actually get  
24 it printed in the *Federal Register*, I'd allow a month.

25 CHAIRMAN APOSTOLAKIS: So the industry will

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1 not see it before May, I suppose?

2 MR. KING: Yes. Okay, I had mentioned we  
3 received an SRM from the Commission on January 22nd that  
4 gave feedback on the four policy issues that we had sent  
5 up in October. Now let me just summarize what the  
6 feedback was.

7 I think in general the reg. guide as developed  
8 is consistent with this feedback. The Commission has  
9 asked us to do a few extra things and provides some -- a  
10 report back to them on several items between now and the  
11 end of August, as I remember.

12 The first policy issue had to do with  
13 performance-based regulation. We had raised the issue  
14 that in these risk-based initiatives we are trying to  
15 implement them via some performance monitoring and  
16 feedback, but through the context of what we're doing here  
17 that's limited to things that are submitted under the PRA  
18 risk-informed initiative.

19 We asked the Commission whether that's what  
20 they had in mind when they mentioned performance-based  
21 regulation. They wrote back and said that's fine for  
22 these plant-specific items, but we want to go beyond that  
23 and they asked for a further plan for performance  
24 monitoring that would address performance monitoring on  
25 things that aren't amenable to PRA-type analysis, so we

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1 owe something to the Commission the end of August as to  
2 what our plan is for expanded role of performance-based  
3 regulation.

4 They also asked for a summary discussion on  
5 how performance monitoring is being addressed in the pilot  
6 application, so we owe them that as well. But it didn't  
7 really change what we had in the reg guide in terms of our  
8 intent on performance monitoring there.

9 The second issue was use of safety goals for  
10 plant-specific application. The Commission tentatively  
11 approved plant-specific application of the safety goals.  
12 The reg. guide had been written assuming that approval  
13 would be given.

14 But in addition to that they asked for a legal  
15 analysis on the use of numerical guidelines in plant-  
16 specific decisions, addressing things such as a potential  
17 for litigation and the effects of, what if the PRA changes  
18 down the road -- does he have to go back and revisit your  
19 decisions -- that kind of thing.

20 MEMBER KRESS: Does OGC do that?

21 MR. KING: OGC has been assigned a lead for  
22 that. It's due the end of June. I'm sure we'll be  
23 involved with OGC in preparing that response.

24 The other items in the SRM, the third issue is  
25 the issue of risk neutral versus risk increase. The

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1 Commission did approve an approach that involved approving  
2 small risk increases under certain conditions. That's  
3 what we had proposed. The reg. guide addresses this issue  
4 and is consistent with that kind of application.

5 They did ask for a definition of small and  
6 what we meant by small, and under certain conditions we've  
7 tried to expand the reg. guide to cover that, and we'll  
8 talk about that today.

9 They've also asked the staff to monitor  
10 cumulative changes in risk. We have noted in the reg.  
11 guide that we expect licensees to keep track of that as  
12 well. They also asked the staff to develop a methodology  
13 for assessing changes in risk that use statistical  
14 concepts and give consideration to uncertainties.

15 Now, we've expanded the uncertainties section  
16 quite a bit in the reg. guide but we've still tried to  
17 leave it somewhat flexible in terms of --

18 MEMBER KRESS: I'm not sure what that bullet  
19 means. I know what "give consideration to uncertainty"  
20 means. I don't know what they're talking about when  
21 they're talking about a methodology for assessing the  
22 change in risk using statistical concepts. Do you have  
23 any idea what that means?

24 MR. KING: Well, I mean, you could consider  
25 it, on the extreme they're looking for some sort of formal

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1 decision criteria type -- or decision process that would  
2 involve numerical guidance. The reg. guide doesn't do  
3 that.

4 CHAIRMAN APOSTOLAKIS: It says for assessing  
5 changes, not for evaluating.

6 MEMBER KRESS: That's what's on it.

7 CHAIRMAN APOSTOLAKIS: And I thought we had  
8 the methodology for assessing them.

9 MEMBER KRESS: Yes, that's why I was confused  
10 about what this meant.

11 CHAIRMAN APOSTOLAKIS: Don't we have a PRA  
12 that does this?

13 MR. KING: We have a PRA that assesses changes  
14 in risk, uses statistical concepts, mean values, and so  
15 forth. We talk in reg. guide about the various  
16 contributors to uncertainty, the use of sensitivity  
17 analysis.

18 CHAIRMAN APOSTOLAKIS: So why do you need to  
19 develop anything? I mean, we have it.

20 MR. KING: Well, hopefully the reg. guide  
21 develops it to the extent that it needs to be developed,  
22 since the Commission hasn't seen the reg. guide yet. So  
23 it may be asking a question that's already been answered.

24 CHAIRMAN APOSTOLAKIS: I guess Dr. Kress and  
25 I, we hear the word "develop" and doing research, develop

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1 something. That's not what it means?

2 MR. HOLAHAN: No, I think the direction from  
3 the Commission, I think, is to use appropriate methodology  
4 in the reg. guide, not necessarily to develop concepts  
5 that aren't currently available.

6 MEMBER KRESS: But when I read this the first  
7 time, I read it to mean, risk calculation has  
8 uncertainties in it, and that sort of assess criteria for  
9 acceptance of a change in risk. And I read this to mean  
10 that we need some sort of methodology that incorporates  
11 that uncertainty, its full extent into your acceptance  
12 criteria.

13 That's the way I read it and I wasn't sure  
14 whether I was interpreting it right or not. Would that be  
15 a good interpretation of it?

16 MR. KING: Yes, I think that would be a good  
17 interpretation of it.

18 MR. CUNNINGHAM: We've got to follow up and  
19 get a little clarification on our own part as to what --

20 MEMBER SHACK: Just to throw in some  
21 observation --

22 MR. CUNNINGHAM: -- how to pursue this.

23 MEMBER SHACK: -- I interpreted it to be  
24 something that I picked up from some RuleNet discussions  
25 where people were arguing against PRA and arguing that you

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1 should use purely statistical evaluations of ongoing  
2 events to evaluate risk wherever possible, and reduce  
3 dependance on PRA.

4 CHAIRMAN APOSTOLAKIS: When was this?

5 MEMBER KRESS: That would be nice, but that's  
6 the reason we went to PRA, is because we can't do that.

7 CHAIRMAN APOSTOLAKIS: When was this, Bill?

8 MEMBER SHACK: If you go back and look at some  
9 of the discussion that was on RuleNet, it was sort of  
10 connected with the probabilistic assessment for the fire  
11 PRA, there was some discussion from people who were  
12 essentially PRA, arguing that in fact, you did have enough  
13 data to do more classical, statistical approaches.

14 CHAIRMAN APOSTOLAKIS: But the PRA does not --  
15 when the data is available, it does it.

16 MEMBER SHACK: I'm only quoting what was in  
17 the RuleNet discussion.

18 MR. KING: Again, I think since the Commission  
19 hasn't seen the reg. guide yet they don't really know  
20 exactly how we're treating uncertainties in the package,  
21 so there may be some -- the wording I think, is influenced  
22 by the fact I haven't seen it.

23 CHAIRMAN APOSTOLAKIS: So they use the word  
24 "develop" or is it your word?

25 MR. KING: They use the word develop, yes.

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1 The other thing they mentioned under this particular item  
2 was that they supported encouraging licensees to use risk  
3 assessment for the purposes of improvement as well as  
4 burden reduction. Which is a -- we put a stronger flavor  
5 in the current version of the reg. guide to emphasize  
6 that, and the Commission has supported that emphasis.

7 And the last --

8 CHAIRMAN APCSTOLAKIS: Maybe you should  
9 develop a definition of "develop".

10 MEMBER CATTON: Aren't you looking for  
11 appropriate criterion for acceptance?

12 MR. KING: I think in general, yes.

13 MEMBER CATTON: Then that's what that should  
14 say. Then that gets away from all of this discussion.

15 MR. CUNNINGHAM: Those are the Commission's  
16 words.

17 MR. KING: This is a quote from the  
18 Commission.

19 MEMBER CATTON: I understand.

20 MEMBER KRESS: Well, I think it would be a  
21 good idea to understand what they had in mind.

22 MR. KING: The last item had to do with, how  
23 do you implement changes to the ISI program. It was more  
24 of a process question. The Commission agreed with the  
25 process the staff had recommended.

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1           The next couple of pages summarize the changes  
2 from the version of the reg. guide you had seen in  
3 November, to what you received a week or two ago. And I  
4 just want to go through those quickly. We'll walk through  
5 the reg. guide itself later on this morning.

6           The first thing we did was, we added an  
7 emphasis on the overall expectation of improved safety  
8 that we think should result from application of this  
9 process and this approach. There was a concern that the  
10 way earlier versions of the reg. guide and SRP were  
11 worded, they were sort of like a road map as how you  
12 increase risk.

13           Being a safety agency, there was concern that  
14 we didn't want to send that message, so we've tried to put  
15 more of a balance in the reg. guide in terms of when you  
16 use risk information there can be improvements in safety,  
17 there can be burden reduction. In the long run, we expect  
18 the overall direction to be improvements in safety because  
19 you're concentrating on the more important things.

20           MEMBER KRESS: When I read through the reg.  
21 guide and the SRP, that part of it jumped out at me a  
22 little bit as bit of an inconsistency in that, the word  
23 "expectation" didn't translate into any of the acceptance  
24 criteria or any of the processes that I saw later on in  
25 the standard review plan. The expectation that you'll

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1 improve safety.

2 MR. KING: I think it does.

3 MEMBER KRESS: It does?

4 MR. KING: In the sense that, what we're  
5 saying is if your CDF is above  $10^{-4}$  and your LERF is above  
6  $10^{-5}$ , we think the direction of changes ought to be  
7 improvements in safety, not increases in risk.

8 MEMBER KRESS: Wasn't that in your original  
9 SRP and your original reg. guide?

10 MR. KING: Yes.

11 MEMBER KRESS: So you really didn't change  
12 anything?

13 MR. KING: No, that hasn't changed but I think  
14 we --

15 MEMBER KRESS: You just changed the word of  
16 how you said things.

17 MR. JONES: I think another area you probably  
18 see it now Tom, is if you look at the decision criteria,  
19 acceptance criteria, the numerical discussion -- as you're  
20 aware it's kind of three regions and not acceptable,  
21 acceptable, and kind of a gray area.

22 MEMBER KRESS: Yes.

23 MR. JONES: In the gray area I think you see  
24 some of that flavor, the idea of considering cumulative  
25 increases, looking at the licensees, risk management

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1 program, their operations, and other items. So it's in  
2 there that where we're looking in that gray area that we  
3 will look much harder at what the licensee is doing, the  
4 direction they're heading. And that's what we factored  
5 in; some of this in a qualitative sense.

6 MEMBER KRESS: Okay.

7 MR. KING: We've introduced some wording in  
8 principle 4 that talks about insignificant risk and used  
9 the safety goal subsidiary objectives to sort of define  
10 the level below which we think, when you're making changes  
11 you're down in the insignificant level or small level, as  
12 the Commission mentioned in their SRM. That's new.

13 We've removed the figures, the CDF versus  
14 delta CDF, LERF versus delta LERF figures.

15 CHAIRMAN APOSTOLAKIS: It's very hard to  
16 follow the next slide.

17 MR. KING: But we have a backup of figures  
18 here if you want, to explain the words. Now, we've  
19 expanded the text to try and define the regions where CDF  
20 and LERF are used as guidelines for looking at changes in  
21 risk, and we basically have three regions now.

22 The numerical guidelines are essentially the  
23 same as before, but in the text we've defined the region  
24 where if you're above the CDF and LERF benchmark values,  
25 we would expect changes to be in the direction of improved

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1 safety. We've defined the region where if the changes are  
2 small enough and your CDF and LERF are small enough, we  
3 would expect the changes to be acceptable, and in some  
4 cases maybe not even requiring rigorous analysis.

5           And then we've got that middle region that's  
6 going to require a closer look, and we've tried to define  
7 that middle region being within about a factor of 10 of  
8 the CDF and LERF benchmark values, and defined what this  
9 additional look would consist of in terms of the scope of  
10 the analysis, the rigor of the uncertainty and sensitivity  
11 analysis, looking at other factors, recent plant  
12 performance, other qualitative factors that are listed in  
13 the reg. guide. And we'll go through each of those when  
14 we get into Mark's presentation.

15           The other two changes, we've expanded the  
16 discussion on uncertainties -- and Mark will cover that --  
17 and we're updating the appendices. We're planning on  
18 three appendices now to the reg. guide covering peer  
19 review, risk importance measure, and how to estimate LERF  
20 when you only have a level-1 PRA.

21           And finally, just to summarize the overall  
22 approach in sort of general terms, again the emphasis is  
23 up-front on utilizing risk information in a comprehensive  
24 fashion that looks at risk reduction as well as burden  
25 reduction and the cumulative impact of changes.

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1           We have the 4-step process as before which  
2 basically says, define the change, do your engineering  
3 analysis and integrated decision-making, implement it  
4 through a monitoring and feedback program or strategy, and  
5 then define the documentation that needs to be submitted.

6           Under the engineering analysis we've got five,  
7 what we call fundamental safety principles, which  
8 basically are: meet the regulations, maintain defense-in-  
9 depth, maintain sufficient safety margin, have no  
10 significant increase in risk to public health and safety,  
11 and implement the change utilizing performance-based  
12 monitoring and feedback strategies.

13           Again, Mark will cover each of these. There's  
14 supplemental guidance or expectation associated with each  
15 of these that Mark will go into.

16           We've used the subsidiary objectives of the  
17 Commission's safety goal to define benchmark risk levels,  
18 below which changes are considered insignificant. That's  
19 the  $10^{-4}$  CDF,  $10^{-5}$  LERF.

20           As I mentioned, we've got the various regions  
21 where if your baseline CDF or LERF are high enough, we  
22 expect the changes to be in the improvement direction.

23           We expect again, as we had in earlier  
24 versions, we expect changes to be made in small increments  
25 in terms of risk, and we've kept basically the small

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1 increment being about ten percent of the benchmark CDF and  
2 LERF values.

3 And then the middle region where you've got  
4 additional management review, the closer you get to the  
5 benchmark LERF values and CDF values.

6 In a number of areas we tried to provide  
7 flexibility for licensees to adjust their analysis and  
8 their submittals to what's appropriate for the change  
9 they're requesting. That includes the extent of  
10 uncertainty and sensitivity analysis, the ability to  
11 package several changes together, what's the appropriate  
12 confidence level for the decision that they're making.

13 CHAIRMAN APOSTOLAKIS: So the conditional  
14 containment failure probability is gone now, right?

15 MR. KING: Yes. And they have flexibility to  
16 decide on the scope of analysis that's necessary to  
17 support their proposed change and to justify where the  
18 plant stands on their baseline CDF and LERF.

19 We still retain words about -- we expect the  
20 scope of the analysis that deals with the change should  
21 cover all the system structures, components, operating  
22 modes, initiators affected by the change, or conversely,  
23 make an argument why that doesn't have to be done. And  
24 again, retain the performance monitoring and feedback  
25 aspects of the approach.

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1 With that, we're ready to go into the more  
2 detailed review of the DG-1061.

3 MEMBER FONTANA: Tom, a few years back the  
4 thought was that a large release should be, or have the  
5 probability of  $10^{-6}$  or less, and I see LERF here,  $10^{-5}$ . Is  
6 that a different concept?

7 MR. KING: It's not a different concept. We  
8 had worked on the  $10^{-6}$ , defining a large release at a  $10^{-6}$   
9 frequency several years ago. And were unable to come up  
10 with a definition that we felt was consistent with the  
11 Commission's QHOs; that the  $10^{-6}$ , in effect, made it a new  
12 safety goal.

13 And we're going to point that out to the  
14 Commission in the transmittal package of all these reg.  
15 guides; that we've used  $10^{-5}$ , they had given us a  $10^{-6}$   
16 number ten years ago; here's why we're using  $10^{-5}$ . If  
17 they want to resurrect  $10^{-6}$  they're free to do that, but we  
18 do want to point that out to them.

19 MR. HOLAHAN: But I think it's also fair to  
20 say, because of the way we've drawn this intermediate  
21 region, which has got a factor of 10 on it, it basically  
22 says, at  $10^{-6}$  it's the other end of this gray region.

23 MEMBER CATTON: Transition.

24 MR. HOLAHAN: It's sort of a transition  
25 region. And in effect what it says is, the staff will

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1 consider and give additional consideration to, cases in  
2 which LERF is around  $10^{-6}$ . So we haven't -- I don't think  
3 of it as having shifted our focus by an order of  
4 magnitude.

5 What I think is, that the Commission told us,  
6 think about  $10^{-6}$  as a possible goal. And we're still doing  
7 that in some sense, but we've drawn sort of a stricter  
8 speed limit at  $10^{-5}$ , which is a lot closer to the health  
9 effects.

10 MEMBER KRESS: Are you going to go into your  
11 definition of LERF any more in today's presentation?

12 MR. KING: We're not but I can do it real  
13 quickly right now. Basically, we came up with  $10^{-5}$  by  
14 looking at NUREG-1150 and LaSalle PRA results --

15 MEMBER KRESS: I'm not -- Tom -- discussing  
16 the numerical value. Just the definition of it appears to  
17 me to be really an early containment failure frequency.  
18 It seems to be a bit of a misnomer, especially compared  
19 with what Rick Sherry's been doing. Have I got that  
20 pretty much right?

21 MR. CUNNINGHAM: No, I think you're right.  
22 The definition is really an early containment failure  
23 frequency and you're just -- there's some sort of a loose  
24 relationship between that and release frequency.

25 MEMBER SHACK: Well, I think it's a slightly

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1 modified version. It's a significant core melt with an  
2 early containment failure. Because there is sort of some  
3 scrubbing element and things in there.

4 MR. CUNNINGHAM: Again, I'm going to go into  
5 more detail about the reg. guide itself, 1061 itself.  
6 I've got a couple of slides that are going to cover the  
7 overall structure of the report, and then I'm going to  
8 jump into a discussion of some of the key elements of the  
9 document, including principles and expectations, some of  
10 the acceptance guidelines, and then talk a little bit  
11 about the implementation process.

12 We've talked about this a little bit already  
13 but the purpose of the guide is to provide one acceptable  
14 approach for analyzing issues associated with proposed CLB  
15 changes, including how the risk has -- how an assessment  
16 of risk is factored into that assessment of the proposed  
17 change.

18 The process that we've laid out in the reg.  
19 guide is, as it is today, is basically, this process is  
20 identical to what we talked about in the November meeting  
21 which is a variation on what there was in the September  
22 meeting or whatever, as a result of the comment from the  
23 ACRS.

24 But basically it lays out a -- the key parts  
25 of it being an engineering analysis that is some mixture

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1 of PRA and traditional analyses, and the mixture depends  
2 on the type of issue that you have and the type of  
3 information you have available to you.

4           There's an implementation and monitoring  
5 program aspect of it, which gets into the performance  
6 element of it, and then there's a documentation, a  
7 submittal aspect of it.

8           The first key element of the reg. guide is the  
9 set of principles that the staff has defined. Basically,  
10 the first of these is that the proposed change meets the  
11 current regulations, unless of course you're trying to --  
12 the intent of the change is to explicitly -- it's  
13 explicitly related to an exemption or a rule change,  
14 either by 50.12 or by 2.802 or something like that.

15           The second principle is that defense-in-depth  
16 is maintained. We've talked about this a number of times  
17 before, as we have on the third item which is that  
18 sufficient safety margins are maintained after the change  
19 is made -- after the proposed change would be made.

20           The fourth principle is the risk element of  
21 it, if you will, that the proposed change either results  
22 in a risk reduction or safety improvement, or it leads to  
23 an insignificant increase in core damage frequency and  
24 risk. And this is in the context of the individual or the  
25 specific change being made, and in a more cumulative sense

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1 that the overall effect of all the proposed changes does  
2 not lead to a substantial increase in risk.

3 And then the fifth principle is that the  
4 performance-based implementation strategies are  
5 established as part of the program to address  
6 uncertainties in the process and the models and data, and  
7 to provide a feedback mechanism for problems that are  
8 identified.

9 CHAIRMAN APOSTOLAKIS: Could you, or would you  
10 accept an alternate wording for number 4? Proposed  
11 changes, both individually and cumulatively, result in  
12 small increases in the risk to the health and safety of  
13 the public. I had to stop and think, in no more than  
14 insignificant increases. How about small?

15 MR. CUNNINGHAM: In some cases, because of the  
16 way we've set up the acceptance guidelines, small  
17 increases would not be permitted -- if you're above the  
18 subsidiary goals.

19 CHAIRMAN APOSTOLAKIS: Yes.

20 MR. CUNNINGHAM: So that's why we had no more  
21 than insignificant. It could be a reduction. Perhaps it  
22 may be better worded to say, either its a, under some  
23 circumstances, a risk reduction, or only small increases,  
24 or something like that.

25 CHAIRMAN APOSTOLAKIS: Yes.

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1 MR. CUNNINGHAM: This is trying to mix two --

2 CHAIRMAN APOSTOLAKIS: Something to make it  
3 clearer. I mean, I don't have any objection to the  
4 essence of it, the substance, but the wording is a little  
5 bit strange. You try to be as general as possible to  
6 cover all the -- so maybe --

7 MR. CUNNINGHAM: Yes, we're trying to mix  
8 together both the need, in some cases to have risk  
9 reduction, in other cases, small increases.

10 CHAIRMAN APOSTOLAKIS: Well, all you can say,  
11 result -- proposed changes, both individually and  
12 cumulatively, when allowed, result in small increases. I  
13 mean, there is an element here that says that you should  
14 not violate the goals, so that increases are not allowed,  
15 right?

16 MR. CUNNINGHAM: Increases would not be  
17 allowed. Yes, that's right.

18 CHAIRMAN APOSTOLAKIS: So maybe you can say  
19 that. That, you know, result in small increases as long  
20 as the quantitative health objectives are met. Something  
21 like that. To make it simpler.

22 MR. CUNNINGHAM: Something like that.

23 MR. HODGES: This is Wayne Hodges with the  
24 staff. But even if they're not bumping up against limit,  
25 changes may improve safety and you don't want to rule

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1 those out either.

2 CHAIRMAN APOSTOLAKIS: That's correct.

3 MR. HODGES: And I think what you just said,  
4 might.

5 CHAIRMAN APOSTOLAKIS: You say even if they  
6 are above the goal?

7 MR. HODGES: No, I said even if they're not  
8 bumping up against the goal. If they've still got plenty  
9 of margin, a proposed change may be in the direction of  
10 reducing risk.

11 CHAIRMAN APOSTOLAKIS: Yes.

12 MR. HODGES: And that statement has to allow  
13 that.

14 MEMBER SHACK: Yes, you don't want to outlaw  
15 decreases.

16 CHAIRMAN APOSTOLAKIS: No, no, but I'm sure  
17 you can change the wording here to make it clearer. I  
18 mean, a principle -- you shouldn't have to stop and think  
19 about the principle. Is that no more than insignificant.

20 MEMBER SHACK: See, the previous wording said  
21 it results only in small increases in calculated plant  
22 risk, which certainly sent you the wrong message.

23 CHAIRMAN APOSTOLAKIS: Well, in small  
24 increases or decreases, you know. I mean, you can always  
25 play with the words.

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1 MR. CUNNINGHAM: Yes. That may be a better  
2 way to say it. Either decreases or no --

3 CHAIRMAN APOSTOLAKIS: And also the --

4 MR. CUNNINGHAM: Or small increases.

5 CHAIRMAN APOSTOLAKIS: -- idea that you don't  
6 go above the goals.

7 MR. CUNNINGHAM: Yes.

8 CHAIRMAN APOSTOLAKIS: Speaking of that, there  
9 was another place in the guide, on page 1-2, where  
10 something like that comes up again, starting line 11. The  
11 acceptance guidelines defined in this regulatory guide are  
12 consistent with the safety goals and their subsidiary  
13 objectives. And changes to the CLB are expected to result  
14 in risk increases which are no more than a small fraction  
15 of these goals and objectives.

16 Again, it's understood that you don't go above  
17 the goal, right? It could be a small fraction of the goal  
18 that takes you above the goal. So maybe you can make it  
19 clearer. Without exceeding the objectives, in other  
20 words. It's understood that you're always below the  
21 objective.

22 MR. KING: Yes, and it just mentions  
23 increases, so I think that's a --

24 CHAIRMAN APOSTOLAKIS: And also it mentions on  
25 the increases --

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1 MR. KING: Yes, so we ought to take a second  
2 look at that.

3 CHAIRMAN APOSTOLAKIS: Yes. Now, we will  
4 revisit these principles later in your presentation,  
5 right? You will talk about defense-in-depth and --

6 MR. CUNNINGHAM: Yes, we go into a little more  
7 detail about each of them. Yes.

8 Associated with the principles are a set of  
9 staff expectations. The first of these, that the safety  
10 impacts of the proposed change are evaluated as part of an  
11 overall risk management approach to identify places where  
12 requirements or where safety improvements should be  
13 accomplished as well as trying to reduce burdens in other  
14 areas.

15 So this is getting at the issue that was  
16 addressed by the Commission as well, that this is part of  
17 a bigger program and we shouldn't just be looking at ways  
18 to reduce burdens.

19 The second expectation is that there's an  
20 integrated aspect of the analysis, that we look at all --  
21 we're trying to assure that all the principles are met,  
22 and it's not a pick or choose of which principles are  
23 being met or not met.

24 The third expectation then is, we've  
25 already talked about it in many respects, is that CDF and

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1 this large release frequency or large containment  
2 performance frequency if you will -- containment  
3 performance frequency measures are suitable metrics to use  
4 in lieu of the quantitative health objectives or something  
5 else.

6 CHAIRMAN APOSTOLAKIS: Although, if you go  
7 later in the text, you seem to be making a distinction  
8 between CDF and LERF in the sense that the LERF part can  
9 be done qualitatively, is not true in some cases?  
10 Although the CDF part is always quantitative with some  
11 qualitative arguments regarding what's missing perhaps.

12 MR. CUNNINGHAM: Yes.

13 CHAIRMAN APOSTOLAKIS: And I was wondering  
14 whether you should say something like that here, or if you  
15 think it's unnecessary to put it here that's fine. But  
16 there seems to be more to it than just what the bullet is  
17 saying.

18 MR. CUNNINGHAM: In the sense of, this could  
19 be done either qualitatively or quanti --

20 CHAIRMAN APOSTOLAKIS: The LERF part would be  
21 done qualitatively. That's the impression I got from  
22 later on.

23 MR. CUNNINGHAM: Okay, I guess I'm --

24 MEMBER KRESS: I would prefer when you're  
25 doing this sort of stuff that you keep it direct like

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1 this. I like the way it's breaking.

2 CHAIRMAN APOSTOLAKIS: So the understanding is  
3 then that these are the metrics --

4 MEMBER KRESS: They're the metrics --

5 CHAIRMAN APOSTOLAKIS: -- and how you actually  
6 --

7 MEMBER KRESS: How you --

8 CHAIRMAN APOSTOLAKIS: Okay, all right.  
9 That's fine. I just wanted to point that out.

10 MEMBER KRESS: Yes, okay.

11 MR. CUNNINGHAM: I guess I'm a little puzzled  
12 that, I don't think -- we can go back to the text at some  
13 point and talk about where you think we could -- we've  
14 said that the LERF can be just a qualitative argument.

15 CHAIRMAN APOSTOLAKIS: I believe it's in the  
16 section on acceptance. Comparison with acceptance  
17 guidelines. If you go to page 2-10 -- let's see --  
18 actually, it refers to both. I thought I saw it -- well,  
19 maybe you referred to both CDF and LERF, but --

20 MEMBER SHACK: Page 1-21 gives you the  
21 bounding analysis or qualitative --

22 MR. CUNNINGHAM: Yes, but we weren't  
23 differentiating there.

24 CHAIRMAN APOSTOLAKIS: Now, in our letter  
25 though, we did, right? Do you remember? Yes, we wrote a

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1 letter that said that because of -- the degree of comfort  
2 that the licensees have with core damage frequency  
3 methods, estimation methods, we should not discourage them  
4 by requiring a rigorous population of LERF, and that they  
5 may be able to have supplied qualitative arguments if  
6 appropriate. Isn't that the thrust of our letter? The  
7 letter we wrote last time? Yes.

8 MEMBER SHACK: I wouldn't say that was the  
9 thrust of it, but there's that flavor to it.

10 CHAIRMAN APOSTOLAKIS: Flavor, okay. No, this  
11 was a letter afterwards. I mean, you don't have to do  
12 what our letter says. I just wanted to point out the  
13 difference.

14 MEMBER KRESS: Well, I think you have a 2-  
15 dimensional matrix risk here. Just focusing on the CDF  
16 and forgetting all about LERF --

17 CHAIRMAN APOSTOLAKIS: No, no.

18 MEMBER KRESS: -- I think in my --

19 CHAIRMAN APOSTOLAKIS: That's not what the --

20 MEMBER KRESS: That's not what the -- they're  
21 taking it into proper consideration.

22 CHAIRMAN APOSTOLAKIS: That's not what our  
23 letter said either. It didn't say forget about LERF. It  
24 said, we're willing to consider less than rigorous methods  
25 in the estimation of LERF.

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1 MEMBER KRESS: As long as --

2 CHAIRMAN APOSTOLAKIS: As opposed to the --

3 MEMBER KRESS: As long as you know it bounds  
4 it.

5 CHAIRMAN APOSTOLAKIS: Exactly, exactly.

6 MEMBER KRESS: I don't think they're excluding  
7 the choice --

8 CHAIRMAN APOSTOLAKIS: But the industry is  
9 using LERF as well, in NEI documents.

10 MEMBER KRESS: So?

11 CHAIRMAN APOSTOLAKIS: So that's not something  
12 they will contest.

13 MR. CUNNINGHAM: Yes, and we're not precluding  
14 what your letter suggested. It was just that --

15 CHAIRMAN APOSTOLAKIS: Yes.

16 MR. CUNNINGHAM: I wasn't thinking that we  
17 explicitly came out and said that you can do that. You  
18 have to be quantitative in CDF and quali -- you can't be  
19 qualitative --

20 CHAIRMAN APOSTOLAKIS: That's fine. That's  
21 fine.

22 MEMBER KRESS: As long as you're on page 2-10,  
23 I was puzzled in that second from the bottom paragraph, a  
24 statement that starts out about point estimates maybe --

25 CHAIRMAN APOSTOLAKIS: What is this --

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1 MEMBER KRESS: This is in the --

2 CHAIRMAN APOSTOLAKIS: Line?

3 MEMBER KRESS: This is in the reg. guide and  
4 it's the second line in the -- second paragraph --

5 MEMBER BARTON: Line 30.

6 CHAIRMAN APOSTOLAKIS: Line 29.

7 MEMBER KRESS: Yes, 29. I was puzzled with  
8 that. Are you -- does that bother you any, George?

9 CHAIRMAN APOSTOLAKIS: Yes, when I read it I  
10 had to stop and think about it. My first inclination was  
11 to drop the sentence.

12 MEMBER FONTANA: Well, the problem I've got  
13 with that was that there are a lot of areas, I think we're  
14 pulling estimates that are very useful, in that if you  
15 require a full-blown analysis of everything you do you'll  
16 never get there.

17 CHAIRMAN APOSTOLAKIS: No, but if you read the  
18 whole section -- whatever it is -- 2.4.2.1, the whole idea  
19 is that we would like you to consider these two metrics.  
20 Of course, you're very welcome to do a rigorous analysis,  
21 but then they allow you to argue qualitatively, they allow  
22 you to do bounding estimates and so on.

23 So it seems to me in that context, I can do  
24 what you just said. If I can argue that my point  
25 estimates are meaningful. But I don't have to be so

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1 specific as to say, point estimates result from inputs  
2 that are mean values of the input parameters, and so on.  
3 So that was my --

4 MEMBER KRESS: I think there's an implied  
5 relationship here that is, if you use the mean values for  
6 input, that the point estimate you get will be higher than  
7 the mean. And I think there's some justification for  
8 that. I think you get a log normal distribution for the  
9 output, or it's close to it, for risk. I'm not sure you  
10 get a log normal for CDF.

11 MR. PARRY: Can I add a comment in here? This  
12 is Gareth Parry of NRR. The intent of this statement is  
13 to recognize the fact that the true mean, when you  
14 propagate distribution through, is usually slightly higher  
15 than the point estimate that you get from using means as  
16 point values.

17 MEMBER KRESS: Its true mean is higher than --

18 MR. PARRY: Is higher, right.

19 MEMBER KRESS: Okay, I thought it was the  
20 other way.

21 MR. PARRY: No, it's that way. But the intent  
22 of this statement is that, it's a recognition of the fact  
23 I think, that many licensees have not done full parametric  
24 uncertainty analyses. The difference generally, when you  
25 do that, is often not very large. It may be as a factor

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1 of 20 percent or something.

2 And I think all this statement is, is that you  
3 haven't done a full parametric uncertainty analysis you  
4 can still use your point estimate calculations as long as  
5 you're convinced that the difference between the true mean  
6 and the point estimate isn't that great. And you can --

7 MEMBER KRESS: How does one make that  
8 convincing argument?

9 MR. PARRY: You look at the concepts and you  
10 look for where the correlations between the like  
11 parameters exist that would lead to this distinction.

12 MEMBER KRESS: I see.

13 CHAIRMAN APOSTOLAKIS: That's the epistemic  
14 relation?

15 MR. PARRY: Yes.

16 MEMBER KRESS: That may be a little  
17 sophisticated.

18 CHAIRMAN APOSTOLAKIS: It depends very much on  
19 how broad --

20 MR. PARRY: How broad the individual --

21 CHAIRMAN APOSTOLAKIS: -- the individual  
22 distributions are.

23 MR. PARRY: -- distributions are. Right.

24 CHAIRMAN APOSTOLAKIS: The only place that I  
25 have seen where this made a difference was the interfacing

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1 systems LOCA --

2 MR. PARRY: Right. That's when it makes a big  
3 difference.

4 CHAIRMAN APOSTOLAKIS: Where you have two  
5 valves in series and both must fail, and the time we did  
6 this analysis 15 years ago, they were never tested --  
7 their valves. And we didn't have enough information, so  
8 the distinctions were very broad.

9 So now the frequency is the product of the  
10 unavailability, right? So if you put only mean values,  
11 you severely underestimate the mean of the product. You  
12 have to add the variance, in other words. The variance is  
13 the measure of how far you are from the rest of it.

14 MR. PARRY: Right.

15 CHAIRMAN APOSTOLAKIS: But let me come back to  
16 Gareth's argument. I agree that a lot of people really  
17 all have distributions, but it seems to me that the burden  
18 really is to develop the distributions for the input, not  
19 propagating them. Because propagating them is a simple  
20 Monte Carlo thing. I mean, anybody can do it.

21 And now with the availability of packages for  
22 use on PCs, that's not a big deal, is it?

23 MR. PARRY: I think you may occasionally find  
24 the Monte Carlo codes don't handle the correlations real  
25 well.

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1 CHAIRMAN APOSTOLAKIS: Yes, but still --

2 MR. PARRY: You've got to adapt -- it's  
3 possible, sure. You can do it.

4 CHAIRMAN APOSTOLAKIS: But the point is that,  
5 if you ask them to use mean values for inputs, that means  
6 you're asking them to have the distribution for the input,  
7 which is really most of the work.

8 MR. PARRY: That's true.

9 MEMBER KRESS: Once you've got that --

10 CHAIRMAN APOSTOLAKIS: That's most of the  
11 work. Once you've got that then to propagate is  
12 relatively straightforward. Well, you may have some  
13 problems with epistemic dependencies but --

14 MR. PARRY: Yes, but that's the point.

15 CHAIRMAN APOSTOLAKIS: You're already asking  
16 them to do most of the work, so you're not really  
17 relieving the burden. Because you're saying, I want you  
18 to use mean values as inputs.

19 Now, if some people come back and say, well  
20 this point estimate is a mean value, then you have a  
21 problem. Because you know, you need some sort of  
22 argument. I personally would drop that sentence, and I  
23 think everything else in this section is fine. It gives  
24 you guidance how to do it.

25 Which people that come only with point

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1 estimates, then you can ask all these questions. If  
2 people come with mean values but they don't propagate  
3 uncertainty, then you can do what Gareth just said. Ask  
4 them to convince you that the mean is not underestimated  
5 very much, and so on.

6 MR. ABBOTT: I have a really dumb question.  
7 It says, the proposed change meets the current  
8 regulations. If I'm performing a change to the facility -  
9 - and take a fairly complicated one like room in the RTD  
10 bypass line on PWRs.

11 It's a fairly extensive change, requires some  
12 tech spec changes, significant changes to the procedures  
13 and point -- and I go through the whole change process,  
14 50.59, I look at the regulations, I do the tech spec  
15 changes and everything meets the regulations.

16 Why do I need to go any further? I'm done,  
17 all right?

18 MR. CUNNINGHAM: You're talking about the  
19 first of the principles here?

20 MR. ABBOTT: Yes. The proposed change meets  
21 the current regulations. So what's the advantage of  
22 having any of the rest of the things in here? If I meet  
23 the regulations it's over.

24 MR. JONES: Well again, when you look at this,  
25 recognize -- as stated. The reg. guide is voluntary and

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1 it's for where you choose to make changes to your license,  
2 that we think risk may have an impact.

3 MR. ABBOTT: Then why would it be an advantage  
4 to me to go through this process in terms of doing a  
5 fairly extensive design package which requires technical  
6 specification changes?

7 MR. JONES: It may not. A more specific  
8 example may not require you to go through such an  
9 assessment.

10 MR. ABBOTT: Would I ever have to go through  
11 such an assessment if it meets the regulations?

12 MR. HOLAHAN: Yes. First of all, this is not  
13 a very dumb question, and I think Dr. Powers wouldn't  
14 think it's a very dumb question because he asked that at  
15 some of our earlier meetings, as I recall.

16 MEMBER POWERS: He's very happy the question  
17 came up.

18 MR. JONES: From somebody else.

19 MR. HOLAHAN: And I think I said --

20 MEMBER POWERS: I wasn't getting very far when  
21 I asked it.

22 MR. HOLAHAN: I think I said at that time that  
23 meeting the regulations is one thing, but there's not  
24 always such an obvious connection between meeting the  
25 regulation and your licensing basis. And I think what we

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1 talked about was things like -- not necessarily hardware  
2 changes where you're redesigning the plant -- but  
3 something like a technical specification, okay.

4 If a diesel generator outage time is allowed  
5 to be seven days, I don't think the staff said that we  
6 declare that any more than seven days doesn't meet the  
7 regulation. It just happened to be the only value that  
8 was, you know, currently justified. So if a licensee  
9 wants to justify a 9-day or a 21-day diesel generator  
10 outage, I think you still have to say that the basic  
11 regulations are being met.

12 But in that case, you know, I don't think  
13 you've changed the general design criteria or you know,  
14 the reliability of off-site power, and all those other  
15 things that go into meeting the regulation. But you have  
16 a lot of additional arguments about safety margin and  
17 whether you've influenced CDF or large early release  
18 frequency.

19 So I think it's very relevant to the kinds of  
20 operational questions that industry is trying to deal with  
21 at the moment.

22 CHAIRMAN APOSTOLAKIS: But I must agree  
23 though, that that sentence really doesn't sound right, and  
24 maybe there's another way of stating it. I thought your  
25 original statement was different, or wasn't -- you said

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1 that they have -- I mean, two meetings ago, that the  
2 licensee first has to prove that it meets all the current  
3 regulations. Having proven that, then we proceed to look  
4 at the change. So that's how I always interpreted this --

5 MR. ABBOTT: If the proposed change deals with  
6 allowed outage times, say on diesel generators or HPCI or  
7 whatever --

8 CHAIRMAN APOSTOLAKIS: Right.

9 MR. ABBOTT: -- and those numbers are part of  
10 the licensing basis in the technical specification basis  
11 of the facility, then are you saying that -- so that kind  
12 of change is -- say if I extend it, make it longer, that  
13 change is not in conformance with the regulations?

14 MR. HOLAHAN: No, I think I said the opposite.  
15 In effect, this was a one-sided test.

16 MR. ABBOTT: Well, no I --

17 MR. HOLAHAN: When we --

18 MR. ABBOTT: If I ran up a change that extends  
19 the allowed outage times on the diesel generators, that  
20 change is not in compliance with my license. Correct?

21 MR. HOLAHAN: That's correct. But when the  
22 staff granted the original license it said in effect, that  
23 the 7-day outage was in conformance with the regulations.  
24 That's a one-sided test --

25 MR. ABBOTT: The example I just cited doesn't

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1 meet the first sentence in item one. It doesn't meet the  
2 current regulations.

3 MEMBER CATTON: What I hear is interpretation.  
4 You interpret the regulation in a particular way and that  
5 has sort of become case law. And what you're going to do  
6 is, you're going to allow PRAs a tool that you can go back  
7 and readjust the interpretation. Because that's what this  
8 diesel issue is all about.

9 MR. ABBOTT: The last time I knew, if I took  
10 the diesel generator out of service longer than was  
11 allowed in the technical specification, you guys would  
12 nail me.

13 MEMBER CATTON: Well, now they give you a way  
14 to do it.

15 MR. ABBOTT: Yes, okay. So isn't that -- so  
16 the proposed change that I'm making in terms of allowed  
17 outage times, makes it longer than what's in there  
18 currently, is not in conformance with the regulations.

19 MR. HOLAHAN: Well, what it's not in  
20 conformance with -- it's not in conformance with the  
21 license and the tech spec.

22 MR. ABBOTT: So we're making a distinction  
23 between the regulations and the design basis? And the  
24 licensing basis?

25 MR. HOLAHAN: Well, I mean, the regulations

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1 have got lots of pieces to it.

2 MR. ABBOTT: What are we talking about the  
3 regulations?

4 MR. HOLAHAN: Well, if you get a violation for  
5 keeping your diesel generator out for eight days, you're  
6 not getting the violation of general design criteria 17.

7 MR. ABBOTT: Okay, so the regulations in this  
8 context have a very specific meaning, and that's what's  
9 contained in 10 CFR 50? Is that what we're talking about  
10 here?

11 MR. HOLAHAN: This is -- when we eventually  
12 grant the amendment we will say that you meet the  
13 regulations, you meet all the design regulations --  
14 applicable to this particular issue -- and granting eight  
15 days instead of seven is also -- constitutes an  
16 appropriate technical specification, so that meets the  
17 regulations, too.

18 See, they're one-sided tests in the sense that  
19 when the staff said that a seven-day outage time for a  
20 diesel was acceptable, we never made a finding that said  
21 eight days was inconsistent with the rest of the  
22 regulations. We didn't forego the possibility of changing  
23 the number of --

24 MR. ABBOTT: Well, certainly the actions that  
25 the industry takes against people who violate that are

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1 contrary to what you just said.

2 MR. HOLAHAN: No, no. I think you have to  
3 look at -- well, look up your last violations and you'll  
4 see that they're not against the design criteria; they're  
5 against a specific operational limit. It's against the  
6 tech spec.

7 MR. ABBOTT: Okay, then the word "regulations"  
8 in the first sentence of the first bullet applies to  
9 everything that's in 10 CFR 50?

10 MR. HOLAHAN: Yes.

11 MR. ABBOTT: Okay, all right. We're not  
12 referring to the FSAR, we're not referring to the  
13 technical specifications?

14 MR. HOLAHAN: We're not referring to the FSAR,  
15 that's true.

16 MR. ABBOTT: And we're not referring to the  
17 technical specifications?

18 MR. HOLAHAN: We're not referring to the  
19 technical specifications before they were changed.

20 MR. ABBOTT: Obviously.

21 Thank you.

22 MEMBER CATTON: It's a really good start.  
23 It's just a complex method of reinterpretation of the  
24 regulations. That's all it is.

25 CHAIRMAN APOSTOLAKIS: Is it a

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1 reinterpretation or --

2 MEMBER CATTON: I really -- because the first  
3 interpretation -- I think this diesel is really a good  
4 example. The first interpretation was seven days. Now  
5 you come in and you say, "But gee, based on my PRA and all  
6 of this statistical analysis I've done, I can demonstrate  
7 to you that I maintain the safety with eight days." So we  
8 reinterpret. Safety and that regulation is eight days or  
9 nine days.

10 CHAIRMAN APOSTOLAKIS: My understanding is  
11 that the seven days is not a regulation.

12 MR. HOLAHAN: Seven days is not a regulation.

13 MEMBER CATTON: It's an interpretation of the  
14 regulation.

15 MR. HOLAHAN: Well, I would say it's an  
16 implementation of the regulation.

17 MEMBER CATTON: Well implementation, but  
18 really you interpret the diesel engine rule and safety  
19 with seven days. The seven days is not written into the  
20 rule.

21 MR. HOLAHAN: That's right.

22 MEMBER CATTON: So you have to interpret the  
23 meaning of the rule. Now what you are going to use to  
24 interpret the rule is PRA.

25 MR. HOLAHAN: Right.

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1 MEMBER CATTON: So really this is not risk  
2 based regulation at all.

3 MR. HOLAHAN: This is risk informed  
4 regulation.

5 MEMBER CATTON: That's right. Now --

6 CHAIRMAN APOSTOLAKIS: So is this the new  
7 definition of regulation? Or is it an interpretation of  
8 the regulation?

9 MR. HOLAHAN: Well, if it helps Dr. Catton to  
10 think of this as interpretation, he can, he can do so.  
11 But the regulations -- from my point of view, this is an  
12 implementation of the regulation. Okay? The regulations  
13 also have rules about who is allowed to interpret them and  
14 things like that.

15 MEMBER CATTON: Sure, sure.

16 MR. HOLAHAN: And it's not us. So I prefer  
17 not to use that word.

18 MEMBER CATTON: I guess --

19 MR. HOLAHAN: I think you have a correct  
20 understanding of what we are trying to achieve.

21 MEMBER CATTON: It's just like the law. I  
22 mean you build up case law. What is case law? It's  
23 interpretation of the rules. And they slowly shift one  
24 way or another depending on what's happened.

25 MR. JONES: In fact in this case, 50.36 is the

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1 tech spec regulation. It says you shall provide certain  
2 time frames for equipment out of service, action times and  
3 justifications that ensure -- provide reasonable assurance  
4 and no undue risk to public health and safety. Now, in  
5 there it defines what equipment should be covered by  
6 technical specifications, we are not reinterpreting that.

7 But in your specific example, you are  
8 interpreting, for example, the limited condition for  
9 operations and action statements and how long they apply.  
10 So in that sense it is like case law, but a licensee  
11 proposes and we dispose to a review process. Then that  
12 becomes the basis for the tech specs and the basis for  
13 their license.

14 To change that there is an amendment process  
15 in 50.90 which tells you what you do and you would apply  
16 the appropriate justification and we would look at it.

17 MEMBER CATTON: So if I came before you with  
18 what was actually a design change, I couldn't do it via  
19 this route.

20 MR. HOLAHAN: Well then you would have to use  
21 the second sentence under 1.

22 MEMBER CATTON: Oh, so I can take my pick out  
23 of these elements?

24 MR. HOLAHAN: No, no, no.

25 MEMBER CATTON: That's all right.

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1 CHAIRMAN APOSTOLAKIS: Unless --

2 MR. JONES: Even on a design change there is  
3 50.59, there is a regulation that tells you what you can  
4 do yourself with respect to the design, and when you have  
5 to come to the Commission for review and approval.

6 MEMBER CATTON: Okay.

7 MR. JONES: And while that's a matter that may  
8 be some of the implementation is currently may be being  
9 debated on current guidance, but it does deal with there  
10 is a process in the regulations on how you deal with it if  
11 you come up with a nonreviewed safety question you come to  
12 the staff for review and approval. There is a whole  
13 method.

14 Sometimes an unreviewed safety question can  
15 get into an area where it's not always clear what  
16 regulation applies. But as an unreviewed safety question,  
17 because it violates some specific test that is specified  
18 under 50.59 and we would have to review and approve it.

19 MR. HOLAHAN: As a general matter, you have to  
20 meet all of the key principles for each application. Now,  
21 you will see that, I think there is a fair amount of  
22 flexibility in each of them. And even the one that says  
23 you have to meet the current regulations, if you were  
24 proposing a sensible alternative that didn't meet one of  
25 the current regulations, there is also a mechanism for

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1 dealing with that.

2 MEMBER CATTON: So there is still a chance  
3 with the large break LOCA?

4 MR. HOLAHAN: Yes, I guess there is still a  
5 chance with the large break LOCA.

6 MEMBER CATTON: Okay.

7 MR. HOLAHAN: Well, if we are throwing pet  
8 projects on the table, personally a loss of offsite power  
9 with large break LOCA is not my favorite risk informed  
10 requirement. Okay?

11 MR. ABBOTT: So what's your understanding of  
12 the set of proposed changes that a licensee might make  
13 that would come under this regulatory gun? I mean what,  
14 other than the AOTs, are there other examples?

15 MR. JONES: Well we have current examples in  
16 the area of graded QA, examples in the area of the IST, in  
17 service testing program and in service inspection program,  
18 ISI.

19 MR. ABBOTT: Those are all -- that's it?

20 MR. JONES: Those are the ones that are  
21 currently in review -- in tech specs which is your AOT  
22 examples. That we have separate applications, specific  
23 guidance documents being prepared at various stages.

24 MR. HOLAHAN: If you are looking at the  
25 population of potential applications, I think it's fair to

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1 say historically most of the license amendments that the  
2 NRC grants are changes in technical specifications. So  
3 that's probably where most of the applications would be.

4 MR. ABBOTT: Okay, that's --

5 MR. CUNNINGHAM: I can't recall if we talked  
6 about the last bullet on the slide. But we -- in a  
7 general sense we have. One of the expectations is that  
8 the increases in estimated CDF and LERF will be small.

9 Continuing with the expectations, that the  
10 scope and quality of the analyses basically they are  
11 saying is the scope and quality of the analyses performed  
12 should be in some sense commensurate with the nature and  
13 the scope of the change. This is another way of saying,  
14 small, very small changes may need not as much analysis as  
15 changes that are very significant in terms of the change,  
16 increase in CDF or LERF or something like that. And that  
17 the engineering analysis should be based on the as built,  
18 as operated, maintained plant.

19 The next expectation then is one we have  
20 danced about already this morning, the consideration of  
21 uncertainty in the analyses. We will come back to that a  
22 little bit later.

23 There is a quality control process as expected  
24 for the PRA including such things as peer review --

25 MEMBER CATTON: But they won't always require

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1 a peer review, will they?

2 MR. CUNNINGHAM: Correct.

3 MEMBER CATTON: I couldn't really find  
4 anywhere where it told me when a peer review should be  
5 done and when it shouldn't.

6 CHAIRMAN APOSTOLAKIS: You are missing the  
7 appendices.

8 MEMBER CATTON: Okay, there was something else  
9 -- oh, so when I read the SRP and it referred back to DG-  
10 1061 for information on peer review, that's why I couldn't  
11 find it, because it's not there.

12 MR. JONES: Absolutely.

13 MEMBER CATTON: How about that.

14 MR. CUNNINGHAM: And I will tell you all those  
15 appendices are kind of flowing a good bit as to whether we  
16 are going to end up with the appendices in the SRP and the  
17 reg guide and that type of stuff. But that's --

18 MEMBER CATTON: I understand. But that's  
19 important one because there is peer review and then there  
20 is peer review.

21 MR. CUNNINGHAM: Yes, yes.

22 MEMBER CATTON: I'm very interested in seeing  
23 it.

24 MR. CUNNINGHAM: And then the last bullet is a  
25 reflection of what was stated in the Commission's PRA

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1 Policy Statement a couple of years ago, that basically the  
2 methods and the data that are used are scrutable -- well,  
3 are available for public review. They are out there in  
4 the public domain..

5 CHAIRMAN APOSTOLAKIS: Why don't you just say  
6 the methods and assessment used to support regulatory  
7 decision making must be available for public scrutable --

8 MEMBER CATTON: Another thing I noticed in  
9 reading the standard review plan is you list the various  
10 branches and what their responsibilities and so forth are.  
11 And it turns out that the probabilistic branch really is  
12 sort of only on call in this whole process. Shouldn't  
13 there be a criterion for their involvement like if they go  
14 from one step to the next rather than just when somebody  
15 thinks they need them?

16 CHAIRMAN APOSTOLAKIS: I didn't follow that.

17 MEMBER CATTON: If you look at -- and I don't  
18 recall where they are --

19 MEMBER BARTON: Page 2 of the SRP.

20 MR. HOLAHAN: I think that's an excellent  
21 comment and it's not a new one that we've heard. I mean -

22 -

23 CHAIRMAN APOSTOLAKIS: Oh, the SRP.

24 MR. JONES: One of the issues in this whole  
25 process is how are we going to implement this thing at the

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1 back end --

2 CHAIRMAN APOSTOLAKIS: Oh, that's right.

3 MR. JONES: -- and are we really ready to  
4 implement it? And we are going to have to give further  
5 consideration to the training needs of the staff, the  
6 project management staff that might process some of these  
7 amendments.

8 MEMBER CATTON: Well, training is one thing.  
9 This is different than training.

10 MR. JONES: Well, part of the training will be  
11 when do you go to where and how do you do that?

12 MEMBER CATTON: I think there should be a  
13 clear statement of when people who are experts in PRA get  
14 involved. There should be a clear statement and there is  
15 not.

16 MR. HOLAHAN: That's a good comment. I'm not  
17 sure how to address it but --

18 MEMBER CATTON: I'm not either, but you see  
19 you address the other issue by if it's the risk is greater  
20 than you do this, if it's less than what you can do, you  
21 can key it directly to that. Because you even in it state  
22 that if the risk is less than, you don't have to do a very  
23 good PRA. If you don't have to do a very good PRA, it  
24 doesn't have to be a very good person to review it.

25 MR. HOLAHAN: But ever there there is some

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1 judgement that about --

2 MEMBER CATTON: Yes.

3 MR. HOLAHAN: -- whether you are really in the  
4 region that you think you are.

5 MEMBER CATTON: Well, no, I understand. But  
6 you took on that task and you made some definitive  
7 statements. Key it to it, whatever they are.

8 MR. HOLAHAN: We, perhaps we need some sort of  
9 screening criteria for putting the reviews in the right  
10 places.

11 MEMBER CATTON: That's right.

12 CHAIRMAN APOSTOLAKIS: Because presumably the  
13 other groups here that you mention do have some knowledge  
14 of PRA. I mean, it's not like if you don't go to the PSA  
15 branch, there will be no PRA considerations, right? I  
16 mean if you look at the Office of Analysis and Evaluation  
17 of Operational Data, they do understand PRA, don't they?

18 MR. HOLAHAN: Yes, but they are not going to  
19 be processing the license amendments. I'm afraid that the  
20 branches that would be processing license amendments don't  
21 have much background in PRA.

22 CHAIRMAN APOSTOLAKIS: But they should, right?  
23 At some point when this is implemented, you have a  
24 training program, don't you?

25 MR. HOLAHAN: We have a training program, but

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1 we are going to be in a long transitional phase I think.

2 CHAIRMAN APOSTOLAKIS: Because if everything  
3 has to go to the PRA branch, that may create  
4 administrative problems.

5 MR. JONES: Everybody will work for me.

6 CHAIRMAN APOSTOLAKIS: So shall we talk about  
7 training at some point in connection with this? Not  
8 today, but certainly that's an important part.

9 MR. JONES: Sure, that will be fine. Okay,  
10 Mark.

11 MEMBER CATTON: George, are we going to get to  
12 take a break?

13 CHAIRMAN APOSTOLAKIS: Somehow they put it at  
14 10:30. I don't understand that. It must be log normal  
15 distribution of some sort. Do you want to take a break  
16 now? Okay, we take a break now.

17 (Whereupon, the foregoing matter went off the  
18 record at 10:23 a.m. and went back on the  
19 record at 10:34 a.m.)

20 CHAIRMAN APOSTOLAKIS: Shall we start?

21 MR. CUNNINGHAM: Yes sir.

22 CHAIRMAN APOSTOLAKIS: Before you continue,  
23 Mark, the question of whether we need to go to 6:00 was  
24 raised earlier. Because if we don't, then people would  
25 like to know early, maybe rearrange their flights. Some

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1 people are travelling very far.

2           It seems to me that the overview of SRP  
3 Chapter 19 will really, oh, you only have allowed 15  
4 minutes so it shouldn't take -- do you think that the  
5 discussion on RG-1061 pretty much covers the issues under  
6 SRP as well so we don't need all this time in the  
7 afternoon? I mean we are doing now item 9, detailed or  
8 general discussion of the issues. And we do have two more  
9 meetings. So is it possible to finish say by 3:30, 3:45?

10           MR. HOLAHAN: Yes, I think it's possible.

11           CHAIRMAN APOSTOLAKIS: Yes, with the  
12 discussion of major issues today and then --

13           MR. HOLAHAN: It was never the intent that the  
14 Standard Review Plan contain major issues. It's supposed  
15 to be guidance to the staff on how to implement the major  
16 thoughts that are in the reg guide. So long as we are  
17 still dealing at that level, I think it's good to look at  
18 the Standard Review Plan, but maybe a page by page, line  
19 by line review isn't necessary.

20           CHAIRMAN APOSTOLAKIS: Yes, and we have a two  
21 day meeting scheduled for February, so we can go through  
22 the details then. I think what you need today is to see  
23 whether there are major points of disagreement, and I  
24 think this level of presentation that Tom and Mark are  
25 giving us accomplishes that. Because if there are

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1 disagreements, they will surface at this level.

2 So, okay, let's try to finish then by 3:30 or  
3 3 -- a little after that.

4 MR. CUNNINGHAM: Just to clear my own mind, if  
5 we finish the rate -- the 1061 discussion early, are we  
6 still kind of bound to start the SRP discussion after  
7 lunch or --

8 CHAIRMAN APOSTOLAKIS: That I will defer to  
9 Mike.

10 MR. MARKLEY: You shouldn't start the SRP  
11 discussion earlier than what you've set up but that  
12 doesn't mean you can't finish it early.

13 CHAIRMAN APOSTOLAKIS: We can discuss issues,  
14 right?

15 MR. MARKLEY: Yes, sure.

16 CHAIRMAN APOSTOLAKIS: Now you came to my  
17 favorite subject.

18 MR. CUNNINGHAM: I was going to say that I  
19 don't think there is anything on this slide that wasn't  
20 discussed with the Committee before, so just move on.

21 CHAIRMAN APOSTOLAKIS: Yes, but I think I've  
22 always made comments that I'm a bit uncomfortable with  
23 this because I understand where you are coming from  
24 because defense in depth has been the cornerstone of  
25 reactor safety and we are not about to abandon it. But my

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1 concern is that it may be used as an excuse to really  
2 defeat any benefits we may derive from risk informed  
3 regulation.

4 I'm not saying that that will happen, but it  
5 may be used that way because somebody may argue on the  
6 basis of PRA that something makes sense, and the reviewer  
7 agrees and then he says but in the name of defense in  
8 depth, I really would like you to do this anyway, or I  
9 don't want you to do it, whatever the case may be.

10 So, I put my thoughts on paper. So can I read  
11 to you something that may be, if it was there I would not  
12 object?

13 MR. HOLAHAN: I have no objection to your  
14 readings, I just --

15 CHAIRMAN APOSTOLAKIS: Okay, so this probably  
16 would go to Section -- actually it goes to several places.  
17 It would go to page 2-5 of the reg guide, but also you  
18 have a very nice discussion of various uncertainties  
19 later, so the same thoughts might go to 2-9 and 2-10 and  
20 so on. But we will come to that.

21 So basically this is what I thought would  
22 prevent what I mentioned.

23 In implementing the defense in depth  
24 principle, it is important to consider the degree to which  
25 the model is used in the engineering analysis (both

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1 probabilistic and mechanistic) include important phenomena  
2 or specific features of plant design and operation.

3 I think I have to change the words here. There  
4 is no pride here. This was written on the airplane.

5 Examples of phenomena or impacts that are not  
6 in general modeled are the detrimental effects of frequent  
7 testing, the impact of smoke on operators and equipment  
8 during a fire, and general organizational factors.  
9 Examples of relatively crude models are the various  
10 parametric models for common cause failures, those for  
11 post initiating event human actions and the models for the  
12 occurrence of fires in various plant compartments.

13 When the relevant phenomena or plant features  
14 are modeled reasonable well, traditional defense in depth  
15 should play a minimal role. All the information that is  
16 needed for decision making is in the relevant probability  
17 distributions (location and spread).

18 When important phenomena or plant details are  
19 not modeled well, however, traditional defense in depth is  
20 important. In particular -- and then I would go to the  
21 list that Mark has up there and I would use everything  
22 except the first one, the last five bullets.

23 So, that makes it clear and it's in the same  
24 spirit as in your discussion later of parameter and model  
25 and certain incomplete uncertainty that there are certain

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1 rules when one applies defense in depth. I mean if you  
2 are dealing with something that is not modeled well in the  
3 PRA, then you would expect defense in depth to play a more  
4 significant role. You may have programmatic requirements  
5 and so on and so on.

6 But if everything you are dealing with is in  
7 the PRA, then you look at the probability distributions.  
8 If they are very broad, for example, you may not like it.  
9 And then you may require something. Right? If the  
10 uncertainty is very large. But I wouldn't want to always  
11 look at defense in depth when I have a good probability  
12 model. Do you have a comment Wayne?

13 MR. HODGES: I personally would have a very  
14 large problem with that.

15 CHAIRMAN APOSTOLAKIS: Why?

16 MR. HODGES: Because basically you are trading  
17 uncertainty for defense in depth and I don't think they  
18 are there for the same reasons.

19 CHAIRMAN APOSTOLAKIS: No, I said both  
20 location and uncertainty. If you don't have what the  
21 first bullet says there. If you don't have a reasonable  
22 balance. If you don't have the third bullet, redundancy,  
23 independence and so on, then your probability numbers will  
24 be fairly high because that's how you go to low numbers,  
25 because you have redundancy and you have independence and

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1 so on. So that will raise a flag immediately that  
2 something is wrong.

3 So I don't have to consider a separate  
4 principle, defense in depth, when I consider these things.  
5 By looking at the results I will say, "Gee, this is a  
6 number that's very high." And already the goals are taken  
7 care of. You will not find a core damage frequency that's  
8 less than  $10^{-4}$  or  $10^{-5}$  if you don't have redundancy. If you  
9 have single element cut sets or single events, chances are  
10 that your frequency will be very close or even higher than  
11 the goal.

12 So we are repeating a lot of things. I mean,  
13 a lot of the stuff, the ideas that you have here are  
14 already in the safety goals. So I don't have to repeat  
15 them. Where this becomes important is when the PRA either  
16 does not model things or it does so very poorly and then I  
17 can see, you know, the stuff coming back and saying, "Yes,  
18 but we would like you to have this program in place or do  
19 this or do that."

20 MR. KING: I guess I'm bothered too. You go  
21 first.

22 MR. HOLAHAN: Let me try my -- What I would  
23 suggest is rather than say you use defense in depth in  
24 those cases where the PRA doesn't come from the subject  
25 matter. I'd be more comfortable in saying you achieve

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1 reasonable defense in depth either demonstrated through  
2 the PRA analysis or alternatively through the engineering  
3 analysis. If you could construct the argument that way I  
4 would be more comfortable. But that would lead me to  
5 leaving in the first bullet

6 CHAIRMAN APOSTOLAKIS: I -- in principle I  
7 would agree with what you said. It would depend now on  
8 how the words are put together. But I think that's fine.

9 I guess my main message here, if there is a  
10 message, is that the safety goals do take care of the  
11 first bullet. I mean you do have a subsidiary core on  
12 core damage frequency and a LERF. So it seems to me there  
13 is a reasonable balance among prevention.

14 MR. HOLAHAN: What it doesn't cover is suppose  
15 core damage frequency is  $10^{-6}$  --

16 CHAIRMAN APOSTOLAKIS: Yes.

17 MR. HOLAHAN: And LERF is  $10^{-6}$  --

18 CHAIRMAN APOSTOLAKIS: Oh, you mean because of  
19 that --

20 MR. HOLAHAN: That's right.

21 CHAIRMAN APOSTOLAKIS: Okay, I agree with  
22 that. I agree with that.

23 MR. HOLAHAN: I think you control the total  
24 but you don't control the distribution of the pieces.

25 CHAIRMAN APOSTOLAKIS: Yes, you are absolutely

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1 right. So, I don't object to the concept. What I'm  
2 saying is I can do these things in the context of a PRA --

3 MR. HOLAHAN: Yes.

4 CHAIRMAN APOSTOLAKIS: And we have discussed  
5 in the past various approaches like --

6 MR. HOLAHAN: Yes.

7 CHAIRMAN APOSTOLAKIS: Some people are saying  
8 if you have a certain goal, say core damage frequency of  
9  $10^{-4}$ , that should be more or less evenly spread out among  
10 the principle contributors. That's one possibility.

11 Or, there are certain established standards  
12 for the unavailability of certain functions so you  
13 shouldn't really deviate that much. So we are going  
14 beyond what the goals are saying.

15 I would rather see statements like that than  
16 going back and saying defense in depth because that's a  
17 deterministic -- a traditional deterministic --

18 MR. HOLAHAN: But it doesn't have to be.

19 CHAIRMAN APOSTOLAKIS: It doesn't have to be  
20 but -- can we get a little more guidance? That's all I'm  
21 saying.

22 MR. HOLAHAN: Okay, perhaps we -- a  
23 little more guidance. I think we've already -- a fair  
24 distance. I think if you turn the clock back a year or  
25 two and talk to people about defense in depth, they would

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1 talk about, you know, cladding and reactor coolant system  
2 and containment. And here if you look at the bullets on  
3 this slide we are talking about defense in depth in a much  
4 more probabilistic arena. So I think we've already moved  
5 off that point.

6 I could see your concern that there is some  
7 danger of the staff being unwilling to change because of,  
8 not necessarily the principle of defense in depth, but the  
9 engineering implementation of it in the past. Say, I need  
10 two somethings and I'm not willing to change my view.

11 I think we can construct a guidance document  
12 and even provide cautions to the staff about not being too  
13 insistent on the engineering aspect of defense in depth  
14 where a probabilistic provides adequate, usually a better  
15 story.

16 But I'd like to construct that guidance within  
17 the guidance of defense in depth as opposed to an  
18 alternative to it.

19 MR. JONES: I think, George I guess we did  
20 bring in words on page 2-5 talking about use of risk  
21 analysis --

22 CHAIRMAN APOSTOLAKIS: Yes.

23 MR. JONES: -- to support the guidelines. We  
24 are trying to recognize licensees will do that and even a  
25 more direct comment on the use of PRA and its review of

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1 defense in depth on pages 8 and 9 of the SRP. So that  
2 we've tried to recognize that we can and should in fact  
3 use the PRA to look at defense in depth and look at those  
4 aspects.

5 CHAIRMAN APOSTOLAKIS: Well --

6 MR. JONES: So we have tried to de-emphasize -  
7 -

8 CHAIRMAN APOSTOLAKIS: I understand that.

9 MR. JONES: -- engineering.

10 CHAIRMAN APOSTOLAKIS: I understand that. The  
11 lines that I just read would go somewhere between lines 34  
12 and 36 on page 2-5.

13 I suppose if there was some discussion similar  
14 to the discussion that you have on types of uncertainty  
15 and methods of analysis and comparison with acceptance  
16 guidelines, something like that would be a discussion of  
17 what is the role of defense in depth in a probabilistic  
18 context? And that this is not a separate idea.

19 To repeat myself. You will not get the low  
20 frequencies that we are talking about if you don't have  
21 system redundancy, if you don't have system diversity, if  
22 you don't have defenses against common cause failures. I  
23 mean all that should be reflected in the probability  
24 distributions that you get. It's not something different.  
25 I don't think you will get  $10^{-5}$  if you don't have that

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1 step. I mean, except of course with the vessel.

2 MEMBER POWERS: George, I guess I'm a little  
3 confused because it seems to me that if you take that  
4 point of view that on all these bullets on this slide,  
5 guidelines for maintaining defense in depth, the only one  
6 you would leave is the first one.

7 CHAIRMAN APOSTOLAKIS: After Gary's comment I  
8 would include it. I'm not sure it's the only one.

9 MEMBER POWERS: I mean, what you are saying is  
10 that the remaining five are reflected in the PRA.

11 CHAIRMAN APOSTOLAKIS: No, let me tell you,  
12 for example, what I just tried. That certain things are  
13 not -- are modeled in a crude way in a PRA. The impact of  
14 programmatic activities, in my opinion, is not modeled  
15 explicitly.

16 MR. ABBOTT: Let's try and examine --

17 CHAIRMAN APOSTOLAKIS: I would keep the second  
18 bullet. Because if somebody comes to me and says "This  
19 probability is  $10^{-4}$  because I have these programs in place"  
20 I will not believe that. So then I would invoke defense  
21 in depth and say "Gee, I need something else as well. I  
22 don't believe this number."

23 MEMBER POWERS: But I mean as well -- it seems  
24 to me that there, you get into problems here very quickly  
25 with that kind of approach. Because you say, okay, this

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1 is modeled crudely. I'm willing to attest that every  
2 single model in a PRA is crude to somebody. Okay? Then  
3 you come in and you say an over reliance -- is that an  
4 over reliance when it's  $10^{-4}$  or is it over reliance when  
5 it's  $10^{-5}$  or  $10^{-6}$  or  $10^{-8}$ ? At what point is reliance an over  
6 reliance?

7 MR. HOLAHAN: Well, I don't know if it makes  
8 you feel more or less comfortable, but you may notice that  
9 one of the words in this area that we changed from the  
10 last to the current version of the reg guide, is we took  
11 out the modifier. I think it used to say adequate defense  
12 in depth. And then we didn't like adequate and we said  
13 sufficient defense in depth. And then we decided to take  
14 off that word completely with the feeling that defense in  
15 depth is a principle and it's a quality more than a  
16 quantity. And you can't quite measure how much you've  
17 got, you just know when it's not there.

18 MEMBER POWERS: Well, the statement will be  
19 meaningless to you, I know, but it will mean something to  
20 the members. You are moving to the structuralist point of  
21 view and away from the rationalist point of view.

22 CHAIRMAN APOSTOLAKIS: That makes you very  
23 happy, does it not?

24 MEMBER POWERS: It certainly makes me happy.

25 MR. ABBOTT: Okay, can we just try an example

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1 here which I think connects with what George is saying.  
2 If a licensee came in with a change to allow outage time  
3 in the diesel generators and one of the key elements in  
4 all this is all the stuff you listed here and all the  
5 expectations, he is going to SALP 3 across the board.  
6 What would you do?

7 MR. HOLAHAN: I probably wouldn't process it.

8 MR. ABBOTT: Why?

9 MR. HOLAHAN: Because I probably didn't feel  
10 good about, well, it -- I might not feel good about all  
11 those programs that are underlying all of the assumptions  
12 in the analysis.

13 MR. ABBOTT: So he is not meeting one of your  
14 expectations but the expectation in operations is not  
15 listed. Nor is it anywhere in the guidelines on defense  
16 in depth, except for the last bullet on the page that's up  
17 there where the defense against human errors are  
18 maintained. So, you know, I'm not sure where the human  
19 performance comes in.

20 CHAIRMAN APOSTOLAKIS: But that comment though  
21 could be accommodated in the framework I'm discussing  
22 because then you could say --

23 MR. HOLAHAN: I think so -- it's in the gray  
24 region. It's in the gray region.

25 CHAIRMAN APOSTOLAKIS: But it's also an issue

1 that's not modeled in the PRA, at least not explicitly.

2 MR. HOLAHAN: Yes, yes.

3 CHAIRMAN APOSTOLAKIS: I mean there is always  
4 some influence. So you might argue on the basis of that.  
5 But I really don't believe the numbers you are giving me.  
6 I think the numbers are really higher, therefore go back  
7 and do a better job.

8 MR. ABBOTT: Yes. I think you can argue that  
9 that's in the, when you look at the decision criteria, the  
10 completeness issue and how comfortable you feel about a  
11 licensee from its performance, may have bearings on the  
12 decisions. And that's why, again, the gray area in the  
13 decision.

14 CHAIRMAN APOSTOLAKIS: That's correct.

15 MR. ABBOTT: That's not included in any of the  
16 stuff in here.

17 MR. JONES: Well, it's in Section 2-4 on  
18 dealing with the risk assessment in the risk area.

19 MR. HOLAHAN: I think you simplified the  
20 question and I simplified the answer. But I think there  
21 probably would be cases in which we would process the  
22 amendment. I mean if we thought it were part of the  
23 licensees, you know, improving their performance, you  
24 know, in some way, reduce unnecessary testing and have  
25 them focus their attention on other things where they

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1 really need to put attention. Then, probably, you know,  
2 we would welcome it.

3 MR. KING: Let me back up. I think your point  
4 is covered directly. If you go back to March slide page  
5 7, the first bullet, it says the analysis should be based  
6 on the as built, as operated and maintained plant. And  
7 that's one of our expectations. And if somebody has got a  
8 Cell 3 it ought to be, you know, his equipment performance  
9 is probably low, his human operator performance is  
10 probably low, and the idea is that ought to be reflected  
11 in his analysis. He will come in with some optimistic --

12 MR. ABBOTT: Okay, I mean that may be true. I  
13 mean, you are referring to the phrase "as operated" then?

14 MR. KING: Yes.

15 CHAIRMAN APOSTOLAKIS: By the way, when I  
16 wrote what I read I had not reached page 2-8, okay? So  
17 that was written independently.

18 But it seems to me the three types of  
19 uncertainty that you are talking about on page 2-8 and 9,  
20 parameter, model and completeness cover more or less what  
21 I just said. Maybe I talked about crudeness of models and  
22 so on, you can find the right words. But how about this  
23 idea? Instead of discussing these types of uncertainty  
24 late meaning page 2-8, modify this discussion a little bit  
25 to include some of the points that I made and then move it

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1 up. And then base all your discussion on defense in  
2 depth, and I think similar comments apply to safety  
3 margins.

4 Place all that discussion and the requirements  
5 and so on, the guidelines, in that context because that's  
6 really a driver. If somebody submits a PRA or a part of a  
7 PRA, you know, relevant to the issue at hand, which  
8 suffers seriously from completeness problems, then that  
9 certainly is handled in a different way. And then I can  
10 see defense in depth really playing a very significant  
11 role there.

12 If on the other hand, even though, you know,  
13 Dana has a point in some beholder's eyes and the model may  
14 not be complete or as perfect as we would like, but you  
15 know, if there is a general agreement that certain events  
16 and phenomena are modeled in a reasonable way, then I  
17 would take the same thoughts that you have here, but  
18 convert them to a probabilistic argument. And as I say,  
19 you know, it's the location of the distribution, the  
20 uncertainty that you have and you can't really make  
21 general recommendations in advance.

22 Because, for example, you may have a very  
23 broad distribution like I think we usually get in the  
24 seismic area, which is way down there,  $10^{-9}$ , right? It  
25 goes from  $10^{-12}$  to  $10^{-7}$ , it's very, very broad. But the

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1 whole vocation is such that you really don't worry too  
2 much about it.

3           For example, let's go to bullet 4, defenses  
4 against potential common cause failures are maintained.  
5 Again, I mean, if the PRA has done a reasonable job on  
6 common cause failures, then all these defenses have  
7 a'ready been modeled. So, all you have to do is convince  
8 yourself that the numbers you get there make sense.  
9 Right? It's built into the PRA. Is there a reason to  
10 have a separate statement that defenses should be  
11 maintained?

12           MR. JONES: I'll give you an example, George,  
13 in the area of graded QA. Okay? Graded QA has a  
14 potential for causing common cause failures across many  
15 systems, as you reduce the controls. We don't know how  
16 necessarily to model.

17           CHAIRMAN APOSTOLAKIS: But you confirm my  
18 point. That's probably the area where PRA will play the  
19 least role. Correct?

20           MR. JONES: And -- well, at this point it  
21 plays some role, but it's mostly in a ranking. We are  
22 maintaining --

23           CHAIRMAN APOSTOLAKIS: It's ranking, exactly.

24           MR. JONES: Recognizing that ranking is the  
25 primary way we are dealing with graded QA to identify

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1 what's more important than not, but we also recognize that  
2 this is an area we need to be consciously considering as  
3 part of the overall engineering analysis. So we are not  
4 saying that this area, defense in depth or safety margins,  
5 or even the probabilistic LERF CDF criteria, they are all  
6 concepts if you will. How you meet those concepts,  
7 whether you do it with traditional engineering for PRA, or  
8 more than likely a combination thereof, that's what we  
9 expect you do to and to integrate those findings.

10           So, if your PRA is weak you should probably  
11 supplement it much stronger with traditional engineering  
12 concept. If your PRA is very strong, we will look at  
13 maybe some of these traditional engineering concepts, or  
14 licensees should, and do some balances to the decision  
15 making process, balancing both of those issues. But the  
16 concept of defense in depth we expect to still be  
17 fundamentally maintained. How you demonstrate you met it  
18 is subject to whatever engineering analysis technique you  
19 choose to play.

20           CHAIRMAN APOSTOLAKIS: And I would be very  
21 happy to see statements to that effect, explicit  
22 statements in the report. Judging from what you just  
23 said, I don't think we disagree. It's just that the  
24 presentation, the way it is now, really presents defense  
25 in depth as, you know, this deterministic thing that is

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1 outside the PRA.

2           And all I'm saying is plant it the way you  
3 just said. But the graded quality assurance I think is a  
4 good example because that's an example where you use some  
5 PRA results, as you say, in ranking the components, but  
6 you know very well that quality assurance is not modeled -  
7 - I mean what we call quality assurance is not modeled  
8 very well in the PRA. So you really have to resort to --  
9 but again, don't forget that you are really creating  
10 history here and what you put on paper here will be used  
11 by others in the future.

12           A good example is the steam generator rule  
13 that we reviewed a month or so ago where there were, there  
14 was a number of programmatic requirements stated there and  
15 it was not clear to the committee why they were there.  
16 And, I mean, if it's a performance based rule, then you  
17 have to have some rules as to when you impose these  
18 requirements. I mean, you can't have it both ways.

19           And that's why I really want a more explicit  
20 statement here. I know it's not going to be the  
21 definitive statement, but at least we are getting there,  
22 you know. Because, just to repeat one small -- it seems  
23 to me that the way it's stated now, even though the intent  
24 may not be that, these guidelines can be used by someone  
25 to defeat all the probabilistic analysis. Let's say,

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1 okay, your PRA is fine but I really want you to do this in  
2 the name of defense in depth. And this document allows  
3 them to do it.

4 And my point is that we will restrict that  
5 freedom a little bit if we say, you know, but PRA itself  
6 has elements of it already. That's all.

7 MR. KING: All right. Why don't we take a  
8 commitment to expand the write-up on 2-5 along the lines  
9 that PRA information could be used to help interpret the  
10 scope and depth of defense in depth that's needed.  
11 Something along those lines.

12 CHAIRMAN APOSTOLAKIS: And some of the  
13 thoughts that you have on pages 2-8, 9 and 10 regarding  
14 completeness. I would add something about the crudeness  
15 of the models, their sensitivity to certain things, I mean  
16 -- you did make the statement, and I agree with it, that  
17 you should model the plant as built, operated and  
18 maintained. And what if the details there are not  
19 explicit parameters in the PRA, that's for sure, right?  
20 So you bring in additional principles like good  
21 engineering practice for example, I mean, but you guys  
22 don't want to talk about that.

23 So that's all the point I'm making. And that  
24 applies also to, as I said, to safety margins because I  
25 think they are also -- although you do say there more

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1 explicitly. You say risk assessment methods are expected  
2 to be adequate for evaluating many safety margins. So  
3 that really takes care of my concern. On Line 16.

4 MR. HOLAHAN: Okay.

5 MR. CUNNINGHAM: Since we've kind of moved  
6 into the safety margins, I'll just put this up. This is  
7 the two basic elements of the guidelines --

8 MEMBER FONTANA: Before you do that, I don't  
9 know if this is the proper place to bring this up. On  
10 page 2-11, line 21, it says if just a level one PRA is  
11 available, in general only the CDF is calculated and not  
12 the LERF. The approach is presented in Appendix C, which  
13 we don't have, which allows a subset of the core damage  
14 accidents identified in level one to be allocated to  
15 release category that's equivalent to the LERF.

16 The last time we looked at this we were kind  
17 of skeptical. Has this been changed or can we get another  
18 shot at it or -

19 MR. CUNNINGHAM: You'll get another -- it has  
20 not been changed. You'll get another shot at it at the  
21 subcommittee meeting in February. We figured that would  
22 be the place to talk about it.

23 MEMBER FONTANA: Okay.

24 MR. CUNNINGHAM: If nobody has anything else  
25 to say about safety margins, we will move on to the risk

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1 impact discussions.

2           This slide and the next slide cover basically  
3 the characterization of the acceptance guidelines from a  
4 more probabilistic standpoint. Basically the types of  
5 things that Tom talked about earlier that you have a  
6 region, and if we had a figure we'd see this clearly. But  
7 anyway, if you have a region that if core damage frequency  
8 is at or above  $10^{-4}$  per year where LERF is at  $10^{-5}$  per  
9 reactor year, we'd expect that applications would result  
10 in either a net decrease in risk or would be risk neutral.

11           CHAIRMAN APOSTOLAKIS: On page 2-7, it's not  
12 on your slide, but on page 2-7, line 20, you are saying a  
13 large early release frequency range rather than a single  
14 value of  $10^{-5}$  to  $10^{-6}$  per reactor year has been adopted as a  
15 containment performance guideline. And if you read the  
16 acceptance guidelines that you have there, you are really  
17 using  $10^{-5}$  as the performance level. Okay  $10^{-5}$  for LERF  
18 plays the role of  $10^{-5}$  for CDF, isn't it true?

19           MR. JONES: That's true. But what is  
20 different, unlike LERF, we are defining, I mean unlike the  
21 CDF and LERF between  $10^{-6}$  and  $10^{-5}$  plants a baseline LERF  
22 for those value will get the increased management  
23 attention and scrutiny on making the changes. And that's  
24 why we are saying it has a range.

25           We don't have a similar range in CDF. The CDF

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1 is kind of above  $10^{-4}$ , that's not acceptable. Below  $10^{-4}$   
2 that the evaluation of whether or not you need increased  
3 management attention is based on the delta, not the  
4 baseline. In LERF space --

5 CHAIRMAN APOSTOLAKIS: No, no, you do have a  
6 range from  $10^{-4}$  to  $10^{-5}$  where you have increased management  
7 attention, don't you?

8 MR. KING: Yes, yes, we do.

9 CHAIRMAN APOSTOLAKIS: So that's what I'm  
10 saying that really  $10^{-6}$  is treated  $10^{-5}$  for LERF plays  
11 exactly the same role as  $10^{-4}$  for CDF.

12 MR. HOLAHAN: Yes.

13 CHAIRMAN APOSTOLAKIS: So line 20 and 21  
14 really are not needed.

15 MR. KING: Yes, I think the word range is a  
16 holdover from some earlier versions.

17 CHAIRMAN APOSTOLAKIS: Okay.

18 MR. KING: And I noticed that when I was  
19 reading it as well.

20 CHAIRMAN APOSTOLAKIS: Okay.

21 MR. ABBOTT: I have a question. Let me get  
22 this straight. If I have a plant that's an order of  
23 magnitude above the CDF and an order of magnitude above  
24 the LERF, the licensee is not required at my plant, say I  
25 own the plant and I operate it, I'm under no obligation to

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1 you to reduce that.

2 MR. HOLAHAN: Right.

3 MR. ABBOTT: All you are going to do is stick  
4 another resident manager in my face.

5 MR. HOLAHAN: Well, no we are doing more than  
6 that, but --

7 MR. ABBOTT: Okay, what would you do?

8 MR. HOLAHAN: In the context, first in the  
9 context of these documents and the license amendments, we  
10 would expect you not to be making the situation to be  
11 increasing the risks. We would be looking for things that  
12 reduce risk.

13 In addition to that, we have a program to look  
14 at the IPE results and we are going to start with the  
15 IPEEE results, you know, when that report on all of those  
16 is complete. And we are going to look through those for  
17 high values of CDF, high values of our LERF or other  
18 things that might look like outliers to decide why it is  
19 that your values are high --

20 MR. ABBOTT: Okay.

21 MR. HOLAHAN: -- and consider the possibility  
22 of backfitting requirements you know based on cost  
23 justified rules, 50.109. So, you are right, as a licensee  
24 you wouldn't have any obligation to do anything. But it  
25 doesn't mean that we would be ignoring the results of that

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1 analysis.

2 CHAIRMAN APOSTOLAKIS: Now, again, as a point  
3 of clarification. When you start talking about the  
4 acceptance guidelines, would it be useful to have a  
5 paragraph there explaining what the  $10^{-4}$  CDF and the  $10^{-5}$   
6 LERF are? And these are the issues that have been raised  
7 in the past.

8 For example,  $10^{-4}$  is supposed to include all  
9 modes, shutdown, low power. And I think once you  
10 mentioned Gary that it's supposed to refer to the things  
11 that we have quantified or can quantify. Or is it an  
12 absolute measure so I have to make an allowance for things  
13 that I have not quantified?

14 And then there is the issue of the so-called  
15 instantaneous risk. Can you go above this? This is an  
16 average per year. What kind of an average is it? I mean,  
17 can you tolerate a  $10^{-2}$  for a day? You may very well say  
18 that these are issues that will be addressed in a later  
19 document, but I think we need an explanation of the  $10^{-4}$   
20 and  $10^{-5}$ . That is sort of a time average?

21 MR. HOLAHAN: Yes.

22 CHAIRMAN APOSTOLAKIS: But what does that  
23 mean? I mean that for short periods of time you can shoot  
24 up to the sky?

25 MR. HOLAHAN: Yes.

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1 CHAIRMAN APOSTOLAKIS: Yes? Did you say yes?

2 MR. HOLAHAN: Yes, well, I'm not sure about  
3 shoot up to the sky since I'd rather you didn't quantify  
4 shoot up to the sky. But it says our guideline is based  
5 on the average effect which, you know, in your example  
6 would be the integral under the shooting up to the sky.

7 MEMBER KRESS: So in effect it does include it  
8 and places limits on it?

9 MR. HOLAHAN: Well, it would include it, but  
10 it would include the integral effect and not the  
11 differential value.

12 MEMBER KRESS: In essence, that means that it  
13 places limits on it.

14 CHAIRMAN APOSTOLAKIS: Sure, but can I live  
15 with a  $10^{-4}$  core damage frequency for five hours?

16 MEMBER KRESS: You are questioning it  
17 appropriately places --

18 CHAIRMAN APOSTOLAKIS: Yes, yes, that is  
19 exactly what I am saying.

20 MR. HOLAHAN: In practice, I think the other  
21 guidelines prohibit those kinds of situations. Because in  
22 order to have that kind of situation you not only have to  
23 have removed defense in depth and most of your safety  
24 margin, but you have to have imminent initiating event.

25 CHAIRMAN APOSTOLAKIS: Yes, you do mention

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1 somewhere else that safety function should not be lost in  
2 how you set up the performance criteria.

3 MR. KING: No, we have intentionally decided  
4 at this point not to include the limits on temporary  
5 changes in risk. But we have put into the statement of  
6 considerations that we are going to solicit comment on  
7 whether such guidelines should be included and what they  
8 ought to be.

9 In NEI's document of last year did propose  
10 some guidelines for temporary changes.

11 CHAIRMAN APOSTOLAKIS: All I am saying is that  
12 -- you don't necessarily have to have the answers now.  
13 But should there be a few lines there between 21 and 23,  
14 page 27, explaining the situation, that  $10^{-4}$  is the time  
15 average. There may still be some open issues that may be  
16 addressed later.

17 MR. HOLAHAN: We should certainly define what  
18 it is that we mean. I don't know that we need to go  
19 further. This document doesn't need to be the place where  
20 we lay out thoughts of what might be done later.

21 CHAIRMAN APOSTOLAKIS: Yes.

22 I have one more comment on this.

23 MR. HOLAHAN: Yes?

24 CHAIRMAN APOSTOLAKIS: Would you object to  
25 changing the second of the last three bullets, the

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1 parenthesis. Instead of i.e. put e.g.? That is along the  
2 spirit of flexibility and not being over prescriptive.

3 For example, less than  $10^{-6}$  is small, but that  
4 does not commit what I call small. So rather than say  
5 i.e., say e.g. You don't have to decide now; it is just a  
6 suggestion.

7 MR. HOLAHAN: I don't know.

8 CHAIRMAN APOSTOLAKIS: That is what I am  
9 saying. Don't answer now. I am a Bayesian, I used your  
10 past performance. You don't have to make a decision now.

11 MR. HOLAHAN: Yes, sir.

12 CHAIRMAN APOSTOLAKIS: It is just a  
13 suggestion.

14 MR. HOLAHAN: You probably don't want me to  
15 make a decision now because it would probably be i.e.

16 CHAIRMAN APOSTOLAKIS: Now, as a point of  
17 clarification, when you say in the last bullet, subject to  
18 increased NRC technical and management review, is that  
19 increased technical and management review part of the  
20 monitoring program?

21 MR. HOLAHAN: No. It could have some element  
22 of that to it. But it could also have additional staff  
23 and management review before the license amendment was  
24 issued.

25 CHAIRMAN APOSTOLAKIS: Okay.

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1 MR. HOLAHAN: But logically, because it would  
2 come in close to the safety goal or because the change was  
3 relatively large, it might be one that is appropriate for  
4 additional, stricter monitoring as well.

5 CHAIRMAN APOSTOLAKIS: Okay.

6 Do we need to mention at all the corresponding  
7 changes in the QHOs or do you think that is unnecessary?

8 In other words, when you say that the core  
9 damage frequency changes by this much -- you don't need  
10 to? Okay.

11 MR. CUNNINGHAM: I think we have defined it  
12 more in the sense of, if you do this you will have an  
13 insignificant increase in public risk.

14 CHAIRMAN APOSTOLAKIS: Okay. That's fine.  
15 That's fine.

16 MR. CUNNINGHAM: Move on to -- this is the  
17 follow-on aspect that we have talked about a little bit.  
18 That there is an in between region, if you will, in LERF.

19 CHAIRMAN APOSTOLAKIS: Is that a typo in your  
20 third bullet? The result in an increase in the calculated  
21 LERF of up to  $10^{-6}$ . Shouldn't that be  $10^{-5}$ ?

22 MR. JONES: It's  $10^{-6}$ , that is correct.

23 MR. KING: You have to read it very carefully  
24 when you read it in the reg guide.

25 MR. CUNNINGHAM: Yes, it is. Remember we

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1 wanted changes in small increments, so we are saying that  
2 if the LERF is  $10^{-5}$ , the delta should be no more than 10  
3 per cent of that for a given change. So that is why it is  
4  $10^{-6}$ .

5 MR. CUNNINGHAM: And then the analog down  
6 there is  $10^{-7}$ .

7 MEMBER KRESS: See figure.

8 MR. CUNNINGHAM: See figure, yes.

9 LAUGHTER

10 CHAIRMAN APOSTOLAKIS: So, this is the delta  
11 LERF. The  $10^{-6}$  is the delta LERF?

12 MR. CUNNINGHAM: Yes, the increase in  
13 calculated LERF.

14 CHAIRMAN APOSTOLAKIS: Okay.

15 Now, again, the bullet before last, I would  
16 also suggest that i.e. becomes e.g.

17 MR. CUNNINGHAM: Suggestion noted, thank you.

18 MR. HOLAHAN: Yes, that would be consistent.

19 CHAIRMAN APOSTOLAKIS: That would be  
20 consistent.

21 MR. CUNNINGHAM: Yes, it would be consistent.

22 CHAIRMAN APOSTOLAKIS: And I originally  
23 thought that maybe a note on line 24, page 2-8, something  
24 like the following: 'The above numbers define approximate  
25 ranges and are not intended to be absolute criteria.'

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1           That would be appropriate, but then it may not  
2 be necessary in light of your discussion on page 2-9.

3           So, whether you want to put it there just to  
4 make sure that the message is clear, or not, is fine. But  
5 these numbers are not to be viewed as absolute go/no go  
6 criteria, but I think that message is on page 2-9.

7           MR. CUNNINGHAM: Yes.

8           CHAIRMAN APOSTOLAKIS: I really don't insist.

9           MR. CUNNINGHAM: Let's move on then.

10          The last two slides talked about there were a  
11 series of factors in the decision-making. The next two  
12 slides defines those factors.

13          As we talked before the quality of the  
14 analysis that needs to be performed varies with the  
15 magnitude of the change and how close the plants would be  
16 to the guidelines, the subsidiary goals.

17          CHAIRMAN APOSTOLAKIS: Are you skipping the  
18 discussion on the types of uncertainties now?

19          MR. CUNNINGHAM: No.

20          MEMBER SHACK: Defining certain factors.

21          MR. CUNNINGHAM: Yes, this is still with the  
22 acceptance guidelines. Page 12.

23          CHAIRMAN APOSTOLAKIS: And where is the  
24 discussion of uncertainties?

25          MEMBER SHACK: It's 2-7 and 2-8 in the reg

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1 guide.

2 MR. CUNNINGHAM: Yes, this is still part of  
3 the acceptance guidelines.

4 CHAIRMAN APOSTOLAKIS: Okay.

5 MR. CUNNINGHAM: So, as I was saying, the  
6 quality of the analysis varies with how large of an  
7 increase is estimated and how close the plants would be to  
8 the guidelines.

9 Related to that is the base CDF and the LERF  
10 of the plant.

11 A third consideration or factor is what has  
12 transpired for this plant in the past; looking for the  
13 cumulative impact of previous changes or you can think o  
14 fit in terms of their risk management program.

15 So, the history of what has occurred int his  
16 plant would be a factor in the decision-making in this  
17 gray region, if you will.

18 The next bullet is perhaps a long way of  
19 saying that as we are considering a relatively significant  
20 increase of risk in this gray region, one of the questions  
21 we would have in our mind is, if we were to allow this,  
22 would this be an issue that we would consider under the  
23 regulatory analysis guidelines as a possible backbit.

24 You don't want to get into a situation where  
25 we permit an increase that could potentially be turned

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1 around and require a backbit. So that is how the reg  
2 analysis guidelines fit into this.

3 MEMBER KRESS: If you've properly formulated  
4 your CDF and LERF acceptance criteria, doesn't that  
5 automatically account for that?

6 MR. CUNNINGHAM: It should. Where it gets  
7 tricky is in these regions of these LERFs of  $10^{-5}$  to  $10^{-6}$ .  
8 If you go back and look at the reg analysis guidelines  
9 matrix, you can see where there is some murkiness in some  
10 of those areas. It's unfortunate.

11 MEMBER KRESS: What you are saying here is you  
12 take this requested change and say you assume that this  
13 change was granted.

14 MR. CUNNINGHAM: Yes.

15 MEMBER KRESS: Now, let's go back and do a  
16 regulatory analysis to see if we required them to put it  
17 back like it was, would it pass the backbit.

18 MR. CUNNINGHAM: That is where this factor is  
19 and it is because some of the delta LERF changes, if they  
20 were up close to the  $10^{-6}$  range and you are base LERF was  
21 in the  $10^{-6}$ ,  $10^{-5}$  range, you might slide into corners, if  
22 you will, of the boxes in the reg analysis guidelines. It  
23 is a funny kind of situation.

24 MEMBER KRESS: There's a real problem there in  
25 that I don't think there is a one-to-one consistency

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1 between the backbit decision chart where you have the  
2 additional containment failure probability and the CDF. I  
3 don't think there is a one-to-one correspondence between  
4 that and this --

5 MR. CUNNINGHAM: That's right. That's part of  
6 the problem because you are right; there isn't a one-to-  
7 one correspondence.

8 MR. KING: I mean we tried to select values  
9 that kept you out of the backbit range. But, granted,  
10 they interface and the idea of this is when you get close  
11 to that, to look at it the other way. Is this something  
12 that we turn around and backbit.

13 MR. CUNNINGHAM: And we obviously don't want  
14 to get into that.

15 MR. KING: We don't want to do that.

16 MR. HOLAHAN: In the long run, if this reg  
17 guide is really establishing our philosophy on how to do  
18 risk-informed regulation, then I think we need to revisit  
19 the regulatory analysis guidelines.

20 MEMBER KRESS: I think that would be my  
21 recommendation. Make them consistent.

22 MR. CUNNINGHAM: Yes.

23 MR. HOLAHAN: Well, consistent in the sense  
24 that they are paired up properly.

25 MR. CUNNINGHAM: The next factor is does the

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1 proposed change in these gray regions have an impact that  
2 could increase the complexity of operations of the plant,  
3 does it add a burden to the staff and this type of thing.  
4 It is a factor that you don't want to add. Have a change  
5 that would add a great deal to what the operating staff  
6 has to do.

7           And then there is the kind of catch-all at the  
8 end of other plant-specific performance factors. We got  
9 into this a little bit ago. If a plant is SALP 3 was Mr.  
10 Abbott's example, how would that influence our decision  
11 whether or not some change would occur? In this gray  
12 region, this is where these types of things would come in.  
13 Not necessarily SALP factors, but what is the population  
14 density around the site, what the inspection is telling us  
15 about it, performance indicators, that sort of thing.

16           MEMBER KRESS: Would that middle bullet go  
17 both ways?

18           MR. CUNNINGHAM: Yes, absolutely. So that's  
19 the set of factors that would come into play in this gray  
20 region that we talk about in the acceptance guidelines.

21           This gets into the discussion of the  
22 uncertainties that are of concern.

23           A few moments ago, George, you talked about  
24 what was discussed in here, how you define the precision  
25 of those lines, if you will. There is, if you will, a

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1 reasonable assurance standard put on here, that we are not  
2 defining this as an absolute go/no go. There is a  
3 reasonable assurance aspect to it.

4 Then there are a couple of tests for  
5 reasonable assurance in the context of uncertainties. One  
6 is for the quantified uncertainties, the question comes  
7 into play, does the probability distribution that is  
8 associated with the change, do you have a low confidence  
9 that if you looked at the whole distribution that the  
10 decision would change?

11 If you have low confidence of the guidelines  
12 being met, that is a factor that you want to bring to bear  
13 here, that that may not provide reasonable assurance.

14 MEMBER POWERS: Do you have a sense of what  
15 low confidence is?

16 CHAIRMAN APOSTOLAKIS: A sense of what, Dana?

17 MEMBER POWERS: Of what low confidence is.

18 MR. CUNNINGHAM: At this point, I think there  
19 is a variety of opinions within the staff of what low  
20 confidence means. We talked about different things but  
21 didn't come to any particular consensus.

22 MR. KING: An earlier version had a numerical  
23 guideline for confidence level. We took it out because we  
24 didn't think it was appropriate to be that specific. Let  
25 the licensee come in and propose what he thinks is

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1 appropriate for the change.

2 MEMBER POWERS: And I think I agree with that.  
3 I really asked exactly, did you personally have a feeling  
4 for what low confidence is?

5 MR. CUNNINGHAM: I'm sure I do. I actually  
6 haven't thought much about it, but I am sure I do.

7 LAUGHTER

8 MR. CUNNINGHAM: That's not very helpful, I  
9 know.

10 MR. HOLAHAN: I think 50 per cent is low.

11 CHAIRMAN APOSTOLAKIS: So, we would want Joe  
12 Murphy; he is supposed to come and tell us.

13 MEMBER POWERS: That's all the specificity I  
14 am looking for. Because if you had told me that 95 per  
15 cent is adequate and anything less than that is low, that  
16 says something else about your mind set.

17 And my sense is that when you come out of a  
18 deterministic world into setting these things up for  
19 probabilistic, the deterministic world tended to demand  
20 higher levels of confidence.

21 MR. CUNNINGHAM: Yes, that is right.

22 MEMBER POWERS: You suddenly have to start  
23 thinking in terms of 50 per cent is low and 90 per cent is  
24 fantastically high.

25 MR. CUNNINGHAM: Yes, I think that is fair.

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1 MEMBER POWERS: That is what I was looking  
2 for.

3 MR. CUNNINGHAM: Yes, that is what I think my  
4 sense would be if I were to think about it a little bit.

5 MEMBER POWERS: I am not surprised. You  
6 haven't been in the deterministic world for a long time.

7 MR. CUNNINGHAM: Be that good or bad.

8 CHAIRMAN APOSTOLAKIS: Perhaps you should add  
9 here -- you are making the distinction between quantified  
10 and unquantified uncertainties. There is this gray area  
11 in between where some things are modeled very crudely.

12 They are part of the PRA but we all know that  
13 the level of sophistication is not there yet. People are  
14 still working on that.

15 So, that's in between.

16 MEMBER POWERS: Is the definition of things  
17 that are crude in a PRA those that people are still  
18 working one?

19 CHAIRMAN APOSTOLAKIS: Not necessarily.

20 MEMBER POWERS: Not necessarily.

21 CHAIRMAN APOSTOLAKIS: But that is certainly a  
22 good indication. If people are spending money on working  
23 on something that means that the existing models are not  
24 very well accepted. But there may be other areas where --

25 MR. CUNNINGHAM: The converse wouldn't

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1 necessarily be true.

2 CHAIRMAN APOSTOLAKIS: The converse is not  
3 always true.

4 MR. HOLAHAN: We may have already given up.

5 MEMBER POWERS: My concern is that when you  
6 focus on crude and non-crude, I still insist that all  
7 models in PRA are crude to somebody.

8 CHAIRMAN APOSTOLAKIS: Yes, but still, some  
9 things are cruder than others. An example is the dynamic  
10 human performance.

11 There is work that is going on now. We know  
12 that if somebody gives you a probability distribution or a  
13 probability number for the operators doing certain things  
14 during a post-initiating event, that that number is very  
15 suspect because it depends so much on what model the guy  
16 is using or who he is and so on. And that is not true for  
17 failure rates. In that sense there is a distinction.

18 MEMBER POWERS: I would bet that if you asked  
19 Tom about aerosol behavior in the containment that he  
20 would say that that number is very suspect, it depends a  
21 lot on who gave you that number, what model he was using.  
22 I think he would use the same words.

23 CHAIRMAN APOSTOLAKIS: Yes.

24 MEMBER FONTANE: Is the analogy here kind of  
25 like I can't define what crude is but I know it when I see

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1 it?

2 MEMBER POWERS: Yes.

3 CHAIRMAN APOSTOLAKIS: Yes, but even the  
4 definition of the failure rate; what goes into that? It  
5 is a class of potential failures but I don't think you  
6 will see any people disagreeing with the distribution of  
7 the failure rate that is derived using standard methods.

8 MEMBER POWERS: Yes.

9 CHAIRMAN APOSTOLAKIS: So, in my mind that is  
10 not a crude estimate.

11 Now, it is crude in the sense that you don't  
12 really know what the failure rate represents; it  
13 represents a class of failure modes, right?

14 MEMBER CATTON: Your data set is incomplete.

15 CHAIRMAN APOSTOLAKIS: But you do have data  
16 for a lot of components now. But you will never do better  
17 than that anyway.

18 MEMBER POWERS: I would say that people tend  
19 to say this estimate of failure rate is very crude because  
20 of the data base that you used. If you didn't use my data  
21 base, then his data base is crude. That's the kind of  
22 problem that you run into.

23 CHAIRMAN APOSTOLAKIS: Yes, but still if you  
24 look at the distinction of markers there, there are  
25 quantified and unquantified. But I think it is important

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1 to recognize that in between we have some models that are  
2 not as well accepted; there are shades of crudeness.

3 If somebody gives you a calculation that  
4 really involves only failure rates and maybe common cause  
5 failures and so on, using data bases that AEOD has  
6 developed and so on, you would feel a bit more comfortable  
7 than analysis that requires the modeling of recovery  
8 actions and things that happen in that world, after the  
9 initiating event.

10 MEMBER POWERS: My concern over crude is are  
11 you going to require these PRAs to come in and use the  
12 state of the art models?

13 CHAIRMAN APOSTOLAKIS: I think that as they  
14 state in the document, the analysis should be appropriate  
15 to the issue.

16 MR. HOLAHAN: Exactly.

17 CHAIRMAN APOSTOLAKIS: If you are requesting a  
18 change involves events of phenomena that requires  
19 sophisticated analysis, then so be it. Otherwise, I would  
20 say no, you didn't convince us.

21 So, I don't think we can make a statement in  
22 advance to do state of the art or something cruder. Page  
23 2-9 makes that very clear

24 MR. HOLAHAN: Right.

25 MEMBER CATTON: This really brings out the

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1 importance of the peer review, doesn't it?

2 CHAIRMAN APOSTOLAKIS: I mean doesn't that  
3 apply to other fields like thermal hydraulics?

4 MEMBER CATTON: Of course not; we don't do  
5 anything crudely.

6 MEMBER POWERS: There's just wrong BUT NEVER  
7 crude.

8 LAUGHTER

9 MEMBER CATTON: We can always CFD it and  
10 everybody's impressed.

11 MR. CUNNINGHAM: I was just thinking, looking  
12 at the slide, that one possibility to deal with your  
13 point, is the bullet that is the choice of modeling  
14 assumption does not overly bias results, that may be  
15 applicable for some of the quantified uncertainties as  
16 well.

17 CHAIRMAN APOSTOLAKIS: Yes.

18 MR. CUNNINGHAM: That may be a way of dealing  
19 with that.

20 CHAIRMAN APOSTOLAKIS: The problem is that you  
21 don't know which way it biases them.

22 MR. CUNNINGHAM: Yes.

23 CHAIRMAN APOSTOLAKIS: Of course if it biases  
24 it toward the highest side, we are happy.

25 MR. CUNNINGHAM: Yes.

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1 CHAIRMAN APOSTOLAKIS: But we don't know in  
2 many instances.

3 MEMBER POWERS: I don't know that you need to  
4 glibly say that biasing things high makes you happy.

5 CHAIRMAN APOSTOLAKIS: No, I don't want to say  
6 that. But at least the concern is not the same is it?  
7 You are not as concerned when you know that what you have  
8 is conservative.

9 MEMBER POWERS: I get very nervous because I  
10 think there are probably things that I need to be very  
11 concerned about that I don't know about.

12 CHAIRMAN APOSTOLAKIS: Now, if I can make a  
13 couple of detailed comments on page 2-8 and 2-9, this  
14 seems to be the appropriate time.

15 On 2-8, I think there is an exaggeration on  
16 lines 40 through 43.

17 "It is straight forward that within the  
18 capability of most PRA codes the propagated distribution  
19 representing the uncertainty on the basic parameter values  
20 could generate a probability distribution from the  
21 results. This is in fact the only true way of generating  
22 a mean value of the CDF."

23 Well, I think that is too strong. I can  
24 propagate the moments, can't I in a rigorous way and get  
25 the mean value.

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1 MR. PARRY: Have you tried to do that with  
2 30,000 cut sets?

3 CHAIRMAN APOSTOLAKIS: But in principle, I  
4 can. This is not the only true way.

5 MR. PARRY: But is it practical?

6 CHAIRMAN APOSTOLAKIS: You may say it is  
7 impractical, that's different.

8 MEMBER KRESS: It's in essence, the same  
9 thing.

10 CHAIRMAN APOSTOLAKIS: Oh, what's the truth  
11 now? Something that is impractical cannot be true?

12 MEMBER KRESS: No, but when you propagate the  
13 moment, you're doing the same thing.

14 CHAIRMAN APOSTOLAKIS: Oh, yes, but you are  
15 not doing this Monte Carlo thing. So, I thought this  
16 statement that this is the only true way is too strong.

17 MEMBER KRESS: It's just another way to  
18 propagate.

19 CHAIRMAN APOSTOLAKIS: Yes, you do propagate.

20 Then the so-called state of knowledge  
21 dependency seems, on page 2-10, you use the word on the  
22 first line, epistemic. I think that at some point we have  
23 to decide which one to use.

24 State of knowledge may be brackets, epistemic,  
25 to make sure that's the same thing.

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1 MR. CUNNINGHAM: I'm sorry.

2 CHAIRMAN APOSTOLAKIS: I must say that after  
3 line one of page 2-10, I stopped for two minutes and  
4 rejoiced.

5 LAUGHTER

6 CHAIRMAN APOSTOLAKIS: But this is a separate  
7 issue.

8 MEMBER FONTANA: They just went halfway. They  
9 didn't use the other word.

10 CHAIRMAN APOSTOLAKIS: Page 2-9, the  
11 discussion on model uncertainty, line 10.

12 "It is possible to include some model  
13 uncertainty by incorporating within the PRA model,  
14 discreet probability distribution over a set of models for  
15 a particular issue. This has been done for the modeling  
16 of seismic hazard for example."

17 If you want to get into that, there is also an  
18 alternate way; this is what 1150 did of course.

19 But there is an alternate way where you have a  
20 so-called best estimate, the result of a code, then you  
21 multiply that by some factor that is based on judgement,  
22 obviously, that stretches the distribution. It is an  
23 additional uncertainty factor that represents model  
24 uncertainty and so on.

25 And this has been done in seismic analysis, it

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1 has been done in fire analysis. So, if you are to mention  
2 this I think you should mention the other or mention  
3 neither.

4 I guess that takes care of my comments on  
5 this.

6 We are not discussing comparisons with  
7 acceptance guidelines yet, are we? Oh, yes we are. So, I  
8 should go on.

9 In order not to be negative in all our  
10 comments, I think this is one of the best sections I have  
11 seen yet; it is really an excellent section. I like lines  
12 like number 44:

13 "In the context of decision-making, the  
14 acceptance guidelines should not be interpreted as being  
15 overly descriptive. They are intended to provide an  
16 indication in numerical terms."

17 That's great. On the next page, line 18:

18 "The closer the base case estimates are to  
19 their corresponding acceptance guidelines, the more detail  
20 will be required."

21 That is also very good. Then the paragraph  
22 that starts on line 28 is good, except for the lines that  
23 Tom raised earlier regarding the point estimates, that I  
24 would drop; but I can live with the variation.

25 I really think this is a great section.

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1 MR. HOLAHAN: You're sure you want to wait  
2 until March to write a letter?

3 CHAIRMAN APOSTOLAKIS: Yes.

4 MEMBER KRESS: He may change his mind by then.

5 MR. HOLAHAN: That's why I wanted him to write  
6 it now.

7 CHAIRMAN APOSTOLAKIS: It is not entirely  
8 consistent with our letter regarding CDF and LERF, but I  
9 think the difference is insignificant.

10 MEMBER KRESS: In fact, I kind of prefer their  
11 approach.

12 CHAIRMAN APOSTOLAKIS: But in Vienna, it  
13 wouldn't work.

14 Implementation is later, so I will wait.

15 MR. CUNNINGHAM: If you are through with this  
16 section of the report, we can move on to the  
17 implementation.

18 CHAIRMAN APOSTOLAKIS: Yes.

19 MR. CUNNINGHAM: Our last slide here talks  
20 about the implementation and monitoring process. By and  
21 large this is not much different from what was discussed  
22 with the Committee before. I think we tried to go through  
23 and clarify some of the things about trip points, if you  
24 will, for unexpected safety degradation and things. We  
25 had had some word before that the Commission didn't

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1 particularly like, such as defining the outcome as being  
2 unacceptable or intolerable or something like that.

3 We tried to clean up some of the discussion of  
4 that to make it clear that when you have a failure in a  
5 system or area that is being monitored, that the failures  
6 are not catastrophic, if you will. By and large, this is  
7 similar to what we have discussed before.

8 CHAIRMAN APOSTOLAKIS: On page 2-12, lines 13  
9 and 14 you say:

10 "Failure to meet performance criteria must not  
11 result in unacceptable consequences such as a loss of a  
12 safety function."

13 So, essentially, with this line, you are  
14 eliminating the possibility of using the unavailability of  
15 safety function as a performance criteria, is that  
16 correct?

17 MR. HOLAHAN: I am not sure I want to say that  
18 categorically. I think it would be a poor choice if there  
19 are any other alternatives.

20 Now, I don't know that there are. Maybe there  
21 is some example in which you have no other alternative but  
22 to wait for that level of failure.

23 But I think we always prefer to have some  
24 other level. Either look at the components in a system or  
25 look at degradation before it gets to failure levels; some

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1 earlier indication other than actual loss of function.

2 MR. CUNNINGHAM: At the train level or you  
3 could even have a system failure depending on the  
4 function.

5 CHAIRMAN APOSTOLAKIS: But you could say that  
6 the event that you really don't like is core damage. So,  
7 loss of a safety function is an early-enough indicator.  
8 But you still need the initiating event and the initiating  
9 events are not things that have frequencies of one a day;  
10 they are  $10^{-x}$ . So I don't see why you say the function, by  
11 itself, could not be a performance criterion.

12 MR. KING: It could.

13 CHAIRMAN APOSTOLAKIS: It could.

14 MR. KING: But if you could find something  
15 that is even more early, that's better yet.

16 CHAIRMAN APOSTOLAKIS: and I agree with that.  
17 But this particular line, the way it is stated now,  
18 discourages you.

19 The undesirable event is core damage.

20 MR. CUNNINGHAM: Thinking back to the  
21 expectations that we have, one of the elements of that is  
22 that the safety functions and things are tied to the  
23 frequency of the challenge. That might be something that  
24 we need to build into this discussion as well.

25 CHAIRMAN APOSTOLAKIS: That's right. For some

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1 reason, people are not willing to give credit to the fact  
2 that initiating events occur very rarely. I have seen  
3 that in other contexts as well.

4 Now, monitoring and implementation, does that  
5 include programmatic requirements.

6 What if someone says we will monitor this  
7 particular performance, but since I am uncomfortable about  
8 something else, I will impose the programmatic  
9 requirements on something else, like defense-in-depth.

10 This is part of this box? Part of the  
11 argument of convincing you to grant the request?

12 MR. HOLAHAN: It would be, but I don't think  
13 it is part of this box; I think it is part of one of the  
14 other boxes.

15 CHAIRMAN APOSTOLAKIS: Which box?

16 MR. HOLAHAN: Part of the engineering box.

17 CHAIRMAN APOSTOLAKIS: No, because there --  
18 On page 2-3, right?

19 Yes, but they may not be able to include those  
20 things in the engineering analysis, right?

21 MR. HOLAHAN: Yes.

22 CHAIRMAN APOSTOLAKIS: So, they might come  
23 back and give you --

24 The program that I am about to install has  
25 this element as well, that kind of thing, which I cannot

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1 quantify.

2 MEMBER BARTON: I think most people have a  
3 program that, between the maintenance room monitoring and  
4 monitoring performance and corrective action systems, I  
5 think most places would have a program that would monitor  
6 changes that the licensee would want to submit.

7 They could monitor the performance of that  
8 equipment that they asked for some relief on.

9 I think there are built in programs.

10 CHAIRMAN APOSTOLAKIS: But is it their job to  
11 review those programs?

12 MEMBER BARTON: Oh, I think the licensee has  
13 to come in and say that the changes will be monitored as  
14 part of my corrective action system, or as part of my  
15 maintenance rule monitoring program on systems and  
16 components.

17 MR. KING: Compensatory measures is discussed  
18 in the engineering section back on page 2-11, line 7.

19 MR. HOLAHAN: In my mind, the difference is  
20 the engineering analysis is something that staff reviews  
21 before the amendment is issued. The performance  
22 monitoring is something that takes place later.

23 There can be programmatic aspects of either  
24 one. But the only programs I expect to see in the latter  
25 part associated with monitoring, are really how the

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1 monitoring program would work? What is it that you  
2 measure? How do you calculate reliability from your data.  
3 That kind of programmatic aspect.

4 CHAIRMAN APOSTOLAKIS: Okay.

5 My final comment on documentation, on page 3-  
6 2, line 34. I like seeing the event trees, but not the  
7 fault trees.

8 MR. CUNNINGHAM: Yes, that at least is an  
9 initial cut. We didn't think we needed to see the fault  
10 trees because by and large the basic structure of the PRAs  
11 is critically determined by the event trees.

12 We may follow-up in particular areas with  
13 fault trees, but not in this initial cut.

14 CHAIRMAN APOSTOLAKIS: If some analyst follows  
15 the large fault trees/small event trees school of thought,  
16 you may have very little to see in the event trees, is  
17 that right?

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

19 CHAIRMAN APOSTOLAKIS: So, maybe you need  
20 another word. I mean, I don't know why you need to select  
21 the event trees to the exclusion of the fault trees. I  
22 know that is what the IPEs did.

23 MR. CUNNINGHAM: Yes. This doesn't preclude  
24 us from asking for that information later, it just is the  
25 first cut.

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1 CHAIRMAN APOSTOLAKIS: But it doesn't say  
2 first cut. This says:

3 "The following information should be submitted  
4 and is intended to illustrate that the scope and quality  
5 of the engineering analysis as conducted to justify the  
6 CLB change, is appropriate to the nature."

7 MR. CUNNINGHAM: Yes.

8 CHAIRMAN APOSTOLAKIS: So, it seems to me a  
9 fault tree may be one of the things that they submit.  
10 This is not a requirement, a list of requirements. It is  
11 just a shopping list of things they might submit. It  
12 doesn't mean that they have to do it all the time. That  
13 is what the opening sentence says.

14 MR. PARRY: George, as a compromise, one of  
15 the things might just be the top logic of the fault trees  
16 which at least would give you --

17 CHAIRMAN APOSTOLAKIS: Why? Is anybody  
18 fighting the idea of submitting fault trees?

19 MR. PARRY: That is an awful lot of paper.

20 MR. CUNNINGHAM: Yes.

21 CHAIRMAN APOSTOLAKIS: But that is again under  
22 the requirement that it must be appropriate to the  
23 analysis. If their argument relies on a detailed fault  
24 tree, then they will submit it. If they can get away with  
25 a smaller fault tree, then --

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1 I would either drop the event, and say the  
2 event/fault trees.

3 I have no more comments. We can go around the  
4 table if anybody wants to ask any question about the reg.  
5 guide?

6 MR. ABBOTT: Yes, I have a couple of  
7 questions.

8 There is a definition on page 1-2 of the  
9 current licensing basis, at the bottom of the page.

10 By and large, most of the things that would  
11 come under the definition of the current licensing basis  
12 wouldn't come under NRC review in the sense that you would  
13 need approval to do something. Most of those would be in  
14 the area of tech spec changes.

15 So, the vast majority of things that are going  
16 to be changed, from my understanding, wouldn't even come  
17 close to being processed by this reg. guide. Is that  
18 true?

19 MR. HOLAHAN: I am not sure what fraction.  
20 But clearly the reg. guide is for licensee submittal, for  
21 license amendments. And, yes, some fraction of what is in  
22 the current licensing basis doesn't need to be changed  
23 through this process.

24 MR. ABBOTT: Well, a large number of  
25 procedural changes are done under 50/50.

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1 MR. HOLAHAN: That's fine.

2 MR. ABBOTT: Plan design changes are done on a  
3 50/59.

4 MR. HOLAHAN: Yes.

5 MR. ABBOTT: I would submit that the majority  
6 of them are.

7 MR. HOLAHAN: I think that that is probably  
8 true.

9 MR. ABBOTT: So, would you expect the  
10 licensees to use this reg. guide in your decision-making  
11 process?

12 MR. HOLAHAN: No, 50/59 has its own tests and  
13 they are not these tests. They are not safety tests, they  
14 are specific tests about whether the change keeps the  
15 plant within the original licensing basis.

16 As matter of fact, the staff is working on a  
17 guidance document for that and it doesn't follow most of  
18 this thinking because it is not a safety test. It is a  
19 test of whether a change leaves the plant in a condition  
20 that is consistent with its licensing assumptions.

21 MR. ABBOTT: I will think about that a bit.

22 MR. HOLAHAN: Okay.

23 MEMBER CATTON: Just to re-emphasize, the  
24 thing that I found missing was the qualification to the  
25 peer review group. I look forward to your appendix.

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1 I think you really have to be fairly clear on  
2 the qualifications of the membership or you won't have  
3 good peer review.

4 CHAIRMAN APOSTOLAKIS: Now, regarding LERF --

5 MEMBER CATTON: It is a comment, without  
6 having seen the document.

7 MR. HOLAHAN: Well, let me say that there has  
8 been some concern on the part of the staff in that area.  
9 You might as well hear it before you wait for the  
10 document.

11 Should we be so prescriptive as to require a  
12 peer review for all license amendments? Or should we be  
13 more flexible in saying the quality of these documents,  
14 whatever analysis is being done or submittal is being  
15 made, clearly there are quality requirements.

16 If you do an ECCS calculation requirements.  
17 People have to check them, you have to have some basis for  
18 thinking that what you did is giving you the right  
19 answers. I think that is clear.

20 Whether we should say peer review is the  
21 appropriate mechanism for showing quality in these cases,  
22 and perhaps being less flexible to allow the licensees to  
23 think about other ways of having qualities, is something  
24 that we have been kicking around. We have been leaning  
25 toward a flexible approach.

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1 MEMBER CATTON: I think that is better. My  
2 own personal view is that the peer review ought to be only  
3 carried out if you have questions.

4 In some cases, and again, this is the fire  
5 area, and I don't recollect which country, but one of them  
6 calls it third party review. If anything is put on the  
7 table that is in question, they say we need a third party  
8 review.

9 You could treat it the same way and you could  
10 establish some criterion based on risk numbers, LERF, CDF  
11 or whatever. That if you are in this area then it should  
12 be accompanied by peer review. What it does, is it takes  
13 the monkey off your back.

14 But then you have to be a bit more specific of  
15 what a peer review is. It is not just a bunch of people  
16 in a room saying, gee, this looks pretty good;  
17 documentation is eight feet thick, we are done.

18 MR. HOLAHAN: We do see the owners' groups are  
19 trying to work on this quality issue and they are not all  
20 doing it the same way. They are working on the  
21 certification process or they are working on a cross-  
22 comparison of results for similar plants.

23 The quality of what is done is important and  
24 has to be in there in some fashion. But I think we would  
25 like to allow the industry to work on some innovative

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1 approaches which aren't usually called peer review. They  
2 have many of the same aspects of a peer review. But I  
3 think we are a little bit reluctant to use the word peer  
4 review in such a strict sense that --

5 MEMBER CATTON: Just call it third party  
6 review.

7 MR. HOLAHAN: Maybe just call it independent  
8 review. I think probably every quality assurance program  
9 has some level of independent review.

10 You will see; we will put something in the  
11 appendix. But I think we do want to allow licensees and  
12 owners' groups to pursue approaches to quality that maybe  
13 people haven't done before.

14 MEMBER FONTANA: I think that is one example  
15 of several. I think this is a really, really good top  
16 level document. But the actual development of specifics  
17 will probably come out from the experience of doing the  
18 implementation and monitoring. It will be really  
19 interesting for us to keep up with that and see how it is  
20 progressing.

21 MR. HOLAHAN: Okay.

22 CHAIRMAN APOSTOLAKIS: Would it be  
23 unreasonable to have a standing group of reviewers? Send  
24 it to them and they do an appropriate review. Who pays  
25 them? Do you expect the licensee to form an independent

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1 group and pay them?

2 MR. HOLAHAN: Yes. Whatever approach the  
3 licensees chooses as their mechanism to assure the quality  
4 of what they submit, is their responsibility.

5 CHAIRMAN APOSTOLAKIS: Okay. Well, anyway, we  
6 will wait until the appendix is out.

7 Are there any other comments? Tom?

8 MEMBER KRESS: On page 1-3 of the reg. guide.  
9 Could someone explain what lines 14 through 16 are saying  
10 to me?

11 MR. KING: What we're trying to do with that  
12 whole paragraph is try to describe why we chose the CDF  
13 and LERF values that we did. In a legal sense, there is  
14 this term called adequate protection which has never  
15 really been defined in a quantitative way but it is sort  
16 of if you meet the regulations you have adequate  
17 protection in terms of protecting public health and  
18 safety.

19 MEMBER KRESS: I understand.

20 MR. KING: In theory, we could allow risk  
21 increases in plants to get up to that level, if one could  
22 define it. What we are saying in this paragraph is, this  
23 isn't the approach that was taken here. We think we  
24 should have a margin above that legalistic term of  
25 adequate protection. And we think that the limits or

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1 margins that are specified in here maintain that margin.

2 MEMBER KRESS: You are assuming that the  
3 safety goals are a risk level lower than adequate  
4 protection is?

5 MR. KING: Well above adequate protection; a  
6 lot of margin.

7 MEMBER KRESS: Better?

8 MR. KING: Better, yes.

9 MEMBER KRESS: That is an assumption that I am  
10 not sure is true. In fact, if we did our job right,  
11 adequate protection, if it means conforming to the  
12 regulations as we now have them, should give you a risk  
13 level that is actually better than the safety goal. And I  
14 am not sure that your assumption is true that safety goals  
15 are maximal.

16 MR. KING: Well, most plants, although they  
17 haven't done full-scope PRA analysis, but the analysis  
18 that they have done through the IP show them better than  
19 the safety goals, the QHOs.

20 MR. HOLAHAN: The Commission has recently, I  
21 think this week, written a letter to the staff to have  
22 them explain the relationship between the reg. guide and  
23 adequate protection. So we are going to have the  
24 opportunity to write some more words on the subject.

25 MEMBER KRESS: Let me go back; I think we are

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1 in agreement now.

2 You are saying that adequate protection gives  
3 you a risk level that is a lower risk safety goal?

4 MR. KING: No, no, no.

5 MEMBER KRESS: What are you saying?

6 MR. KING: The safety goals define a level of  
7 risk that is lower than this concept of adequate  
8 protection.

9 If you look at the regulations and you define  
10 adequate protection, the regulations are supposed to be in  
11 place and people are supposed to comply with them,  
12 regardless of cost considerations.

13 Things that are added over and above adequate  
14 protection have to be justified on a cost/benefit basis;  
15 that is all part of the backbit rule.

16 So, the regulations contain things that are  
17 directed toward adequate protection as well as things that  
18 are enhancements, beyond adequate protection. But when  
19 plants meet the regulations, they achieve a level of  
20 safety that is better than adequate protection and we feel  
21 that the safety goals define a level of safety is better  
22 than adequate protection.

23 MEMBER KRESS: No, wait a minute. You just  
24 said when the plants meet the regulation, they achieve a  
25 risk level that is better than adequate protection.

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1 MR. KING: That's right.

2 MEMBER KRESS: But I was defining adequate  
3 protection to mean that it meets the regulation.

4 MR. KING: If you meet the regulations, then  
5 by definition you have achieved adequate protection.

6 MEMBER KRESS: But that is not necessarily the  
7 real quantified level.

8 MR. HOLAHAN: I don't think there is such a  
9 thing.

10 MR. KING: It is a legal concept; it is not  
11 something that has been quantified.

12 MR. HOLAHAN: I think it is difficult to  
13 compare a legal concept to a calculation and say that one  
14 is higher than the other. I mean how many apples make an  
15 orange.

16 MEMBER SHACK: You can first start with what  
17 does it mean.

18 MEMBER KRESS: I think that clarifies it. You  
19 can't really say that meeting the regulations is the  
20 definition of adequate protection.

21 MR. KING: You have adequate protection, yes.

22 CHAIRMAN APOSTOLAKIS: Isn't it true that we  
23 know what adequate protection is?

24 MR. HOLAHAN: No.

25 CHAIRMAN APOSTOLAKIS: Why?

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1 MR. KING: Because we never define, in a  
2 numerical sense, adequate protection.

3 CHAIRMAN APOSTOLAKIS: But that is what I am  
4 saying; the IP does it for you.

5 MR. HOLAHAN: No.

6 MEMBER CATTON: You just take the average and  
7 equate them?

8 MR. HOLAHAN: No.

9 CHAIRMAN APOSTOLAKIS: This plant as meeting  
10 adequate protection.

11 MEMBER KRESS: Adequate protection.

12 CHAIRMAN APOSTOLAKIS: Then the IP comes and  
13 says, for this plant the core damage frequency is this,  
14 early fatalities are this and that.

15 So, now I have a numerical measure.

16 MEMBER KRESS: Adequate protection is the  
17 highest risk level of the highest plant.

18 CHAIRMAN APOSTOLAKIS: No, it is a legal term.  
19 But the IPs have shown that it really leads to  
20 inconsistent estimates of risk.

21 MEMBER CATTON: Either that, or adequate  
22 protection is the highest value you can find.

23 MR. HOLAHAN: Or the highest value that you  
24 could find.

25 MEMBER CATTON: Could find.

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1 MR. JONES: Or that there are other aspects  
2 that a plant in operation that are not specifically  
3 regulated by the NRC, which leads to differences in those  
4 risks. So the adequate protection that you get from the  
5 IP may go beyond what the regulations in and of themselves  
6 require.

7 CHAIRMAN APOSTOLAKIS: But isn't it true that  
8 all the risk studies we have done the last 20 years have  
9 clearly demonstrated that adequate protection means  
10 different things for different plants?

11 MR. HOLAHAN: No.

12 MR. ABBOTT: No, adequate protection is a  
13 legal concept.

14 MR. HOLAHAN: I think we all said no for  
15 different reasons.

16 LAUGHTER

17 MR. ABBOTT: The numbers have nothing to do  
18 with it.

19 MR. HOLAHAN: Nothing to do with the numbers.  
20 Now, what risk numbers correspond to those plants and  
21 their operation, which had adequate protection. But those  
22 numbers do not constitute adequate protection because it  
23 is not a risk number.

24 CHAIRMAN APOSTOLAKIS: But they demonstrate  
25 the concept.

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1 MR. HOLAHAN: I didn't say that because the  
2 concepts are different they didn't matter.

3 CHAIRMAN APOSTOLAKIS: Isn't the whole idea of  
4 going to risk informed regulation was to achieve  
5 consistent that we didn't have with adequate protection?  
6 Isn't that what it means.

7 MEMBER KRESS: That's part of it.

8 CHAIRMAN APOSTOLAKIS: That's the main driver.

9 MR. KING: It's the focus on what is  
10 important, not to go quantify what we mean by the term  
11 adequate protection.

12 CHAIRMAN APOSTOLAKIS: No, but you are  
13 allowing risk increases which means that adequate  
14 protection now is at the higher level.

15 MR. CUNNINGHAM: No, adequate protection is  
16 still the same.

17 CHAIRMAN APOSTOLAKIS: It's the same in that  
18 it is a legal requirement.

19 MR. HOLAHAN: Right.

20 MR. ABBOTT: If the regulations were changed  
21 to include the policy statement as a rule, then you can  
22 make the connection. Otherwise you can't.

23 CHAIRMAN APOSTOLAKIS: We're talking about two  
24 different things. You guys say that adequate protection  
25 is what the law says.

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1 MR. ABBOTT: Exactly.

2 CHAIRMAN APOSTOLAKIS: I agree with that. And  
3 then I go beyond that and say now that I have all these  
4 IPs.

5 MR. HOLAHAN: In fact, what we are saying is  
6 that the concept of adequate protection adds nothing to  
7 this discussion. You could just as well say what risk  
8 values happen to be associated with all those plants that  
9 meet the regulations and leave out the adequate protection  
10 phrase.

11 CHAIRMAN APOSTOLAKIS: Any other comments?

12 MEMBER SHACK: Let me make one point. That  
13 whole paragraph between lines 5 and 16 is just strange.

14 CHAIRMAN APOSTOLAKIS: Page?

15 MEMBER SHACK: Page 1-3. I am not sure why it  
16 is there. I thought the only practical result out of it  
17 is it sort of defined what you meant by an insignificant  
18 increase in risk.

19 MR. KING: It is really leading up to a basis  
20 for why we chose the subsidiary objectives of the  
21 quantitative health objectives as the guidelines.

22 MEMBER SHACK: Why don't you say that and be  
23 done with it? This whole thing of we could have done it a  
24 different way. I read it and it seemed kind of strange.

25 CHAIRMAN APOSTOLAKIS: Yes, I was a bit

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1 uncomfortable with it.

2 MR. KING: Well, we are an agency that has to  
3 operate within certain legal constraints and I think these  
4 words provide some legal foundation.

5 MEMBER KRESS: If you have a good reason for  
6 them, I wouldn't object.

7 CHAIRMAN APOSTOLAKIS: So, any comments from  
8 the audience? No?

9 Given that we are going to adjourn around 3:30  
10 p.m., take an hour for lunch? Oh, I am sorry. We have to  
11 come back at 1:15 p.m.

12 MEMBER SHACK: We get too long.

13 CHAIRMAN APOSTOLAKIS: Because of adequate  
14 legal requirements.

15 (Whereupon, the proceedings recessed for a  
16 lunch break at 12:11 p.m.)

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A-F-T-E-R-N-O-O-N P-R-O-C-E-E-D-I-N-G-S

(1:20 p.m.)

CHAIRMAN APOSTOLAKIS: Okay. Who's next?

MR. JONES: Mike Cheok of my staff will walk us through the SRP in I think the same kind of way we went through it this morning. Just interrupt as appropriate. If you've got some specific comments in the text you would like to point out at the relevant time, I mean this runs basically in that order, and I'll be glad to address them and entertain them.

MR. CHEOK: Good afternoon. I am going to talk about the SRP, as Bob as just mentioned. Okay. The purposes of this SRP are to provide guidance to the staff for the reviews that will be due for any applications we will get in the risk-informed regulation process.

The second purpose is to identify roles and responsibilities for the different organizations within the staff and what they will do in the whole process.

I guess the last purpose is to put down some conclusions which we expect to be included in the evaluation findings, which we will include in the safety evaluation reports.

Okay. The SRP was written in parallel with the reg guide, which we talked about this morning. The SRP's anchored on the key principles and staff

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1 expectations that were discussed this morning.

2           This SRP was written assuming that a full  
3 scope review is required. However, we realize that there  
4 are many applications where we do not need a full scope  
5 review, in which cases we direct reviewers to go to the  
6 relevant sections of the SRP to pick out the appropriate  
7 sections.

8           For example, I think we foresee needing a full  
9 scope review for applications, which are anchored upon the  
10 bottom line numbers of which -- or where there is a broad  
11 set of scenarios that have to be pulled in.

12           On the other hand, there will be reviews. For  
13 example, for temporary changes where the review will not  
14 have to be as extensive. Other examples could also  
15 include things like applications where they depend on  
16 order of magnitude type of arguments, a qualitative type  
17 of risk arguments, or maybe even some risk ranking type  
18 applications.

19           CHAIRMAN APOSTOLAKIS: Now you say temporary  
20 plant changes. We haven't used that word at all so far,  
21 have we. Is that a new element here? RG-1061 applies to  
22 temporary changes?

23           MR. RUBIN: This is Mark Rubin from the staff.  
24 Not directly. As Mark Cunningham mentioned this morning,  
25 we are going to have to expand the staff guidance in the

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1 areas of risk informed attributes and criteria for  
2 temporary changes.

3 The NEI applications guide, the EPRI NEI  
4 applications guide, does propose certain criteria for the  
5 risk acceptability of temporary plant changes. But the  
6 orientation of the reg guide is to do licensing changes,  
7 permanent plant changes. We are going to be soliciting  
8 public comments where we should step off from that.

9 This is just an example of where it might be  
10 credible when we develop our criteria in the future, for a  
11 less burdensome type of review of qualitative assessment,  
12 order of magnitude assessment, perhaps emergency tech spec  
13 relief requests, something that wouldn't be a permanent  
14 impact on the plant, but some brush of risk insights would  
15 be useful, helping to make a quick decision.

16 We will be doing more in the future on this.

17 MEMBER POWERS: When you say you are looking  
18 for public comment, is it in the sense of we don't know  
19 what to do here, give us some advice? Or is it public  
20 comment you are looking for, we have chosen not to  
21 restrict transient excursions in risk, what do you think?

22 MR. JONES: We're still working up the  
23 questions. I think it's premature for us to tell you  
24 exactly how we're going to phrase some of this at this  
25 point, Dana. I mean we're still developing that part of

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1 the package going out for comment. Those elements will be  
2 considered in developing it. I don't think we've had  
3 enough time at the various management levels to wrestle  
4 with what we want to do.

5 Just in the area of the temporary changes, we  
6 would note that the application specific guides on tech  
7 specs, especially when you are dealing with things like  
8 AOTs, is essentially a temporary short-time duration  
9 change. So we do have criteria that have been developed  
10 in that area. It was in the earlier package. There's  
11 some question as to how far, if any, we wish to extend  
12 that.

13 MR. CHEOK: I am going to spend the rest of  
14 the time basically going through the sub-sections of the  
15 SRP and highlighting the relevant points.

16 The first section would be the definition of  
17 the proposed change. In this area, basically what we need  
18 for the reviewer to do is to ensure that all the impacts  
19 from the change has been identified by the licensee and to  
20 identify if this impact can be supported by the analyses  
21 and data that is currently available and that's being  
22 submitted by the licensee.

23 This would include all your traditional and  
24 probabilistic type information and also pertinent plant-  
25 specific and generic data.

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1 I guess we also will need to ensure that the  
2 process that the licensee goes through addresses all the  
3 key principles and expectations as defined in the reg.  
4 guide.

5 CHAIRMAN APOSTOLAKIS: So in general, who is  
6 the person that makes this determination? Is it the PRA  
7 branch or some other branch?

8 MR. RUBIN: I am sure you are aware, the SRP  
9 is organized with a primary review branch in secondary.  
10 The sections usually delineate which portions of review  
11 are the responsibilities of the various review branches.

12 The concept being, or the high level concept  
13 we're trying to achieve is how much broader ownership of  
14 risk technology throughout the agency and the decision  
15 making. That doesn't mean the expertise will always  
16 reside in the branch, but the primary responsibility of  
17 the review will be the primary review branch.

18 IST will be the mechanical engineering branch.  
19 They will call on us as appropriate, but they will be the  
20 ultimate authority responsible at that level in making the  
21 determination with consultation and input from the experts  
22 in the various fields, PRA in this case.

23 We are a secondary review branch in most  
24 cases.

25 MR. CHEOK: Evaluation of defense in depth.

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1 The first bullet there basically says that you verify that  
2 the system redundancy and diversity is maintained  
3 commensurate with the frequency and consequence of the  
4 challenges. One way to do this as proposed in the SRP, is  
5 to look at the PRA cut sets. By a study of the cut sets,  
6 we feel that we can incorporate, we can look at how an  
7 application could affect the redundancy, and in some  
8 respects, the diversity that is available to mitigate  
9 accident sequences.

10 For example, when we see cut sets which has a  
11 lot of elements in it, we can be somewhat assured that we  
12 have at least some level of redundancy. When we see cut  
13 sets that can not be failed, let's say by a common cause  
14 failure, we can somewhat be assured that we might have  
15 some diversity in it.

16 What we are trying to do here is to see how  
17 the application will affect the elements of the cut set,  
18 and see how defense in depth could be affected in that  
19 sense.

20 MEMBER POWERS: This particular slide does not  
21 closely parallel the guidelines for maintaining defense in  
22 depth. Is there a reason? For instance, it doesn't say  
23 assure that there's a reasonable balance among prevention  
24 of core damage prevention and containment failure and  
25 consequence mitigation.

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1           It doesn't say assure there is not an over  
2 reliance on programmatic activities to compensate for  
3 weaknesses in plants design.

4           MR. CHEOK: The SRP and reg guide actually  
5 similarly have the same words which you just mentioned.  
6 The reason you don't see it on this slide is because I  
7 figured it will be discussed this morning. I did not want  
8 to repeat slides again.

9           All I am trying to point out here, Dr. Powers,  
10 is that this is one way we are telling reviewers how you  
11 can ensure the fact that you just mentioned. In other  
12 words, we can study cut sets and see if a common cause  
13 failure could actually cause a failure that cut set or if  
14 human action can actually compromise the cut set, or if a  
15 human action is actually being relied upon to a big degree  
16 in mitigating a sequence cut set.

17           MEMBER POWERS: How do you look at the fault  
18 trees, the cut sets, if we're not too sure there's a  
19 reasonable balance or be sure there's not an over  
20 reliance?

21           MR. CHEOK: I believe when you look at the cut  
22 sets, you can look at the number of elements in the cut  
23 set and also the probability of the different elements in  
24 the cut set and see what contributes to that one sequence  
25 frequency, and with that, make the proper judgement

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1 whether that's an over reliance on the upper action, for  
2 instance, or if an application actually now degrades one  
3 element, where we now depend, overly depend on another  
4 element of the cut set for compensatory measures, as a  
5 compensating element.

6 We now would like to know what we can do to  
7 ensure that the compensating element performs like we say  
8 it would perform.

9 MEMBER POWERS: I guess my difficulty is I  
10 don't understand what a reasonable balance is. I don't  
11 know what an over reliance is. I could look at the  
12 numbers from now until kingdom come, and I could not  
13 answer the question.

14 MR. JONES: That's correct. The guide is not  
15 that specific in the areas. I think -- excuse me, SRP at  
16 this case. But I think what is embodied in the SRP is a  
17 philosophy similar to what went into the Reg Guide. That  
18 is, a knowledgeable user, persons with the right expertise  
19 can make the right judgement calls.

20 I mean we did not write this as a prescriptive  
21 cookbook, numbers. I mean part of the reason for, is I'm  
22 not even sure how to write it to cover potentially the  
23 broad range of applications we're trying to set up here.

24 So we purposely did it as judgement. It does  
25 rely on judgement. It is set up to allow us to apply this

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1 guidance in a very general sense to all applications and  
2 then develop application-specific guidance as necessary,  
3 consistent with this kind of information to make sure that  
4 that's done.

5 But I think to give you an example on trying  
6 to remember, Mike, maybe you can help me a little bit, in  
7 the IST area. There are concerns about things like common  
8 cause failures and why you may see as you reduce the  
9 programmatic activities, you possibly can increase these  
10 common cause failures. But you may not be able to reflect  
11 that very well in the PRA. We made need to look at what  
12 are the more dominant or important elements giving you the  
13 diversity and assurance for some of these, and make sure  
14 that maybe you need to take special attention with one  
15 train, or concepts like that.

16 MEMBER POWERS: I think Dr. Apostolakis,  
17 Professor Apostolakis' concern about defense in depth is  
18 that it's the grand catch-all. No matter what your  
19 numbers are, I can always say well, but on the other hand,  
20 in the name of defense in depth, do this or don't do this.

21 When you have these reasonable and over  
22 reliance based on judgement, I think that triggers his  
23 concern because he doesn't know how to build that  
24 judgement when he sees these words.

25 MR. JONES: But I don't know how to write up

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1 that judgement for the wide variety of cases I may have to  
2 apply them on either.

3 I can say, I want to just comment that we  
4 heard George's comments this morning. I think we all take  
5 some crack at trying to clarify some of the intent. I  
6 mean we did say in the SRP specifically, that in  
7 addressing the elements, and here I'm talking the six  
8 specific elements for defense in depth, which are exactly  
9 as listed in the Reg Guide.

10 In addressing the elements, both traditional  
11 engineering and PRA results are expected to be used in an  
12 integrated fashion. We're not trying to go and put the  
13 burden one way or the other. You are going to have to  
14 integrate it. You are going to have to look at what's  
15 there. It is going to depend on the applications. Some  
16 may more heavily rely on PRAs than others. So we tried to  
17 provide some guidance on using both. If you have the PRA  
18 information, this is the kind of information to look at,  
19 and here are some of the deterministic traditional  
20 engineering approaches you need to consider if that's the  
21 kind of information you have.

22 So we tried to capture those elements. To  
23 tell you exactly how to blend them is a little bit  
24 difficult I think at this time.

25 MR. CHEOK: Basically in this overall review

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1 of the cut sets, I think they are just trying to tell  
2 reviewers that hey look, where you see that defense in  
3 depth is already marginal as far as diversity and  
4 redundancy is concerned, maybe this is not a good place  
5 for you to be doing relaxation on these components.

6 On the other hand, in places where you see cut  
7 sets, multiple element cut sets, we can feel confident  
8 that relaxation of some of the elements would be prudent.

9 CHAIRMAN APOSTOLAKIS: But what really matters  
10 is the probability distribution of the frequency of that  
11 cut set, not necessarily the number of elements in the cut  
12 set.

13 MR. CHEOK: And that's also a consideration.  
14 We do say that look at the frequency of the sequence cut  
15 set, not just on the --

16 CHAIRMAN APOSTOLAKIS: But that should be the  
17 primary consideration. You may have a two or three  
18 element minimal cut set, but the probability still may be  
19 high. I mean if there are strong dependencies and so on.

20 Now this is internal guidance? You are not  
21 going to put that in the document are you? I haven't read  
22 the SRP, I'm sorry.

23 MR. CHEOK: I believe that what I have said is  
24 in the document.

25 CHAIRMAN APOSTOLAKIS: It is?

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1 MR. CHEOK: Yes.

2 CHAIRMAN APOSTOLAKIS: Oh. It's not overly  
3 prescriptive? Where is it in the document?

4 MR. JONES: Pages eight to nine.

5 MEMBER SHACK: We should compare it with the  
6 November version. It got a lot less prescriptive.

7 CHAIRMAN APOSTOLAKIS: Where is the stuff on  
8 the minimal cut sets though?

9 MR. JONES: Basically at the bottom of page  
10 eight and the first half of page nine talks about.

11 CHAIRMAN APOSTOLAKIS: Yes. We have to think  
12 about that. We have two more meetings.

13 MR. JONES: We would prefer we don't wait two  
14 more meetings, because I mean this is --

15 CHAIRMAN APOSTOLAKIS: You gave it to me when,  
16 last week? I spent a lot of time on the Reg Guide, you  
17 know. I'll read it by the February meeting. How's that?  
18 The full committee meeting.

19 MEMBER SHACK: For internal guidance, the  
20 prescriptiveness isn't quite the same thing as it is in  
21 the Reg Guide. The whole change in the SRP was for far  
22 less detail than there was in the November version.  
23 Almost every place you made a change it was to essentially  
24 reduce the detail that was given.

25 MR. JONES: A couple of reasons. One, I think

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1 there was some concern, and I think I continue to hear the  
2 concern, about us adding an additional regulatory  
3 licensing burden on top of the existing system by doing  
4 PRA. So we wanted to make sure that the guidance did not  
5 give that kind of a perception, that this is just one more  
6 layer of additional regulatory hurdles for you to jump  
7 over. So there was some of that.

8           Secondly, I think again, we were just trying  
9 to -- we recognize that some of the guidance that was in  
10 there was I would say some interesting thoughts and  
11 comments. But also could be interpreted as developing new  
12 requirements above and beyond current regulations.

13           While they could have been shown to be  
14 reasonable guidance that could have been useful for doing  
15 the review, there was also concern about abuse of that  
16 guidance.

17           So we were very careful to try to bring this  
18 down into items that were consistent with the overall  
19 philosophy, did allow more application to judgement, and  
20 provided guidance that indeed went to what the Reg Guide  
21 was there for and not beyond.

22           MEMBER POWERS: And an element, an item of  
23 curiosity which is not part of your document I'm sure.  
24 Suppose it's five years from now. Mark is now the  
25 director of research, and I am a program manager. I have

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1 gotten a job to do review and application. I want to  
2 understand how other branches have handled examination to  
3 see that there's a reasonable balance among preventive  
4 features.

5 Is there a place I go to learn how they have  
6 done that?

7 MR. RUBIN: Certainly. The Safety Evaluation  
8 Reports, the SER is written for the pilot studies and then  
9 eventually, hopefully not too eventually, the risk  
10 informed --

11 MEMBER POWERS: But I would have to go look at  
12 each of the previous programs. There's nobody -- there's  
13 no repository that specifically addresses. There will not  
14 be a specific repository that addresses here's how people  
15 have done these items in the past?

16 MR. RUBIN: Well there's an SRP update  
17 program. As we learn more, we'll be modifying the SRP.

18 MR. JONES: Only one comment beyond that may  
19 be one of the elements of the Commissions SRM was to  
20 develop a system to deal with tracking cumulative  
21 increases in risk as a result of -- not increases, just  
22 even cumulative changes in risk as a result of these  
23 applications.

24 We may end up with such a system that we'll at  
25 least identify what those are and may allow you to target

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1 use of that information.

2 MEMBER POWERS: Do you suppose your education  
3 and training program may become a repository of  
4 experience?

5 MR. JONES: That I would also anticipate to  
6 occur. As I said, the question of getting this out and  
7 spread out within the organization, I mean obviously up  
8 front, the PRA branch is going to have a high burden of  
9 effort in this area. But our intent is to spread this out  
10 and into the other organizations. Those types of  
11 experience, and how we made those decisions and what  
12 forth, will be documented. Some of them will in fact be  
13 looked at by the Commission before they even get issued,  
14 possibly. Some of the pilots are of that nature.

15 MEMBER POWERS: It's you know, it's one of  
16 these situations. As George said, you are making history  
17 here. Five or six years ago when Mark has become the  
18 director of research, he'll be followed along by people  
19 that have not thought as careful and in detail as he has  
20 about these things and they are much more in the cranking,  
21 getting the paper out kind of mode.

22 MR. JONES: Let me make a comment on that  
23 though. On the history I think it may be useful as we go  
24 through and finalize the pilot reviews, to get a briefing  
25 on how we did the review and applied the element.

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1 My expectations of that will fall between the  
2 public comment period of these guides and the finalization  
3 of the guides. So I think that might be a useful comment  
4 that the subcommittee and full committee may want a  
5 briefing on. That I think would be very helpful for  
6 everybody, and instructive.

7 MR. CHEOK: As far as the second bullet is  
8 concerned, we do not expect that there will be too many  
9 applications that will affect the defense -- the very  
10 defense in depth concept. But if they do, I guess the  
11 guidance here is to ensure that the change does not result  
12 in significant increases in the challenges to the  
13 integrity of the barriers.

14 To ensure that the probability of the failure  
15 of each barrier is not significantly changed by the  
16 proposal, and also that new and additional or additional  
17 failure dependencies are not introduced by the changes.

18 MEMBER CATTON: Where do the defense in depth  
19 questions come up? If you do CDF, LERF, with CDF the only  
20 defense depth -- the only thing is your clad. You have  
21 lost it anyway. So where do I have to deal with these  
22 questions on defense in depth? In the calculation of  
23 LERF?

24 CHAIRMAN APOSTOLAKIS: In the safeguards?

25 MR. JONES: Yes. I wouldn't give up that CDF

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1 gives up concepts of defense in depth. I mean I think if  
2 you deal with certain systems --

3 MEMBER CATTON: Well let's define it then.  
4 What do you mean by CDF?

5 MR. JONES: Core damage frequency.

6 MEMBER CATTON: Core damage, you have maybe  
7 lost the clad. That's it.

8 MR. JONES: No. We are not looking at CDF as  
9 just cladding failure.

10 MEMBER CATTON: What are you looking at CDF,  
11 on the floor?

12 MR. JONES: Yes.

13 MEMBER CATTON: You can't calculate that worth  
14 a damn.

15 MR. JONES: We can estimate it. But I think  
16 when you --

17 MEMBER CATTON: So where's defense in depth?  
18 You are losing me again already.

19 MR. JONES: But in looking at defense in depth  
20 for something like --

21 MEMBER CATTON: By the way, I'm not arguing  
22 for you to give it up.

23 MR. JONES: No. I'm just saying you can look  
24 at CDF, I think there's a couple of examples that can be  
25 played out in going through it.

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1           When you talk about certain events like LOCA,  
2 you've got very low probability initiators, and you've got  
3 relatively highly reliable safety systems. I mean the  
4 defense in depth in there is a construction of the barrier  
5 itself, the primary RCS, how you test it, ensure its  
6 integrity, its ISI testing, all of those things a part of  
7 it. ISI is an area that we are looking at potential  
8 relaxations. Here it's a low probability event that may  
9 be impacted, but you are backed up by fairly high safety  
10 systems.

11           Now there are other systems or other places in  
12 the plants where you may have, for example, loss of  
13 feedwater. If you want to mess around with change of  
14 feedwater design, York's feedwater design system, I mean  
15 now you are talking very highly probable event. We rely  
16 on not only maybe one system. You may want to look at  
17 diversity, the redundancy, how it's powered.

18           MEMBER CATTON: The auxiliary feedwater system  
19 reliability requirements already forced you into whatever  
20 the configuration is now. That's not --

21           MR. JONES: Well, they forced you into them  
22 now and I moved further arguably under station blackout.  
23 That's additional requirements even beyond that.

24           So I am saying that defense in depth as you go  
25 through the applications, is going to depend to some

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1 extent on what are the key sequences, what are the  
2 equipment you are talking about, and where is the change  
3 you are making.

4 In some cases, you may be looking at the  
5 initiating event frequency and change in programmatic  
6 requirements. In other places, it may be design. You may  
7 have to look very hard at whether it impacted by day to  
8 day kind of events or whether they are low probability  
9 events in deciding what levels of relaxation. That's the  
10 commensurate --

11 MR. CHEOK: In a sense, the first bullet  
12 basically deals with SSCs that are being modeled in the  
13 PRA. In the second bullet, we are dealing with relaxation  
14 to SSCs that might not be included in the PRA. That's  
15 where we basically say we will evaluate defense in depth  
16 using those factors if they are not modeled in the risk  
17 analysis.

18 MEMBER CATTON: Could you repeat that?

19 MR. CHEOK: When an SSC or an element is  
20 modeled in the PRA, we can evaluate defense in depth by  
21 looking at the PRA element, the cut sets.

22 When the SSC is not being modeled in the PRA  
23 that's been proposed for a change, we do not have the  
24 luxury of looking at the cut sets, the model cut sets to  
25 give us the insights on whether defense in depth is being

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1 sufficiently maintained. We basically now have to rely on  
2 basically the traditional definitions of defense in depth  
3 to help us see if we are maintaining defense in depth.

4 MEMBER CATTON: I guess then maybe the problem  
5 I am having is that defense in depth isn't really very  
6 well defined. Usually when people say defense in depth,  
7 they talk about clad and vessel containment. You didn't  
8 mention any of those things.

9 CHAIRMAN APOSTOLAKIS: That's one of the  
10 interpretations.

11 MEMBER CATTON: It's one that us  
12 thermohydraulics people like.

13 MR. JONES: It's one, and that's a barrier  
14 concept. But there is also --

15 MEMBER POWERS: You can do it with 95 percent  
16 confidence.

17 MR. JONES: Programmatic aspects beyond all of  
18 those too. There are programmatic defense in depth  
19 principles.

20 MEMBER CATTON: I think you have got to  
21 tighten up your definition of defense in depth before you  
22 can talk about it. You talk in a language I kind of  
23 understand. When you start talking about it in mentioning  
24 the PRA and so forth, I don't understand it because  
25 typically CDF is equivalent to core on the floor in a PRA.

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1 As a result, one of your lines of defense is not even  
2 considered, and in the containment. The containment to  
3 the outside, the way you --

4 CHAIRMAN APOSTOLAKIS: Yes, but he's going  
5 beyond that. I mean the single failure criteria and all  
6 of that was part of defense in depth.

7 MEMBER CATTON: Okay. I understand, but  
8 that's the reliability part of it.

9 CHAIRMAN APOSTOLAKIS: Well I know that's  
10 reliability. I mean that was the way things were  
11 designed.

12 MEMBER POWERS: It seems to me that in this  
13 capsule phrase, they have done a pretty decent job of  
14 defining what they mean by defense in depth, not on this  
15 slide, on the one this morning.

16 I mean it is very much a structuralist point  
17 of view, as we have discussed in the past, as opposed to a  
18 rationalist point of view. But it looks like it's a  
19 pretty decent definition.

20 CHAIRMAN APOSTOLAKIS: Ivan missed the meeting  
21 in Boston.

22 MEMBER POWERS: That's right. He did. We  
23 discussed definitions of defense in depth.

24 MEMBER CATTON: So I'm an obstructionist.

25 MEMBER POWERS: They are structuralist.

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1 CHAIRMAN APOSTOLAKIS: I have another question  
2 though. Again, there may be a legal reason for this. But  
3 is it really common to have certain things in the SRP that  
4 are not in the Reg Guide?

5 For example, if I look at your second white  
6 bullet there, the probability of failure of each barrier  
7 is not significantly changed by the proposal. Now there  
8 is no mention of this in the Reg Guide. The Reg Guide  
9 just says that the -- it is? Where?

10 MEMBER SHACK: It will take me a while to find  
11 it.

12 CHAIRMAN APOSTOLAKIS: I think the Reg Guide  
13 says that the overall change should be small. It doesn't  
14 talk about the individual barriers. After all, what is a  
15 barrier. I mean there are a lot of things that are  
16 barriers.

17 MEMBER KRESS: Well, there's a change in the  
18 LERF, is a change in the probability of failure of one of  
19 the barriers.

20 CHAIRMAN APOSTOLAKIS: So barrier here means  
21 what? Oh those? The big ones?

22 MR. JONES: Right. In this section, we are  
23 talking barriers, are defined on page nine. Fuel  
24 cladding, pressure boundary, containment structure.

25 CHAIRMAN APOSTOLAKIS: Oh okay, so you mean

1 those specific ones.

2 MR. JONES: Yes. We're looking here on  
3 looking at them from again, just looking at the heavy  
4 components, in this part.

5 MEMBER CATTON: When you say barrier defense  
6 in depth, you mean in the sense that I say?

7 MR. JONES: Yes.

8 CHAIRMAN APOSTOLAKIS: That is not consistent  
9 with what Mark is saying.

10 MR. CHEOK: Mike.

11 MEMBER CATTON: A guy like me that's not used  
12 to all this stuff just gets confused.

13 CHAIRMAN APOSTOLAKIS: Well I get confused  
14 too.

15 MEMBER CATTON: You shouldn't.

16 MEMBER POWERS: You have to understand, the --

17 MR. JONES: Clearly a range of things that we  
18 will look at when we go through this, and talking for  
19 example of barrier defense in depth. We are not going to  
20 change the defense in depth design attributes for  
21 cladding. Unless somebody proposes a regulation change or  
22 we move down that path, the design requirements for the  
23 cladding barrier aren't going to be changed. It won't be  
24 by -- I want to say it won't be by this process. It may  
25 be eventually through this kind of a process that we would

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1 allow that to be relaxed, but under today's environment,  
2 we would still have to predict the cladding and the normal  
3 regulatory framework for the cladding that we currently  
4 have in place.

5 But when we look at a lot of the changes that  
6 we are looking at, we're looking beyond the traditional  
7 deterministic single failure type analysis and looking  
8 multiple barriers and impacts on plant safety. So defense  
9 in depth does have a much broader view. That's what we're  
10 bringing the PRA and these other concepts and constructs  
11 of what defense in depth is, to capture basically why  
12 defense in depth was put in there in the first place.

13 CHAIRMAN APOSTOLAKIS: Does any of this apply  
14 to any of the pilot studies?

15 MR. JONES: Yes.

16 CHAIRMAN APOSTOLAKIS: What?

17 MR. JONES: All of them. Their needs  
18 standards are going to be held up to --

19 CHAIRMAN APOSTOLAKIS: I know, but --

20 MEMBER CATTON: Did any of them play a role in  
21 the pilot study?

22 CHAIRMAN APOSTOLAKIS: If somebody wants to  
23 change the in-service inspection or testing, there are a  
24 number of elements in the minimal cut sets that will not  
25 be affected. Right? It is hard to see how the

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1 probability of failure of the major barriers wouldn't be  
2 affected by that.

3 MR. CHEOK: Correct. What we would see there  
4 is --

5 CHAIRMAN APOSTOLAKIS: All of these are  
6 automatically satisfied in the pilot programs. Maybe not  
7 automatically, but maybe after five minutes of --

8 MEMBER CATTON: Discussion?

9 CHAIRMAN APOSTOLAKIS: So we are really  
10 talking about something that is weighing to the future.

11 MR. CHEOK: What we would actually see there,  
12 and let's say for IST example. What you would use is, if  
13 you look at the cut sets, we would see that if all the  
14 elements of the same cut set are being proposed for test  
15 extensions, and if that could be a potential concern for  
16 common causes if all the elements of the same cut sets  
17 were being proposed for extended testing also.

18 CHAIRMAN APOSTOLAKIS: But presumably they  
19 will give you a probability for a failure -- they will be  
20 a probabilistic evaluation of the impact of that. So  
21 still, defense in depth doesn't really play a role in  
22 this.

23 MEMBER CATTON: That's right.

24 MR. RUBIN: I would certainly agree with you,  
25 but we can't rule out applications in the future. Someone

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1 may want to take out containment fan coolers, because of  
2 maintainability problems. I mean that's a major change,  
3 but these concepts certainly would have to be looked at  
4 very carefully.

5 CHAIRMAN APOSTOLAKIS: But we are talking  
6 about something that is not of immediate usefulness. I  
7 mean I don't see how any of the pilot plans will violate  
8 any of this. Because they are talking about changes in  
9 the operations really, extending intervals, doing things  
10 like that.

11 The minimal cut sets are essentially the same.  
12 The probabilities may change -- will change, not may  
13 change, will change. So that doesn't mean that you know,  
14 we should not scrutinize them, but I am just saying that  
15 we're discussing something that is not of immediate  
16 significance.

17 MR. JONES: That's probably fair.

18 CHAIRMAN APOSTOLAKIS: But I think it's fair  
19 to say that there will be some comments on this business  
20 of number of elements in the minimal cut set in February.  
21 Okay?

22 MR. CHEOK: Safety margins. In most cases I  
23 guess we have margins put in to begin with to account for  
24 some uncertainties in our analysis. If there are  
25 proposals to reduce the margins, we would need to look at

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1 what our understanding of the uncertainties are, and if  
2 this would allow us to reduce this margin.

3 I guess the second bullet there just basically  
4 tells us that these examples of what we can do to see  
5 margins are being reduced unacceptably.

6 MEMBER CATTON: This is always -- and again,  
7 this is probably not too important, but it's something  
8 that perplexes me.

9 When you talk about safety margins and  
10 enhancing or reducing them, this implies that you know  
11 them. What are you going to do about that? If you make a  
12 statement that the safety margin is a factor of two on  
13 pressure, but I really don't know that it's a factor of  
14 two. Now somebody comes in and says gee, I have done all  
15 this and it's a factor of two. I may well have reduced  
16 the safety margin. I may well have. I haven't reduced it  
17 below your perception, but I certainly have reduced it.  
18 How does that fit into all this? I think you need to  
19 qualify some of the terms.

20 The maintenance of perceived safety margins is  
21 something that I might be able to do. But I certainly  
22 can't maintain safety margins unless you are going to have  
23 a demonstration of where you are at now. This was one of  
24 the big problems that some countries have had with fire  
25 regulation based on performance. What the hell is

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1 neutral.

2 MR. JONES: I think the principle we're trying  
3 to meet is that sufficient margins are maintained. So I  
4 guess it's --

5 MEMBER CATTON: We don't know what sufficient  
6 is either. So somehow you need to figure out how to  
7 address this.

8 MR. JONES: It will have to be defined. I  
9 mean in many cases, that will be anticipated to be new  
10 codes, standards, or whatever. That it may have been  
11 developed based on new data.

12 MEMBER CATTON: Well, but I can't maintain a  
13 safety margin unless you tell me what it is.

14 MEMBER SHACK: Well, many times they are  
15 nominal as in the steam generator case, where the nominal  
16 factor of safety is three.

17 MEMBER CATTON: That's different.

18 MEMBER SHACK: But as long as you can  
19 demonstrate three, it doesn't matter whether it has  
20 decreased from five to three, as long as you have still  
21 got three.

22 MEMBER CATTON: That is a different kind of  
23 statement. If you say you have to maintain a safety  
24 factor of three, period, understand what that means. You  
25 can do better calculations. You can do all better testing

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1 everything, and if you have better than a factor of three,  
2 then you can reduce it. But here --

3 MEMBER SHACK: But his last two bullets are  
4 basically just telling him to do just that really.

5 MEMBER CATTON: If you tell me to maintain the  
6 safety margin --

7 MEMBER SHACK: Skip the maintain up at the  
8 top, because everything else is --

9 MEMBER CATTON: Well, reduction of margins.

10 MEMBER SHACK: Specs of change on safety  
11 margins. He's not really talking about maintaining them.  
12 He's talking about what safety margins he has to have.  
13 They are the ones that the code sort of specifies or the  
14 ones that they have been using in the CLB, whether they  
15 were the real safety margins or not.

16 MR. JONES: That's why the sufficient  
17 maintain. I mean it's whatever, you know, if the licensee  
18 proposes a change and it goes and impacts us, we're going  
19 to have to show that what's left at that point, whatever  
20 that new design change is, that the margin that's there is  
21 sufficient based on data review, actual plant history,  
22 whatever may be the relevant factors to do that.

23 MEMBER CATTON: So it's pretty soft.

24 MR. JONES: It will change with the  
25 application. It's hard to write a general document that

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1 covers all situations, so we tried to account for  
2 basically what we meant and what you need to consider.  
3 That's what we tried to do.

4 MR. ABBOTT: Does this have anything to do  
5 with the safety limits limiting safety systems setting in  
6 the LCOs or in the tech specs? Is that what we are  
7 talking about here in the margins? That are defined in  
8 those things?

9 MR. JONES: No. I think a good example was  
10 Dr. Shack's comment on the steam generator rule. God  
11 knows I'm not an expert on all the structural analysis  
12 margin criteria, but there's certainly as part of the rule  
13 debate as to we're trying to develop a performance base  
14 rule. In fact, we're trying to make sure it's consistent  
15 with this reg guide and SRP, and that the thing is  
16 tracked.

17 One of the issues that we're wrestling with is  
18 what is adequate safety margins on the design, and what is  
19 adequate defense in depth. Those are good examples where  
20 we are wresting with it, and there are questions as to how  
21 much do we want, you know, there are general design  
22 criteria that says the tubes shall basically stay together  
23 under normal design events. That sets up some defense in  
24 depth kind of principle, if you wish.

25 MEMBER CATTON: Well that's a good example,

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1 because the tubes replace the vessel and containment,  
2 essentially.

3 MR. JONES: Yes. At certain circumstances.

4 MEMBER CATTON: So this comment about primary  
5 barriers enters in a big way.

6 MR. JONES: Definitely.

7 MEMBER CATTON: A lot of these other things,  
8 it doesn't'.

9 MR. JONES: Right. And here is a case where  
10 you have -- first you have a set of what I would call  
11 normal design limits. I mean you are going to -- you  
12 don't want the tubes to fail in service, at some  
13 reasonable frequency of which a choice has been made. You  
14 may argue about the adequacy of that choice. We need to  
15 explain to you why it was chosen, how it was chosen, and  
16 how it represents a risk-informed judging.

17 Part of that is also what is the adequate  
18 safety margin upon which it's based. There is an ASME or  
19 industry document then saying it's 2.4 versus 3. I don't  
20 understand the arguments. It's not my area, thank God.  
21 But it's certainly something that we're looking carefully  
22 at.

23 There is a case we're trying to define what is  
24 the safety margins as codified in the codes, and how do  
25 you apply it in this rule. It's part of this whole risk-

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1 informed base.

2           Then you go on and take the tube to its next  
3 challenge, if you wish, which is a severe accident  
4 challenge. That is new. That is very much a risk  
5 informed challenge. Here we are looking at what kind of  
6 reliability do we need for the tubes given a severe  
7 accident in order because the tubes do play a special role.  
8 It does play basically a containment function role.

9           Here we are looking at how do you balance  
10 defense in depth on that. Do you put all your regs on  
11 assuring tube integrity, do you ensure just that you keep  
12 the frequency of the initiating event down. We're using a  
13 PRA type approach and we allow licensees to come up with  
14 how to resolve that in a risk-informed way.

15           So I have a set of performance criteria, if  
16 you wish, for what I would call design basis space with a  
17 check as to their adequacy in a risk perspective at the  
18 back end so that we -- to assure ourselves that we haven't  
19 given up too much in going to this performance based  
20 orientation from a risk standpoint.

21           I mean wrestling with those concepts which  
22 we're discussing here and having difficulty with the time  
23 explaining it, is exactly the wrestling that we continue  
24 to do in applying these concepts.

25           MEMBER POWERS: I can't resist on the steam

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1 generator tube, because I know you are following the  
2 advice we offered in our letter on that subject, that you  
3 are also looking at consequence mitigation there.

4 MR. JONES: Per our discussion with you  
5 earlier in the month.

6 MR. ABBOTT: Let me try an example. There's a  
7 safety limit on peaks and line temperature. That leads to  
8 limiting safety system setting on the containment pressure  
9 and when the diesel generators are supposed to start.

10 If I look at the safety analysis in was it  
11 chapter 15, and I go through all these machinations and  
12 all the computer codes and RELAP, it says that the diesel  
13 has to start in 10 seconds.

14 I do my PRA, and I find, and I look at the  
15 reliability data on the diesel generator and it says  
16 testing that component in a way that shows that it can  
17 start in 10 seconds is detrimental to the diesel.

18 How would that, I mean how would I approach  
19 changing that 10 second start time to show that even  
20 though I may perhaps be reducing my safety margins from a  
21 PRA risk perspective, it's a better thing to do.

22 Instead of having a 10 second start time, I  
23 have a 20 second start time and it relieves me from doing  
24 a lot of the testing and inspections that are done on the  
25 diesel.

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1 MR. JONES: Well, I think first off, you have  
2 to -- you first would need to make the case that change in  
3 the diesel start time --

4 MR. ABBOTT: I have done that.

5 MR. JONES: Makes sense from a risk  
6 perspective.

7 MR. ABBOTT: I have done that.

8 MR. JONES: I agree that you can probably do  
9 that. I am not arguing. I am just trying to say what  
10 would be part of what you would have to do.

11 You would have to then go through and look at  
12 the current regulations. I mean when you change this  
13 diesel, you're going to have lots of impacts.

14 MR. ABBOTT: Exactly.

15 MR. JONES: It's not just the safety analysis.  
16 There are lots of impacts.

17 When you get done evaluating that, you may  
18 find yourself with some -- you know, between a rock and a  
19 hard spot here and there. An example may be, you may run  
20 into a case where the regulations as currently  
21 constructed, say you do A, B, C, D, and it doesn't make  
22 sense from the risk perspective safety. Petition for a  
23 rule change. Petition for an exemption.

24 There are processes that are built in the  
25 regulations to do that.

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1 MR. ABBOTT: It's already there, isn't it?

2 MR. JONES: If it makes sense, we will process  
3 it and do the right thing from a safety perspective.  
4 These guidelines are basically saying that's what you need  
5 to do. Read current regulations or propose a change  
6 consistent with the regulatory framework.

7 MR. ABBOTT: So this SRP would be applied to  
8 that sort of application?

9 MR. JONES: Yes, sir.

10 MEMBER CATTON: Well, I guess the first step  
11 would be to do best estimate LOCA calculation.

12 MR. JONES: Could be.

13 MEMBER CATTON: That might give you the relief  
14 you need straight away.

15 MR. ABBOTT: Not a chance of getting it  
16 approved.

17 MR. JONES: We have approved one.

18 MR. ABBOTT: I take that comment back.

19 MEMBER FONTANA: You could change margins  
20 doing that, couldn't you?

21 MR. ABBOTT: Yes, exactly.

22 MR. JONES: And I mean you could argue that  
23 maybe there are some SRP changes that could be made, that  
24 could give you some operational flexibility, that you  
25 evaluate through here and just say yes, that's not how you

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1 currently interpret the regulations in your SRP, but this  
2 is a much -- this is a better way to do it. And why, and  
3 from its risk perspective, and argue why adequate safety  
4 margins are maintained.

5 Now I am going to also have to admit, I mean  
6 it's not -- we're not trying to suddenly open up the flood  
7 gates and say change the fundamental principles upon which  
8 this design is based. I don't anticipate that we're going  
9 to turn around and say you don't need to worry about  
10 center line fuel melts for setting core limits. I just  
11 don't see that happening overnight.

12 I am not sure I understand the big constraints  
13 on doing that, because I don't think as a general rule,  
14 that has a risk impact. I think however, things like  
15 messing around with diesel start times and reliability and  
16 better testing, that yes, those are things that we  
17 understand are safety significant, and a much broader way  
18 than that. We would clearly be ready to entertain those.

19 But some of the fundamental stuff that's down  
20 there, I mean we'll evaluate them case by case.

21 MR. GARRICK: I guess one of the problems I  
22 have is if you are reflecting -- if you are taking  
23 something like a steam generator tube and you are  
24 analyzing its capacity, and you represent that  
25 probabilistically, how can you not be in any situation

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1 other than understanding those sources of uncertainty?  
2 Otherwise, how do you represent the capacity with the  
3 distribution?

4 I'm not sure I understand. It sort of  
5 suggests here that you end up with a distribution in many  
6 situations, but you have no idea of what the basis is for  
7 that distribution. Anybody that's creating distributions  
8 like that ought not to be doing risk calculations.

9 MR. JONES: I do not mean to imply that.

10 MR. GARRICK: So then I am back to --

11 MR. JONES: But when you look at the steam  
12 generator rule, and it's a relatively complicated rule,  
13 and it's still evolving. I mean we had a meeting on it  
14 earlier this week. I have been trying to have a meeting  
15 the last few weeks. But you start with we have a  
16 regulatory framework which has been put together based on  
17 ensuring tube integrity. Certain engineering judgements  
18 were made in doing that, and certain margins of safety  
19 defined, certain inspection programs defined. I mean  
20 there's a whole construct of regulatory practice and  
21 inspection practices that's behind that. We're moving  
22 towards some kind of performance based regime.

23 As we move to a performance based regime, we  
24 have got to figure out how to translate some of this stuff  
25 into new inspection activities and other constraints,

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1 while still trying to preserve certain fundamental  
2 principles that we don't really want tube ruptures to  
3 occur every day, and back end on the other hand, we don't  
4 want tubes to be plugged when they don't need to be  
5 plugged. In trying to balance those perspectives and put  
6 that in the industry's hands and let them define what  
7 those distributions are, get the appropriate data to  
8 support it. I mean that's all part of the steam generator  
9 rule.

10           Those are going to set up a lot of fundamental  
11 principles about the integrity of the tube for normal  
12 operation. But then you have got to translate that later  
13 on into risk-based and its performance under high  
14 temperature, high pressure conditions. Those failure  
15 probabilities are going to change dramatically from where  
16 you are in normal design space.

17           So you are playing with safety margins at one  
18 end, for designing the front end of the tubes, in order so  
19 you can set up your inspection technology and concepts.  
20 Then making sure at the back end that what that leaves you  
21 with is acceptable from a risk standpoint.

22           MEMBER CATTON: Now we have talked about LERF  
23 and CDF. In this particular incident, the CDF has already  
24 occurred, so it's out of the picture. The only thing left  
25 is LERF. If you do the analysis right, I would bet you it

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1 doesn't impact it either.

2 MR. JONES: I would not agree with that.

3 MEMBER CATTON: I mean you have got all of  
4 that metal up on the top of the steam generator. You've  
5 got this tortuous path to get out. There's going to be  
6 some decontamination factor.

7 Right now, you open up the tube and dump the  
8 whole world outside, which is grossly conservative,  
9 grossly conservative.

10 MR. JONES: I understand. We've got that  
11 question from the --

12 MEMBER CATTON: So what the hell does this  
13 have to do with risk informed? It has nothing to do with  
14 it. I don't mind that it doesn't, but you ought to just  
15 say it.

16 MR. JONES: I am not sure I would agree with  
17 your statement, that's all.

18 Now that we've done the steam generator tube,  
19 I can tell Jack Strosnider all his problems are now  
20 solved.

21 MEMBER SHACK: He's got a general framework  
22 for it anyway.

23 MEMBER POWERS: Which includes consequence  
24 mitigation.

25 MR. GARRICK: So what you are really talking

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1 about here is the reduction in margin should appropriately  
2 reflect acceptance of the supporting evidence of the  
3 uncertainty analysis or of the risk informed analysis.

4 In other words, what was confusing me is that  
5 all risk analysis is, is an attempt to calibrate the  
6 margin, what the margins are. If you could calibrate  
7 those and you have a distribution that represents, for  
8 example, the capacity of the steam generator tubes, then  
9 as far as any action that you might take, it's just simply  
10 dependent upon your being convinced that that distribution  
11 is supported with the information by the evidence.

12 MR. JONES: Yes.

13 MR. GARRICK: So if risk informed here is just  
14 -- and you have been over this, I'm sure, is just a matter  
15 of calibrating these margins, a matter of turning up the  
16 microscope on --

17 MR. JONES: I am not sure I would agree with  
18 just turning up the microscope. But it certainly to the  
19 extent that as changes start to look at or reduce margins  
20 that will be looked at.

21 Again, recognize that this whole construct  
22 also has to fit within the regulations, and there are  
23 other portions of the regulations which may dictate  
24 certain safety margins that you may need to consider in a  
25 more traditional engineering approach.

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1 MR. GARRICK: But the risk informed component  
2 isn't calibrating them or turning up the microscope on  
3 what margins really are, then I am wondering why we are  
4 doing it.

5 MR. JONES: If it's part of the proposed  
6 change, it will be looked at.

7 MR. GARRICK: Okay.

8 MR. JONES: I can't suddenly say throw out the  
9 regulations.

10 MEMBER CATTON: Well, nobody is asking you to.

11 MR. JONES: As it is used to support a change  
12 in the regulations or implement the current regulations,  
13 if it reduces margins, the risk assessments will be used  
14 to help guide us and understand that the margins are  
15 adequate.

16 MEMBER CATTON: In this particular case though,  
17 and I think the steam generator tube is really a good  
18 example, you don't do a risk evaluation.

19 The actual probability of the tube failing  
20 under these conditions is uncoupled from the outside in a  
21 best estimate sense.

22 CHAIRMAN APOSTOLAKIS: The last time we saw  
23 it, it was uncoupled. We don't know what's going to  
24 happen.

25 MEMBER CATTON: That's certainly true, but

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1 from what I just heard, it ain't going to couple up any  
2 better.

3 MR. JONES: I'm not sure I would quite agree  
4 with you, but anyway --

5 MEMBER CATTON: And I don't have any problem  
6 with that. It just should be said.

7 CHAIRMAN APOSTOLAKIS: Let's talk about this  
8 when we discuss the steam generator rule.

9 MEMBER CATTON: I think in the last couple of  
10 viewgraphs that you have seen, the defense in depth and  
11 safety margin, that's the best example we have around. So  
12 they do have a pilot study underway.

13 CHAIRMAN APOSTOLAKIS: I see.

14 MEMBER CATTON: In that sense, I think you  
15 should discuss it.

16 MEMBER FONTANA: It's probably one of the most  
17 difficult areas though to try to practice on.

18 MEMBER CATTON: We didn't select the problem.

19 CHAIRMAN APOSTOLAKIS: I looked at the rest of  
20 your slides, Mike. It seems to me you are just saying do  
21 what the reg guide requires well. So I am proposing that  
22 we skip that very useful piece of advice, but for today,  
23 it's not -- unless a member has an objection or you have  
24 an objection.

25 MR. JONES: That's what the reg guide should

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1 basically do. I mean the SRP should do.

2 CHAIRMAN APOSTOLAKIS: Let's pick up the  
3 general discussion now and see if there are any issues  
4 that people may want to raise that will be helpful to the  
5 staff as they revisit this for the N'th time. So I don't  
6 think we need the projector.

7 Is that okay with you, Mike?

8 MR. CHEOK: That's fine.

9 CHAIRMAN APOSTOLAKIS: So let's spend I don't  
10 know, an hour and five minutes discussing these issues.  
11 Perhaps the best way would be to go around the table and  
12 see if any of the people sitting at the table have any  
13 issues they would like to raise.

14 Shall we start with Ed Abbott?

15 MR. ABBOTT: I knew you were going to say  
16 that. Yes, please.

17 I'll at least try and stumble through this if  
18 I can. Let me start with an example. Suppose I had a  
19 plant that had a breaker on a swing bus which was part of  
20 the original design that was approved, and allowed me to  
21 take a non-safety related bus that connected to a safety  
22 related power source.

23 In the process of operating the facility over  
24 the years, various things happened and I have an inspector  
25 coming in and he says that's a violation of separation

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1 criteria. Take it out.

2 In addition to that, you have been in  
3 violation of the single failure criteria for the last 10  
4 years. He pulls out the ticket and starts writing me up.  
5 There really isn't much argument that in fact, that is in  
6 fact true.

7 Now I look at my PRA and it says by taking  
8 that out, I have decreased the core melt frequency by --  
9 or increased it. It made the situation worse because now  
10 I have that power source is no longer available and that  
11 pump does in fact provide some cooling water to the core  
12 under certain circumstances. So that path is no longer  
13 available to me, because I don't have a power source to  
14 it.

15 So I am in non-compliance with the  
16 regulations. I am facing a fairly stiff fine. The risk  
17 of doing what I'm doing is in the wrong direction. Am I  
18 allowed, under this new regime here in the regulatory  
19 things that we've talked about today, to apply for an  
20 exemption while I'm still being -- I mean could I in the  
21 process of trying to get my arms around this problem apply  
22 to the NRC for an exemption to the single failure criteria  
23 or the separation of electrical equipment, whatever IEEE  
24 standard that is, that I am committed to, and expect to  
25 get it changed.

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1 MR. HOLAHAN: Well, let me start with the easy  
2 part. The first part is whether you confess or not.  
3 Apparently you are guilty in this case.

4 MR. ABBOTT: I'm guilty, absolutely.

5 MR. HOLAHAN: So whether we caught you or you  
6 confessed.

7 MR. ABBOTT: Right. I confessed.

8 MR. HOLAHAN: I think we have to do the  
9 enforcement and corrective action parts. So you have to  
10 pay for your past sentence. Okay? Whether we grant an  
11 exemption or not, you still sinned in the past. So you  
12 have got to pay for the past.

13 The question is, where do we go in the future.  
14 Now you have got to do something. You have a number of  
15 choices as to what to do. The simple choice is to fix, to  
16 put in this extra piece of equipment or whatever you need  
17 to do.

18 MR. ABBOTT: In order to comply with the  
19 regulations, I just pull the breaker out. I'm done.

20 MR. HOLAHAN: Okay. That's fine. So where it  
21 is possible to take what I would consider a corrective  
22 action, there's a choice. You just do that. Then you  
23 paid for your past sins and your future is acceptable.

24 It seems to me that you have a couple of  
25 alternatives. You can look at modifying the plant. One

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1 way of modifying the plant would be to leave this breaker  
2 in place and justify it being there. Okay?

3 When you want to modify the plant, you can  
4 subject that to a 5059 evaluation.

5 MR. ABBOTT: No, I can't. That's not an  
6 option because when I put it back in, I violate the single  
7 failure criteria or the separation criteria, whatever  
8 criteria is appropriate. So that's not an option.

9 MR. HOLAHAN: So in this case, that's not an  
10 option. Then you would want some sort of license  
11 amendment, or maybe in fact, if it really violates a  
12 regulation, you would actually have to get an exemption.

13 MR. ABBOTT: That's what I'm saying.

14 MR. HOLAHAN: Now I see nothing in the process  
15 that says you can't ask for that exemption. You still pay  
16 your fine, whatever it is for the past sins. You want to  
17 move forward with an exemption. I think you can do that.

18 The fact that you are a past sinner doesn't  
19 mean that -- has nothing to do with whether we approve  
20 something in the future. It's not one of our criteria.

21 Now you may have some pretty tough hurdles in  
22 convincing us that this meets those five principles and  
23 that you have got some good analysis that this is a  
24 sensible thing to do. But in terms of a process, I see no  
25 reason why you can't ask.

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1 CHAIRMAN APOSTOLAKIS: And use this process.

2 MR. HOLAHAN: And use this process.

3 Absolutely.

4 CHAIRMAN APOSTOLAKIS: But somewhere here, you  
5 say that the past performance of the licensee is a factor.  
6 So you would probably --

7 MR. HOLAHAN: I think I would want to know why  
8 he violated the regulations in the past, and whether I  
9 should be expecting him to you know, behave better in the  
10 future.

11 If this were some mistake, some oversight that  
12 I didn't think was replicated in numerous other places in  
13 the plant, then that's a different situation from some --

14 CHAIRMAN APOSTOLAKIS: Some intentional  
15 violation.

16 MR. HOLAHAN: Intentional or even negligent or  
17 whatever.

18 MR. ABBOTT: Well, I just, you know, if you go  
19 back and look at the documentation in the facility that  
20 was originally submitted to the NRC, it had that breaker  
21 in there. The license was submitted based on the  
22 information that was provided at the time, which included  
23 that breaker. Now the situations have changed in terms of  
24 interpreting what that particular plant configuration was  
25 at the time, as we look at it today in terms of separating

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1 equipment.

2 MR. HOLAHAN: Well it may also be that you are  
3 innocent. It may be that you proposed something that did  
4 not meet the regulations, that it was reviewed and  
5 approved and maybe it shouldn't have been, but was.

6 MR. ABBOTT: That's what I'm saying.

7 MR. HOLAHAN: Okay? If that's actually the  
8 case, then I think that you are not in violation of  
9 anything.

10 MR. ABBOTT: Okay.

11 MR. HOLAHAN Okay. Then we get into a  
12 discussion of well, if you proposed to stay that way and  
13 we proposed that you not, we are going to have some  
14 arguments as to -- there's a question of whose burden of  
15 proof it is to change the situation.

16 MR. ABBOTT: I understand that. Now what  
17 would happen if this increase in risk as determined by the  
18 core melt frequency, which has now been recalculated in my  
19 PRA, now it's above the safety goal. Now what? Does that  
20 have any bearing on what we do in the future or not?

21 I am in compliance with the regulations, but I  
22 am in non-compliance with the safety goal.

23 MEMBER CATTON: The backfit rule will take  
24 care of that easy if it's just pulling a breaker.

25 MR. ABBOTT: If I pull a breaker and it causes

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1 me to go above the safety goal.

2 MR. HOLAHAN: I am a little confused as to  
3 whose burden of proof this is. But let's just say it was  
4 in the context of something that we had to review and  
5 approve.

6 It seems to me that we would probably reject  
7 it. Or if you were proposing it, we would probably reject  
8 it. If you weren't proposing it, maybe we would force you  
9 not to do it.

10 If it's big enough to make you go beyond the  
11 safety goal, let's just say --

12 MR. ABBOTT: It was marginal to begin with.

13 MR. HOLAHAN: Well, I don't know. Is it just  
14 10 to the minus six, that just trickled you over the  
15 safety goal?

16 MR. ABBOTT: Just a little bit over.

17 MR. HOLAHAN: Is this significant? Is this 10  
18 to the minus five? Is this a substantial risk item? See,  
19 I think it makes a difference.

20 MR. ABBOTT: Okay.

21 MR. HOLAHAN: Not only where you are, but how  
22 big the change is.

23 CHAIRMAN APOSTOLAKIS: I think the message  
24 though is that the framework we've been discussing today  
25 can be used in this context.

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1 Now you guys are getting into the details of  
2 how much is a probability and so on. But I thought the  
3 original question was can I use -- and the answer is yes.

4 MEMBER CATTON: I think this is why you want  
5 this in place, so that you can.

6 MR. HOLAHAN: Yes.

7 CHAIRMAN APOSTOLAKIS: Anything else, Ed?

8 MR. ABBOTT: That's it.

9 CHAIRMAN APOSTOLAKIS: John, do you have  
10 anything?

11 MR. GARRICK: I haven't been here long enough  
12 to ask intelligent questions.

13 CHAIRMAN APOSTOLAKIS: The microphone.

14 MR. GARRICK: Let me carry that point just a  
15 little further. Suppose I had a plant that had a filtered  
16 vented containment system and I came along with a design  
17 of a containment spray pump that gave me the same benefit  
18 as my filtered vented containment system. Would this  
19 process allow me to make that tradeoff?

20 MR. HOLAHAN: I think this would be the proper  
21 arena for us to argue about that. Whether sprays and  
22 filtered vents both constitute the same sort of defense in  
23 depth mechanisms, I think could be argued.

24 I presume that your vent is passive and your  
25 spray system is active. So --

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1 MR. GARRICK: It's a diesel driven containment  
2 spray system, an independent system.

3 MR. HOLAHAN: Let's stipulate that it is  
4 technically as good and good meaning with respect to loss  
5 of off-site powers and all these sorts of things. Yes, it  
6 sounds like a reasonable thing.

7 MR. GARRICK: The filtered vented system cost  
8 me 100 million dollars. The diesel driven containment  
9 spray system may cost me 10 million dollars.

10 MR. HOLAHAN: Okay. Sounds like a reasonable  
11 tradeoff.

12 MR. GARRICK: So we could do those kinds of  
13 tradeoffs?

14 MR. HOLAHAN: I think so. I think this is a  
15 good arena for making that decision. And for example,  
16 because this is perhaps in some ways a more active system,  
17 maybe some performance monitoring. Maybe you want to test  
18 that diesel every once in a while just so that we all have  
19 confidence that what you assumed in that analysis is  
20 really taking place in the plant.

21 MR. GARRICK: I think that's good. I think  
22 that, and I apologize for not being here. But I think the  
23 real benefit of the risk-informed approach here is the  
24 calibration of the defenses in depth. Maybe finding  
25 alternatives that give you a much greater benefit, or a

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1 comparable benefit, but a less cost. I know you are not  
2 interested in cost, but we know there's a tremendous  
3 amount of different in the defense of a fuel element and  
4 the defense of a containment.

5 If you have a containment that you have  
6 calibrated in your risk assessment as having a capacity  
7 two to four times its design basis, you would like to  
8 think that the risk assessment would be a basis for you to  
9 take some credit for that.

10 CHAIRMAN APOSTOLAKIS: Mario?

11 MEMBER FONTANA: As I was reading these  
12 things, I did have some questions and comments as I was  
13 going through this. Some of these have already been  
14 raised. I'll try to skip those.

15 One that I think should not be skipped is the  
16 one that these appear -- the requirements appear to be in  
17 addition to existing requirements, for example, in  
18 maintaining the current licensing basis and so on. The  
19 question is, what is the incentive for the licensee to  
20 pursue this approach in addition to the existing  
21 requirements. That has been brought up and discussed  
22 some. That's going to come up again.

23 Another one, is how does one determine --

24 MR. HOLAHAN: Can I clarify? That item  
25 doesn't say you meet your current licensing basis in

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1 addition to these other things. You only have to meet the  
2 basic regulations.

3 MEMBER FONTANA: That was a distinction --

4 MR. HOLAHAN: You may be able to do it in a  
5 more flexible or you know, less rigorous way if you can  
6 justify it with some of those other bullets.

7 MEMBER FONTANA: Yes. There's another one  
8 which is kind of hard to get around. How does one  
9 determine quantitatively that defense in depth is  
10 preserved, and that sufficient safety margin is  
11 maintained, when you really can't define to start with  
12 what the safety margin is.

13 I know these are tough ones, and the approach  
14 you are taking is about as best as can be done in the  
15 context of what you have got.

16 Another question of what is the role of design  
17 basis accidents in the long-term here. Some of the design  
18 basis accidents are not risk significant, and yet the law  
19 requires that you do these things.

20 Do you have in mind over the long period of  
21 time gradually working away from the DBA or we'll just  
22 leave that the way it is I guess.

23 MR. HOLAHAN: I can comment on it. I think  
24 some people would like us to start with 10 CFR 50.1 and  
25 work through the whole set of regulations and re-write

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1 them all. Some people think that's not a bad idea.

2 MEMBER FONTANA: They figure you don't have  
3 enough time left.

4 MR. HOLAHAN: Well yes. We might not get to  
5 some of the more important ones for quite a while if we  
6 did it that way.

7 So at the moment, I think what we will be  
8 looking for is those regulations, design basis events,  
9 whatever, which are good candidates. That is, where there  
10 appears to be excess margin and excessive burden, or  
11 safety improvements at minimal cost, some combinations of  
12 those.

13 So I don't think we'll go out and wholesale  
14 redo the whole concept of design basis, although I can see  
15 that there may be some subjects for which that's worth  
16 doing.

17 However, in some ways, PRA is not a very good  
18 engineering tool. It's not very good for telling you how  
19 big a pump to make or how thick a pipe. So some sort of  
20 design basis events may be the easiest engineering  
21 solution to problems anyway. You still might do a design  
22 basis LOCA analysis to decide how big a pump as opposed to  
23 doing it from a PRA perspective.

24 MEMBER CATTON: Most people who -- again I  
25 speak strictly in the fire area, but where they had a

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1 performance based by itself, they are now going back and  
2 putting in the option to have the more traditional  
3 engineering. Just for that reason.

4 MEMBER FONTANA: Ivan, there's two things.  
5 One is if you have a plant already designed, then you can  
6 do the PRA on that design and you can probably change some  
7 of the design basis kind of analysis.

8 If you are starting from scratch, you have to  
9 have a design basis to design to. Then you got a plant.  
10 Then you do some probabilistic assessments and maybe come  
11 back and change some things. You have got to have a  
12 design basis to start with.

13 MR. HOLAHAN: I think we are more likely to  
14 address where there is some good reason to address the  
15 subject, to change the design basis as opposed to  
16 eliminating the whole concept.

17 CHAIRMAN APOSTOLAKIS: But in that case,  
18 Mario, PRA could be used to define the design basis.

19 MR. HOLAHAN: Yes.

20 MEMBER FONTANA: Yes, but in a way, it's kind  
21 of a chicken and an egg.

22 CHAIRMAN APOSTOLAKIS: Sure.

23 MEMBER FONTANA: You have to start somewhere.

24 CHAIRMAN APOSTOLAKIS: Yes. You have to start  
25 somewhere.

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1 MEMBER FONTANA: I mentioned before I had a  
2 concern with the estimation of LERF in the absence of any  
3 information other than CDF information.

4 MR. HOLAHAN: Yes. We ducked that one this  
5 morning.

6 MEMBER FONTANA: You ducked that one, but  
7 we're going to hit it later.

8 A clear definition of integrated decision  
9 making is not really apparent. It isn't that it's not as  
10 apparent. It's hard to determine how it's going to be  
11 reviewed and regulated.

12 You identified things that should go into  
13 integrated decision making, but then how do you know if it  
14 has been done right? The same thing applies to using  
15 expert panels to review things. You can say well here, I  
16 have identified the risk, an expert panel. So I check  
17 that criterion off. But there's a question of how do you  
18 review that they have really done a significant job.

19 CHAIRMAN APOSTOLAKIS: Well, the expert panel  
20 is not making the decision. Right? Is that expert panel  
21 an NRC panel?

22 MEMBER FONTANA: It's up to them. Probably  
23 external from what we were talking about before.

24 MR. HOLAHAN: Well, I think you are talking  
25 about two different things.

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1 CHAIRMAN APOSTOLAKIS: Yes. I think we are.

2 MR. HOLAHAN: There's expert panel. I think  
3 on the licensee's side, they have to decide if they have  
4 done a good integrated job of proposing something that  
5 makes sense. On our side, we have to do an integrated  
6 review to convince ourselves that this thing makes sense  
7 also.

8 At some of the earlier meetings, we talked  
9 about you know, whether Joe Murphy should review all of  
10 these himself, or whether we should have some sort of  
11 panel of people to do these reviews to see whether it's  
12 really getting an integrated look.

13 I think the first few reviews we do will be  
14 very thorough because they will be sort of pilot  
15 applications, and everyone will be interested. I don't  
16 think we have really figured out far down the road how you  
17 have sufficiently qualified people and how they work  
18 together to make sure that you are really getting the  
19 product you want out of using the reg guide and the SRP.

20 MEMBER FONTANA: We'll have to learn as we go  
21 along there.

22 MR. HOLAHAN: I think probably so.

23 MEMBER FONTANA: Yes.

24 CHAIRMAN APOSTOLAKIS: Plus, I think it's the  
25 nature of these panels, that you really don't want to

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1 prescribe to them how to make the decision. That's why  
2 you need the panel. So-called behavioral decision making,  
3 deliberative decision.

4 MEMBER FONTANA: As Ivan was saying, you are  
5 more likely to get a better panel if you identify some  
6 criteria and the kind of resources and kind of people are  
7 on it, what kind of capabilities are on it, rather than  
8 telling them what branch are you in.

9 CHAIRMAN APOSTOLAKIS: But again, I would go  
10 by performance. If the panel makes bad decisions, then  
11 it's a bad panel.

12 MEMBER FONTANA: There's one question relating  
13 in the standard review plan, there's a reluctance to allow  
14 for relaxation of multiple programmatic requirements on a  
15 given component. That's on page 20, paragraph two.  
16 Wouldn't that be an objective of risk informed regulation,  
17 as to reduce these programmatic requirements when it makes  
18 sense to do so?

19 The impression I got from reading this thing,  
20 it says you know, you've got to have the same requirement.

21 MR. RUBIN: It would make sense in some  
22 situations, but where we want to be cautious is not to  
23 destroy the underpinnings that are the basis for the  
24 inherent quality of reliability, availability of the  
25 component, the SSC, that's reflected in the PRA.

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1           If you make a change to the IST program and  
2 you model the test interval change, propagate that  
3 through, and come up with a CDF impact, that is predicated  
4 on the overall quality of that component, that may have as  
5 underpinnings part of the QA program.

6           So all we are saying is that we should be  
7 smart about the process so that we don't nibble away and  
8 end up with nothing supporting the quality of the item  
9 that we're looking at.

10           MR. HOLAHAN: I think this also goes -- I  
11 don't remember exactly the context of it, but isn't it --  
12 it seemed to me that the concern was was changing too many  
13 things too fast. It may be that you can make changes one  
14 at a time and allow yourself to get some experience in  
15 between. But if you change too many things at the same  
16 time, you may find out later on that you changed more than  
17 you wanted to.

18           So either you have to have a very good  
19 monitoring program, or you have to make changes in a more  
20 step-wise fashion.

21           MEMBER FONTANA: I think what I am hearing  
22 though is that changes are -- changes are allowable, given  
23 a good enough reason.

24           MR. HOLAHAN: The whole reason we're  
25 developing risk-informed regulation is because we expect

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1 to make changes.

2 MEMBER FONTANA: This relates to the  
3 programmatic requirements.

4 MR. HOLAHAN: Yes.

5 MEMBER FONTANA: So that was a question.

6 Finally, I read both things, you know, were fairly mostly  
7 I think they are really good documents. I think they are  
8 very good top level documents. Only in the application is  
9 going to be a lot of learning involved in actually  
10 implementing them and basically build up a case, a library  
11 of case studies, I presume. That's all I had.

12 CHAIRMAN APOSTOLAKIS: Okay.

13 MEMBER POWERS: Can I go back to the response  
14 on the slow kind of approach?

15 MR. HOLAHAN: I didn't say slow.

16 MEMBER POWERS: Step-wise. You make a step-  
17 wise change and you say okay, let's see if anything bad  
18 happens here. But how long did you have to look to see if  
19 anything bad happens? I mean I think you have a  
20 detectability problem here.

21 MR. HOLAHAN: I think it depends what you are  
22 monitoring. So I think it goes along with this element  
23 five, that says you should have a performance monitoring  
24 element to it.

25 If it's something under which you get a lot of

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1 experience and test data, fine. If it's something for  
2 which you are not getting any feedback, then I think it  
3 probably is slow.

4 MEMBER POWERS: So it is not a case of wanting  
5 to take small steps, but taking steps of a type that could  
6 be monitored.

7 If I take a step that can't be monitored, then  
8 I have to take little tiny baby steps. If I take  
9 something that can be monitored, then I can take big  
10 steps. That's not part of your principles, I don't think.

11 MEMBER CATTON: That is a part of a risk based  
12 approach.

13 MR. HOLAHAN: I think it is part of the  
14 principles.

15 MR. JONES: I think it's the fifth principle.  
16 It says performance based implementation and monitoring  
17 strategies are proposed that address uncertainties and  
18 analysis models and data and provide for timely feedback  
19 and corrective actions.

20 MEMBER POWERS: But it seems to me that if  
21 that's really part of your thinking, I know you guys will  
22 never put up another figure as long as you live, but there  
23 is another figure that says monitoring interval delta CDF  
24 plot with an allowed or contour map of allowed steps that  
25 seems like it ought to appear here someplace, words if not

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1 hidden, in drawing.

2 MR. KING: There is an item we call an  
3 expectation that says increases in CDF and LERF will be  
4 small. That's not a principle, but it's one of the sort  
5 of sub-elements under the principle.

6 MEMBER POWERS: And that's the one that I  
7 think is not the case. I mean first I thought it was the  
8 case, then Gary tells me no, that I can take a much bigger  
9 step. I can have a big CDF if I get a lot of feedback  
10 from it very quickly.

11 MR. HOLAHAN: Well, maybe you interpreted my  
12 big as being bigger than I intended it to be. I mean you  
13 still have the other principles on -- as a matter of  
14 principle, we would like the changes to be small, even  
15 when you can monitor them. But maybe it allows that next  
16 step to come sooner.

17 MEMBER POWERS: So the frequency with which I  
18 can resubmit or submit again is tied to my monitoring  
19 capabilities?

20 MR. HOLAHAN: I would say our receptiveness to  
21 making another change is in some way based on whether we  
22 think you are succeeding at the last change.

23 MEMBER POWERS: Is that clearly articulated?  
24 You do allow people to package.

25 MR. KING: We'll talk about the cumulative

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1 effects that you can consider.

2 MEMBER POWERS: And when they think about  
3 packaging, they should think about these guys are going to  
4 be looking for how well you did. So package things  
5 together that you can monitor. Not for this particular  
6 submission, but for the next one that follows it.

7 It seems to me that if that's the case, you  
8 ought to be fairly explicit about that.

9 CHAIRMAN APOSTOLAKIS: Mike?

10 MR. MARKLEY: My question was related to  
11 Dana's, about how you record the history for future use.  
12 I guess I am kind of curious why there aren't provisions  
13 for BTPs as opposed to future updates for the SRP, when it  
14 seems to me that that would be a forward looking way of  
15 documenting it and putting it into the system.

16 MR. JONES: I guess let me comment.

17 MR. HOLAHAN: Whenever they all look at me, I  
18 get nervous.

19 MR. JONES: I have an answer, Gary. Then you  
20 can --

21 MR. HOLAHAN: Oh good. I didn't understand the  
22 question.

23 MR. JONES: I have a mix on the question. But  
24 I think one of your comments is first about how are we  
25 going to monitor and follow changes in risk, I think is

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1 one of the essence of your questions.

2           It's a good question, and it's something the  
3 Commission has directed us to respond to under the SRM.  
4 So we're going to have to develop that concept further and  
5 system over the next six months or so, at least the  
6 initial thinking on it, on how we will accomplish that.  
7 But monitoring tracking cumulative risk increases is one  
8 of the things, cumulative risk changes, is one of the  
9 items that's in the SRM.

10           Now the other comment on how do you maintain -  
11 -

12           MR. HOLAHAN: But on that first one, it seems  
13 to me that we're going to have to develop some sort of  
14 data base. Now I mean we already keep copies of our  
15 safety evaluations. All of these branches keep them on  
16 the -- as a matter of fact, they are on our home page on  
17 the Internet. But they are not done in such a fashion  
18 that you can track an individual plant and see which  
19 change occurred when in numerical delta CDF or something  
20 like that associated with it.

21           So we will probably have to develop some data  
22 base that we wouldn't have kept in the past.

23           MEMBER POWERS: I think that what I was asking  
24 about, this is a large judgmental component in this. How  
25 does one develop judgement? It's only from experience,

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1 and experience of others. Do you want to have that  
2 experience base accessible in something that parallels  
3 your standard review plan, because I derive judgements on  
4 metallurgical issues from events that have taken place in  
5 connection with I&C issues. I mean it doesn't have to be  
6 a metallurgical issue where I develop judgement.

7 So it may well be in your education and  
8 training program is the appropriate vehicle for doing it.  
9 That they are the ones that keep the -- when you have to  
10 make judgements on the dependence on programmatic areas,  
11 here are the case studies where people have drawn a  
12 conclusion on this. It may be in your education and  
13 training program that you do that. That may be the most  
14 effective place to do it.

15 MR. HOLAHAN: Or maybe the SRP just needs a  
16 reference to tell people to go to another data base,  
17 reference library. My recollection is it's not unusual at  
18 all for the standard review plan to say that the reviewer  
19 should go and see how a decision was made on the previous  
20 plant.

21 MEMBER POWERS: I wish the standard review  
22 plan would say that more often.

23 MR. HOLAHAN: I think maybe it belongs in the  
24 standard review plan too. Since the Commission has told  
25 us there ought to be in effect a data base of these

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1 things, that there's an obvious thing to reference.

2 CHAIRMAN APOSTOLAKIS: Mike, are you done?

3 MR. MARKLEY: Yes.

4 CHAIRMAN APOSTOLAKIS: Tom?

5 MEMBER KRESS: I too thought these were good  
6 documents. There was one thing I wanted to ask about on a  
7 defense in depth, page eight of the standard review plan.

8 It talks about independence, redundancy,  
9 diversity and systems important to safety. If you are  
10 going to maintain this commensurate with the frequency of  
11 challenges to the safety function and the consequences of  
12 function A, which I think is a good principle, I don't  
13 know how you are going to quantify that.

14 Is there already an algorithm that says if you  
15 have a system that's important or a function that's  
16 important to safety, and if it fails, I have real  
17 consequences, then my level with diversity and redundancy  
18 will be this?

19 I am not quite sure how this part, that  
20 particular bullet will be implemented, unless you already  
21 have some knowledge of what that relationship is.

22 When do I start relaxing independence,  
23 redundancy and diversity, at what level of frequency of  
24 challenge or what level of consequence?

25 I am suffering with the word commensurate.

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1 MR. JONES: Well, I think the commensurate was  
2 partly to recognize that there is clearly differences  
3 between systems in the plant on how they put together on  
4 their expected probability and what backup systems you  
5 have.

6 The reactor vessel being the most notable of  
7 it, there's not much behind the reactor vessel if it  
8 fails. The consequences of its failure is not small  
9 necessarily, but on the other hand, its frequency of  
10 failure is remote because of all the other design  
11 considerations.

12 Now if somebody was to change how they wanted  
13 to design a vessel or maintain or inspect it or whatever,  
14 we would have to look at that and we would have to  
15 understand where are we for that component. Obviously  
16 significant, right relaxations that might affect the  
17 potential for vessel failure would not likely be  
18 acceptable.

19 Now other systems have balance between other  
20 components to mitigate it, so you can allocate the risk if  
21 you wish over different systems and components. So as you  
22 make certain changes, their impacts are muted. This was  
23 to try to capture just that recognition, that fact. That  
24 certain things when they fail, there isn't much behind it.  
25 You need to assure low probability of failures and to

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1 recognize low end to that spectrum.

2 So we don't say its' a black and white, you  
3 have got to have three systems to prevent core damage.  
4 It's some recognition to its challenge, the consequences.

5 MEMBER KRESS: What I'm hearing is that it's a  
6 judgement call.

7 MR. JONES: Absolutely.

8 MR. HOLAHAN: It's a judgement call.

9 MEMBER KRESS: No real quantifying  
10 correlation.

11 MR. HOLAHAN: No. But I think it's also  
12 related to, if I remember the other bullets in this list.  
13 The first one having to do with the reasonable balance  
14 among core damage prevention and containment failure and  
15 consequence mitigation.

16 I think that's a very similar issue. So I  
17 think --

18 MEMBER KRESS: But you already know what that  
19 reasonable balance generally is. It's your LERF CDF.

20 MR. HOLAHAN: And usually when you are talking  
21 about system redundancies, it has to do with one of those  
22 barriers. I think it's a core damage concern.

23 So if there is a station blackout kind of  
24 frequency, which you think of as maybe 10 to the minus one  
25 to 10 to the minus two, then you have a general idea that

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1 you probably need more than a single system to respond to  
2 such a thing. You do need some level of redundancy.

3 MEMBER KRESS: Suppose that was 10 to the  
4 minus three?

5 MR. HOLAHAN: Well then it's getting to be  
6 questionable about whether you need that second system.  
7 When it gets to be 10 to the minus four --

8 MEMBER KRESS: It's still a judgement, where  
9 ever you are.

10 MR. HOLAHAN: It's judgmental, yes.

11 MEMBER KRESS: So that would be once again, a  
12 case study.

13 MR. HOLAHAN: Yes.

14 MEMBER POWERS: Let me ask you a question,  
15 Tom. How do you feel about when we identify these things  
16 that are very judgmental, and there's a limited amount of  
17 standards, bear that judgement, to establish that  
18 judgement right now, I mean how do you react to that?

19 MEMBER KRESS: Well, I have several kinds of  
20 reactions. If I put on my hat as a licensee, I am  
21 concerned about getting different judgements at different  
22 times and different applications.

23 If I put on my ACRS hat, where I recognize  
24 that this is done all the time, and is almost a necessary  
25 element to the process, that you build up level of

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1 judgement and experience based on doing it over and over  
2 and over again, and that there is sort of a case history,  
3 that eventually everybody comes to realize what the  
4 judgement level is going to be generally like, then I  
5 don't worry about it too much.

6 But as an engineer, it worries me when I see  
7 things that lie heavily just on judgment, not because I  
8 don't trust these guy's judgment, I'm just not sure  
9 they'll be around 20 years from now.

10 MEMBER POWERS: Guys that have thought about  
11 it very carefully right now that will participate in the  
12 first few cases far more than they will in subsequent ones  
13 probably have a good basis for developing a judgment. It  
14 is when you come into the more mechanical operation where  
15 the penalties for making an error in judgment are rather  
16 severe, that you're liable --

17 MEMBER KRESS: Tend to come down on a very  
18 assertive side. It may defeat the purposes.

19 MEMBER POWERS: What I worry about is it makes  
20 it unattractive. Sure makes it unattractive to be one of  
21 the first few in here. There's no Reg. Guide  
22 traditionally based on the idea that we have a rule, kind  
23 of vague, says to do some things and if you do it like  
24 it's described in the Reg. Guide, and you do it well, the  
25 staff will find that acceptable. Now you don't have that

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1 assurance of acceptability.

2 MEMBER CATTON: I guess what you have to do  
3 could change, couldn't it, depending on which reviewer  
4 happens to be handling what you've put on the table.

5 MEMBER POWERS: Yes.

6 MR. HOLAHAN: That's not our intent.

7 MEMBER CATTON: I know that's not your intent,  
8 but it's certainly real.

9 MR. HOLAHAN: Well, it remains to be seen what  
10 level of control you have to put on such a thing.

11 MEMBER CATTON: If it makes the SRP all the  
12 more important, if it makes the SRP important.

13 MR. HOLAHAN: If we were to see that were a  
14 problem and I think there are a number of mechanisms that  
15 we could use, in the enforcement area, for example, when  
16 you see that we're having a problem with some issue. I  
17 remember back to equipment qualification in the mid-80s  
18 when the rule went into place, as we're doing currently  
19 with the maintenance rule when we're starting up a new  
20 inspection program, what you do is you put together a  
21 panel of people, so you have consistence in judgment and  
22 they deal with all of the cases. So they are not the  
23 reviewers of every case and they're not the inspectors of  
24 every plant. But when a proposed decision is to be made,  
25 it's run through that same panel. So it assures some

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1 level of consistent judgment.

2 Now I'm not sure that ahead of time we have to  
3 decide that we need such a panel or some other mechanisms,  
4 but if this turns out to be problematic, you know, there  
5 are not so difficult mechanisms for dealing with it.  
6 Among other things, I think licensees have been known to  
7 complain if they don't like the treatment.

8 MEMBER POWERS: Surely not.

9 MR. HOLAHAN: I can even recall the ACRS  
10 occasionally criticizing the staff when it thinks our  
11 judgments have gotten a little bit off the beaten track.  
12 So life in the fishbowl means there are lots of  
13 opportunities for us to have people looking over our  
14 shoulder if this thing doesn't seem to be turning out the  
15 way we seem to be suggesting.

16 MEMBER KRESS: I was even wondering whether  
17 George Apostolakis might have jumped in and said hey, that  
18 bullet is already taken care of by the PRA and your delta,  
19 allowed deltas, but he didn't, so I don't know.

20 MR. GARRICK: Yes, why didn't you, George?

21 CHAIRMAN APOSTOLAKIS: It's criticism, John.

22 MEMBER BARTON: I compliment you for the work.  
23 I just hope the industry recognizes that there is benefit  
24 to this process and utilizes it. It's a hell of a lot of  
25 effort going in there.

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1           One thing I'm not clear on is and I think you  
2 mention, I'm not sure I understand, temporary changes are  
3 dynamic plant runs, somebody has to make a temporary  
4 change. Do you go scope without engine, do you go through  
5 your safety review process and you do preliminary  
6 evaluations, safety evaluations. It doesn't turn out to  
7 be a big deal. What's the threshold, where do you see  
8 that you need to approve or get involved in the variation  
9 of plant changes?

10           MR. HOLAHAN: If it'll pass 50.59. Are you  
11 going to do it on your own? Okay, done. We don't need to  
12 be involved.

13           MR. JONES: That's part of it. I think  
14 Professor Apostolakis has mentioned need or potential need  
15 to add some temporary change, guidance if you wish, or  
16 instantaneous change, guidance into the documents.

17           MR. HOLAHAN: Or license them in.

18           MR. JONES: Or license them in. My earlier  
19 comment was what we have done is in the area of tech.  
20 specs, there are allowed outage times and allowed outage  
21 times in the sense are like a temporary plant change. So  
22 many hours, a piece of equipment is out and so we have in  
23 order to develop an acceptance criteria for that, it  
24 doesn't quite work out with the general framework as far  
25 as looking at the deltas over the whole operating period.

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1 We also decide that we need to look at the specifics of  
2 the change and its impact on the time so we have  
3 essentially, if you wish, a temporary change definition or  
4 acceptance criteria in that document to help us do AOTs.

5 But we didn't think it was appropriate because  
6 we weren't sure, like Gary said, most of the temporary  
7 change is not something that we would necessarily review  
8 and approve. So we did not develop such guidance at this  
9 point. It's a question of whether we need to go further  
10 than that.

11 MEMBER BARTON: Okay.

12 CHAIRMAN APOSTOLAKIS: Bill?

13 MEMBER SHACK: Very good document. It would  
14 use a diagram.

15 MEMBER POWERS: We need this figure.

16 MR. HOLAHAN: You could take that up at the  
17 time of writing your letter.

18 CHAIRMAN APOSTOLAKIS: Actually, I drew one  
19 myself.

20 (Laughter.)

21 If I could understand what you are --

22 (Laughter.)

23 MEMBER BARTON: But they're not allowed to use  
24 it.

25 MEMBER POWERS: Well, a lot of things have

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1 been brought up. I think that I continue to be concerned  
2 that when we go to take the safety goals and apply them to  
3 specific plants that we do not now have an adequate set,  
4 that I don't really understand where the 10 to the minus 4  
5 and 10 to the minus 5 came from, but that's not my concern  
6 right now. My concern is I think that when we go to plant  
7 specific applications, probabilistic safety goals, that we  
8 cannot ignore this time excursions of risk and it's not  
9 part of this document, I don't think. I think it's  
10 something that the Commissioners are going to have to  
11 think about, is how they want to limit time excursions.

12 We right now have the effective limit that you  
13 get from the integral of a delta function and that's what  
14 you've done in your allowed outage times.

15 I wonder if that's what they really want to do  
16 because that means that you could have some  
17 extraordinarily high risk situations for short periods of  
18 time and that can be exploited and I think that  
19 exploitation is something that concerns me a great deal  
20 because I think it's during those periods of excursions  
21 and risk, our ability to quantify risk really approaches a  
22 minimum.

23 MR. HODGES: That's why we want to have  
24 defense-in-depth in there.

25 MEMBER POWERS: Absolutely, that's why it's in

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1 there, for us structuralists, Wayne, that's why it's in  
2 there. The rationalists have another problem.

3 (Laughter.)

4 But I think it's something that we, as a  
5 committee, the full committee, not necessarily this  
6 subcommittee, but we as a full committee are going to have  
7 to decide do we want to bring this issue up with the  
8 Commission and knowing full well that if we do, we're  
9 going to have to have an answer or a suggestion for them  
10 in this area.

11 At the very minimum, we need to decide if we  
12 want to bring it up as something that they should be aware  
13 of that exists right now.

14 MEMBER KRESS: But you do think it's separable  
15 from this --

16 MEMBER POWERS: I think that it would be an  
17 unwarranted delay to bring up a new kind of safety goal to  
18 people who have struggled heroically just to handle the  
19 one set we've got right now. I wish that there was a  
20 clear, to me at least, path by which we came up with 10 to  
21 the minus 4 CDF and now this 10 to the minus 5 LERF that  
22 is, whose definition is a little obscure to me a little  
23 bit and the -- I can recall at one of our previous  
24 subcommittee meetings that we've seen some of the European  
25 breakdowns in the subsidiary safety goals they've

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1 established for systems and they've done a much finer  
2 breakdown in that and you can't help but say why didn't we  
3 do a finer breakdown. If 2 is good, why isn't 5 even  
4 better? And that question comes up and I just don't know  
5 the answer to it.

6 At the same time, I keep hoping that a final  
7 breakdown would get us ut of this box that I think we're  
8 headed into where we're asking an industry to do analyses  
9 they really can't do.

10 I am persuaded that the routine, confident  
11 approval licensable analysis is a Level 1 PRA and every  
12 time you ask them to go on beyond the Level 1 PRA, even in  
13 a qualitative sense, you are simply getting into an area  
14 that's fraught with lots of debate, lots of discussions,  
15 lots of judgment, where the licensee has the difficulty.  
16 He doesn't know how that debate is going to come out.

17 You cannot anticipate this is an acceptable  
18 practice.

19 MR. KING: Can I comment on that? We have not  
20 decided that we don't need an element on temporary change  
21 in risk.

22 MEMBER POWERS: I understand that. that's up  
23 for discussion.

24 MR. KING: It's up for discussion. The  
25 Federal Register notice will raise that as an item that we

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1 want comment on regarding is it needed and if so, what  
2 would appropriate criteria be.

3 I guess if the committee feels that that is  
4 something that ought to go in this version that goes out  
5 for public comment, that's an important comment. The  
6 sooner we find that out, the better it will be. But we  
7 are going to point out to the Commission that that's  
8 something that's still undecided. We're soliciting public  
9 comment and we're going to have to decide on the final  
10 version later this year, what do we do in that area?

11 CHAIRMAN APOSTOLAKIS: Okay, well, I think we  
12 have to spend the next 5, 10 minutes deciding we'll cover  
13 in the committee meeting. I understand we have two hours  
14 on Friday, the 7th?

15 Any suggestions? Well, first of all, from the  
16 staff, what do you think we should cover? We will have  
17 the documents by then? No?

18 MR. KING: We're hoping on February 6th to  
19 have the rest of the documents to you. So while you're in  
20 town for the full committee meeting --

21 CHAIRMAN APOSTOLAKIS: Okay.

22 MEMBER POWERS: I will pre-empt the comments  
23 just to say that you have two alternatives, it seems to  
24 me, George. You can have them present a digest that now  
25 most, a substantial fraction of the members have heard or

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1 you can utilize the time to summarize and discuss how we  
2 should respond and what actions we should be taking.

3 CHAIRMAN APOSTOLAKIS: Or both.

4 MEMBER POWERS: Or both.

5 CHAIRMAN APOSTOLAKIS: Then we have a two-day  
6 meeting coming up on the 20th.

7 MR. HOLAHAN: But remember, the two-day  
8 meeting will have additional subject matter --

9 CHAIRMAN APOSTOLAKIS: Yes.

10 MR. HOLAHAN: With the application specific  
11 and some of the appendices.

12 CHAIRMAN APOSTOLAKIS: Also, my understanding  
13 is that the full committee meeting, we will have four  
14 consultants showing up, is that correct?

15 MEMBER KRESS: Yes, but not necessarily for  
16 this subject.

17 CHAIRMAN APOSTOLAKIS: I think they are coming  
18 to the full committee meeting, is that correct?

19 MEMBER KRESS: Yes.

20 CHAIRMAN APOSTOLAKIS: We can change it if we  
21 want?

22 MEMBER KRESS: Not necessarily for this  
23 subject.

24 CHAIRMAN APOSTOLAKIS: They have the documents  
25 that we have. They were asked to review them. Tom Early

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1 and Jay Carroll.

2 MEMBER KRESS: I'm sorry, you're right. I'm  
3 sorry.

4 CHAIRMAN APOSTOLAKIS: Okay.

5 MR. HOLAHAN: I've heard those names.

6 CHAIRMAN APOSTOLAKIS: Well, what would it  
7 take for us to close the subject of NUREG -- NRG 1061 and  
8 the SRP section we discussed today? Shall we have a very  
9 short presentation from you so that will give an  
10 opportunity to the consultants also to jump in if they  
11 have any comments?

12 Perhaps changes that you may make will -- and  
13 then maybe not review the same documents at the 20th, at  
14 the next meeting.

15 MEMBER SHACK: I don't know about this  
16 calculation of the LERF when you don't have a Level 2. I  
17 don't think it's going to have wide applicability. This  
18 is presumably one of the ways they're going to do it.

19 That is really going to change from the  
20 appendices we've seen. I mean maybe you wouldn't know.

21 MR. CUNNINGHAM: That particular appendix is  
22 not changed and we kind of assume that would discuss that  
23 at the subcommittee meeting on February 20th or 21st.

24 CHAIRMAN APOSTOLAKIS: Not the other thing, of  
25 course, coming back to Dana's concern, the industry

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1 document does use the LERF, so evidently the guys who  
2 wrote it don't feel that the industry has a problem  
3 calculating LERFs.

4 MEMBER POWERS: The question is can you  
5 calculate one that the staff will find acceptable?

6 CHAIRMAN APOSTOLAKIS: Yes, that's true.

7 MEMBER POWERS: I'm just very, very concerned  
8 that you get into a position where the technology is not  
9 universally agreed to there. We only have to look at the  
10 AP600. Right now, where they're taking exceptions to  
11 NUREG-1465. I mean they're -- the staff has codified  
12 their technical thinking about as well as they ever have  
13 in the area of source term and the industry is taking  
14 exception to it. So I mean it's obvious an area fraught  
15 with lots of debate.

16 CHAIRMAN APOSTOLAKIS: Does the industry want  
17 to comment on that? The industry has to make a LERF that  
18 would be accepted by the NRC staff.

19 (Laughter.)

20 MEMBER CATTION: Of course.

21 CHAIRMAN APOSTOLAKIS: Well, what I propose is  
22 the following then. Have a short discussion of the Reg.  
23 Guide and the SRP. Shorter than what you guys presented  
24 today.

25 MR. HOLAHAN: Half an hour.

1 CHAIRMAN APOSTOLAKIS: Yes, maybe use it as an  
2 opportunity for people to ask questions, especially the  
3 two new gentlemen who are coming to ask questions. Then  
4 perhaps discuss two or three issues that are still  
5 important. One is what Dana just raised on the LERF.  
6 Surely it would be nice to hear from NEI on that. That's  
7 their business.

8 I think associated with LERF is this issue of  
9 whether we want it to be a universal number, a goal, or  
10 derive it for each plant. It's not something --

11 MEMBER KRESS: That would be something that I  
12 would --

13 CHAIRMAN APOSTOLAKIS: Yes, because this  
14 particular guide, 10 to the minus 5 is a number, although  
15 after Rick's presentation that doesn't sound too bad to  
16 me. It seems like the five plants, NUREG 1150 more or  
17 less are there under, as I remember, but anyway that may  
18 be something that we want to also raise.

19 I still think we need to discuss the issue of  
20 defense-in-depth and its role.

21 MEMBER CATTON: Judgment and its role.

22 CHAIRMAN APOSTOLAKIS: That's another issue,  
23 but defense-in-depth and maybe see if we can come up with  
24 some guidelines that would limit its use when it's  
25 appropriate. And the issue of safety modules that Ivan

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1 and Mario raised, how do you maintain something that you  
2 don't know. What its value is. So these are important  
3 issues I think to discuss.

4 The issue of temporary changes, I do not know  
5 how much you can do about that, but maybe we can have your  
6 current thinking at the time only to remind us in case  
7 there is a discussion and when do you plan to do something  
8 about it.

9 Temporary changes now, I think that means a  
10 lot of things, doesn't it?

11 MR. ABBOTT: It means a lot of things.

12 CHAIRMAN APOSTOLAKIS: I mean, it includes  
13 shutdown estimates of risk.

14 MR. KING: Things like tech specs which are  
15 really temporary changes when you go into an action  
16 statement. You're only in there for a short period of  
17 time. We're dealing with those on an annual average basis  
18 in terms of looking at the risk. We don't really have any  
19 in our pilot applications, any temporary change in risk  
20 that's being proposed. They're all being proposed as  
21 permanent change.

22 That's another reason we haven't really faced  
23 up to it at this time.

24 MR. JONES: Tom, tech specs AOTs we do have  
25 and we are looking at the temporary effect as part of

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1 that.

2 CHAIRMAN APOSTOLAKIS: And the issue of  
3 judgment that Ivan raised in the sense that the expert  
4 panel -- is that what you mean?

5 MEMBER CATTON: I have a pressure problem. I  
6 guess there are two parts to that. It's the peer review  
7 that's used by the applicant for a change and also its  
8 equivalent within the staff.

9 CHAIRMAN APOSTOLAKIS: Yes.

10 MEMBER CATTON: What are you going to do in  
11 the long term?

12 CHAIRMAN APOSTOLAKIS: Okay.

13 MEMBER CATTON: In that regard.

14 CHAIRMAN APOSTOLAKIS: I think those subjects  
15 will probably eat up the two hours, huh?

16 MEMBER POWERS: Is there a point in our  
17 discussions in this, either full committee meetings or  
18 subcommittee meetings where we understand all the various  
19 topics that in fact get addressed in the pilot  
20 applications?

21 Issues of judgmental character, for instance,  
22 things like all the things that we're going to get, the  
23 pilot applications give us some insight on.

24 CHAIRMAN APOSTOLAKIS: We never really  
25 discussed that.

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1 MEMBER POWERS: Whether in reality or in hope.

2 CHAIRMAN APOSTOLAKIS: We know what the pilots  
3 are about. I don't think we ever got into the actual --  
4 how these principles, for example, applied to each pilot  
5 and what you learned from each. I don't think we've done  
6 that. Have we?

7 MEMBER POWERS: I think we asked to do that at  
8 our first meeting and it's never been pursued.

9 CHAIRMAN APOSTOLAKIS: Yes.

10 MR. JONES: I think my earlier comment was one  
11 of we've been working on the pilots and in all honestly,  
12 moving up and down and in and out of the process as the  
13 process has also been evolving and the ground rules have  
14 changed as we've gone through, so it's not -- we haven't  
15 given you that kind of a presentation and certainly as we  
16 go through the application specific guidance documents, I  
17 think we could easily point out how we're using the pilots  
18 to help us out on that.

19 CHAIRMAN APOSTOLAKIS: Would it make sense to  
20 spend a few minutes next time or on the meeting of the  
21 20th telling us what you have learned regarding each  
22 element here, what you have learned so far from the  
23 pilots?

24 MR. JONES: To the extent that we can, yes, I  
25 think we can do that.

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1 MR. HOLAHAN: I think we can do that, but I  
2 don't think it fits in the time frame for the February --

3 CHAIRMAN APOSTOLAKIS: For the February  
4 meeting.

5 MR. HOLAHAN: Yes.

6 CHAIRMAN APOSTOLAKIS: Well, for the full  
7 committee meeting, I guess if somebody asks a question you  
8 can always answer.

9 MR. KING: The 7th is what we're saying.

10 CHAIRMAN APOSTOLAKIS: We'll do it on the  
11 20th.

12 MR. HOLAHAN: Yes, and it might make sense  
13 also for the 20th since we're talking about the  
14 application specific guides.

15 CHAIRMAN APOSTOLAKIS: Yes.

16 MR. HOLAHAN: And the experience is on the  
17 comparable pilot activities.

18 CHAIRMAN APOSTOLAKIS: But it would be nice to  
19 hear something at the next meeting when we discuss the  
20 general approach. In fact, the comment I made earlier  
21 that it doesn't seem to me that defense-in-depth and the  
22 concerns that you guys had there really will have any  
23 problem being satisfied by the pilot program. I mean some  
24 insight would probably help.

25 And I guess we can discuss our letter on

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1 Friday the 21st. I will make sure that we have a couple  
2 of hours at the end of the meeting and we can discuss  
3 this, different committee meeting how we plan to do it so  
4 I will have some guidance on how to put together the first  
5 draft and circulate it and so on.

6 All right? Well, any other comments or  
7 questions?

8 MR. LARKINS: George, I don't think we will  
9 have any consultants at the full committee meeting. It  
10 will be at the subcommittee meeting, the 20th and 21st.

11 CHAIRMAN APOSTOLAKIS: I thought they were  
12 coming to the full committee meeting?

13 MR. MARKLEY: They planned for both  
14 subcommittee meetings initially and they were going to  
15 give us comments if they were not able to attend.

16 MEMBER KRESS: That changes the flavor of what  
17 we want these guys to do.

18 CHAIRMAN APOSTOLAKIS: Well, I don't know. We  
19 don't need another review. So maybe we should address  
20 only the points that are still outstanding, those points  
21 we listed earlier.

22 MR. HOLAHAN: There are some committee members  
23 who have --

24 CHAIRMAN APOSTOLAKIS: Well, Dr. Seale is not  
25 here.

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1 MEMBER CATTON: He's the only one, isn't he?

2 MEMBER POWERS: Don Miller missed the  
3 afternoon session.

4 CHAIRMAN APOSTOLAKIS: Maybe a short -- very  
5 short. The emphasis should be on these issues. Okay,  
6 well, thank you very much. This has been very useful  
7 again. And I'll see you guys on the 7th.

8 (Whereupon, at 3:32 p.m., the meeting was  
9 concluded.)  
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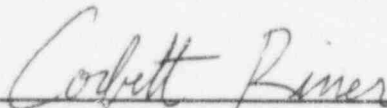
This is to certify that the attached  
proceedings before the United States Nuclear  
Regulatory Commission in the matter of:

Name of Proceeding: PROBABILISTIC RISK ASSESSMENT

Docket Number: N/A

Place of Proceeding: ROCKVILLE, MARYLAND

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



CORBETT RINER  
Official Reporter  
Neal R. Gross and Co., Inc.

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INTRODUCTORY STATEMENT BY THE CHAIRMAN OF THE  
PROBABILISTIC RISK ASSESSMENT SUBCOMMITTEE  
11545 ROCKVILLE PIKE, ROOM T-2B3  
ROCKVILLE, MARYLAND  
JANUARY 28, 1997

The meeting will now come to order. This is a meeting of the ACRS Subcommittee on Probabilistic Risk Assessment. I am George Apostolakis, Chairman of the Subcommittee.

ACRS Members in attendance are: John Barton, Ivan Catton, Mario Fontana, Thomas Kress, Don Miller, Dana Powers, and Bill Shack

We also have in attendance John Garrick who is a Member of the Advisory Committee on Nuclear Waste and Ed Abbott, an ACRS Invited Expert.

ACRS Senior Fellow in attendance is: Richard Sherry

The purpose of this meeting is to continue our discussion of the NRC staff's approach to codify risk-informed, performance-based regulation through development of Standard Review Plan (SRP) sections and associated regulatory guides. The Subcommittee previously met to discuss these matters on October 31, November 1, 21, and 22, 1996. The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate, for deliberation by the full Committee.

Michael T. Markley is the Cognizant ACRS Staff Engineer for this meeting.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register on January 16, 1997.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register Notice. It is requested that speakers first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

We have received no written comments or requests for time to make oral statements from members of the public.

(Chairman's Comments-if any)

We will proceed with the meeting and I call upon Mr. Rick Sherry to begin.

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## **Plant Specific Risk, Safety Goals and the LERF**

Richard Sherry  
Senior Fellow, ACRS

ACRS Subcommittee on Probabilistic Risk Assessment  
January 28, 1997

## **-- Outline --**

- ◆ **Introduce simple relationship between LERF and IEFF**
- ◆ **Provide definition for LERF**
- ◆ **Compare simple relationship with PRA results**
- ◆ **Compare to Reg. Guide LERF definition and numerical criteria**
- ◆ **Summary and conclusions**



The relationship defined between the Individual Early Fatality Frequency (IEFF) safety goal QHO and the LERF is:

$$IEFF = LERF \times EI$$

OR

$$LERF_g = \frac{IEFF(SG-QHO)}{EI} \approx \frac{3 \times 10^{-7}}{1/16} = 5 \times 10^{-6}$$

## Exposure Index

$$EI = \text{Exposure Index} = \frac{\sum_{i=1}^{16} P_i \times F_i}{\sum_{i=1}^{16} P_i}$$

$F_i$  = the relative frequency wind blows toward sector  $i$

$P_i$  = population in sector  $i$  within one mile of plant

## Exposure Index - Examples

Plant	EI	Population within 1 mile
Grand Gulf	.065	34
Surry	.077	9
Sequoyah	.045	213
Maine Yankee	.040	254
Zion	.081	3090
Peach Bottom	.075	118
Lasalle	.083	6
Nominal	.063 (1/16)	

## Large Early Release Frequency (LERF)

-- Definition --

- ◆ Definition includes consideration of both magnitude of radionuclide release and timing of release relative to timing of protective actions (start of evacuation)

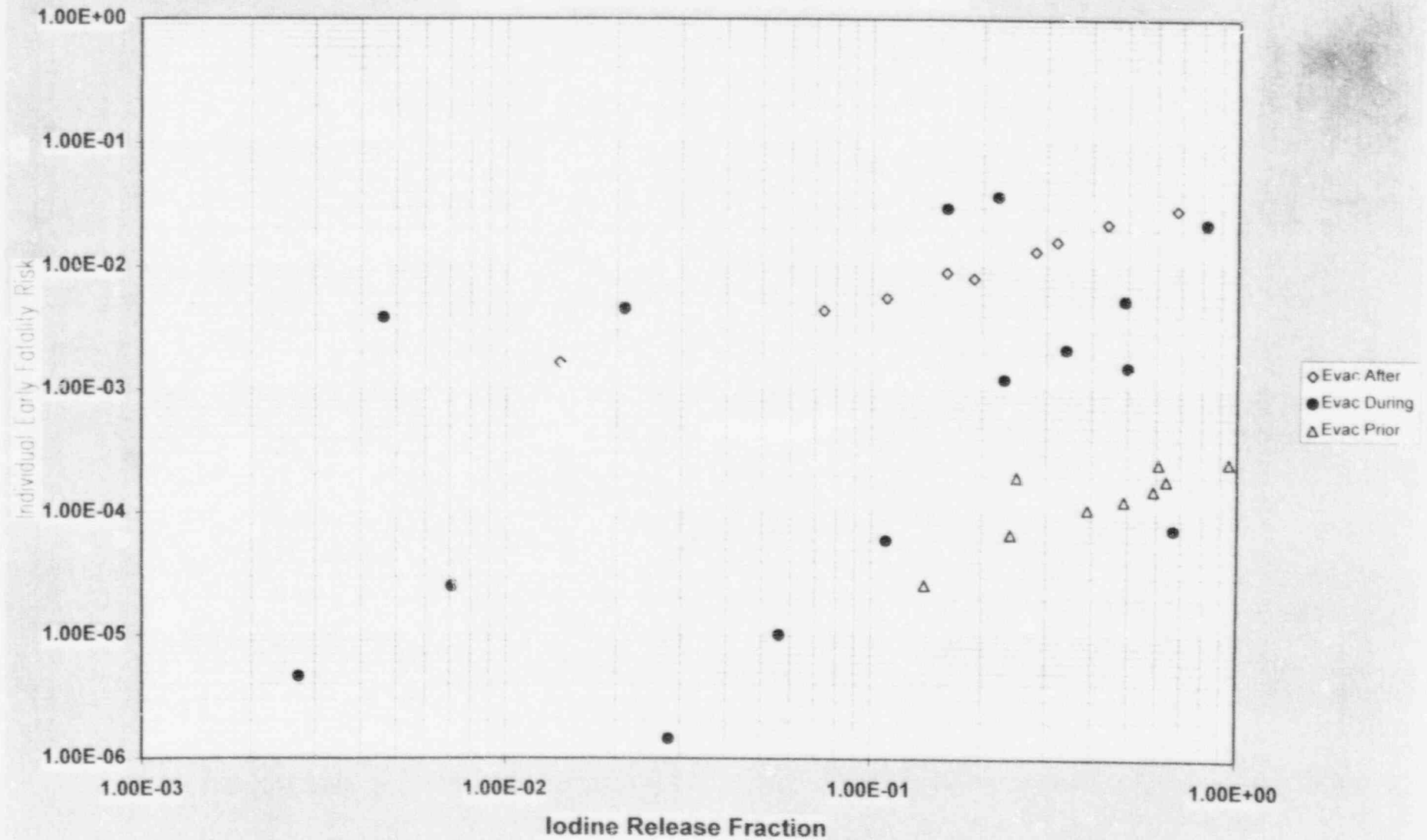
$$LERF = \sum_{k=1}^{N_{rc}} RC_k [\text{early } I > 10\% \text{ and Evac. Delayed}] \times (1 - F_{no-evac}) \\ + \sum_{k=1}^{N_{rc}} RC_k [\text{total } I > 10\%] \times F_{no-evac}$$

$RC_k$  = the frequency of release category  $k$

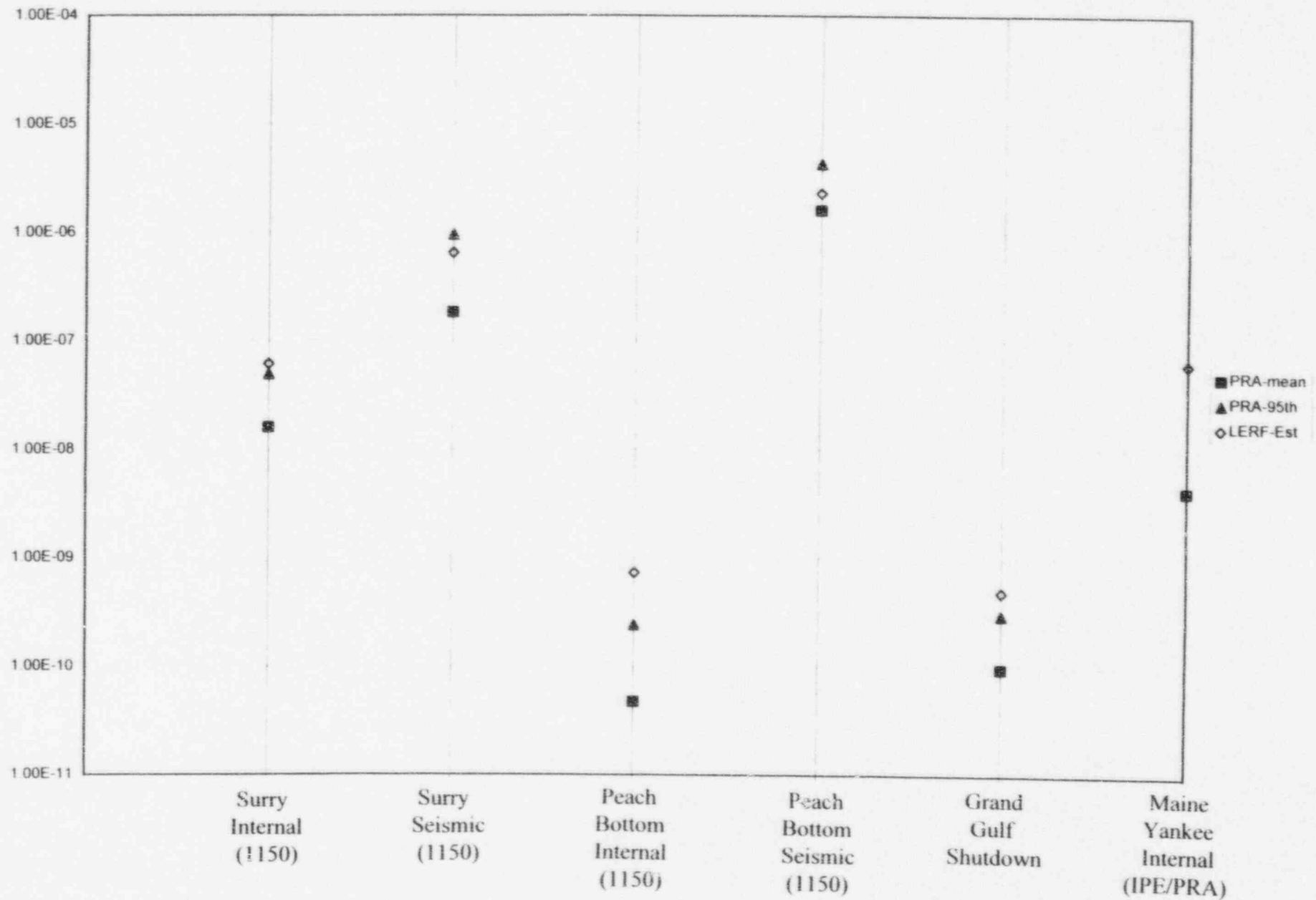
$N_{rc}$  = number of release categories

$F_{no-evac}$  = the population fraction not evacuating

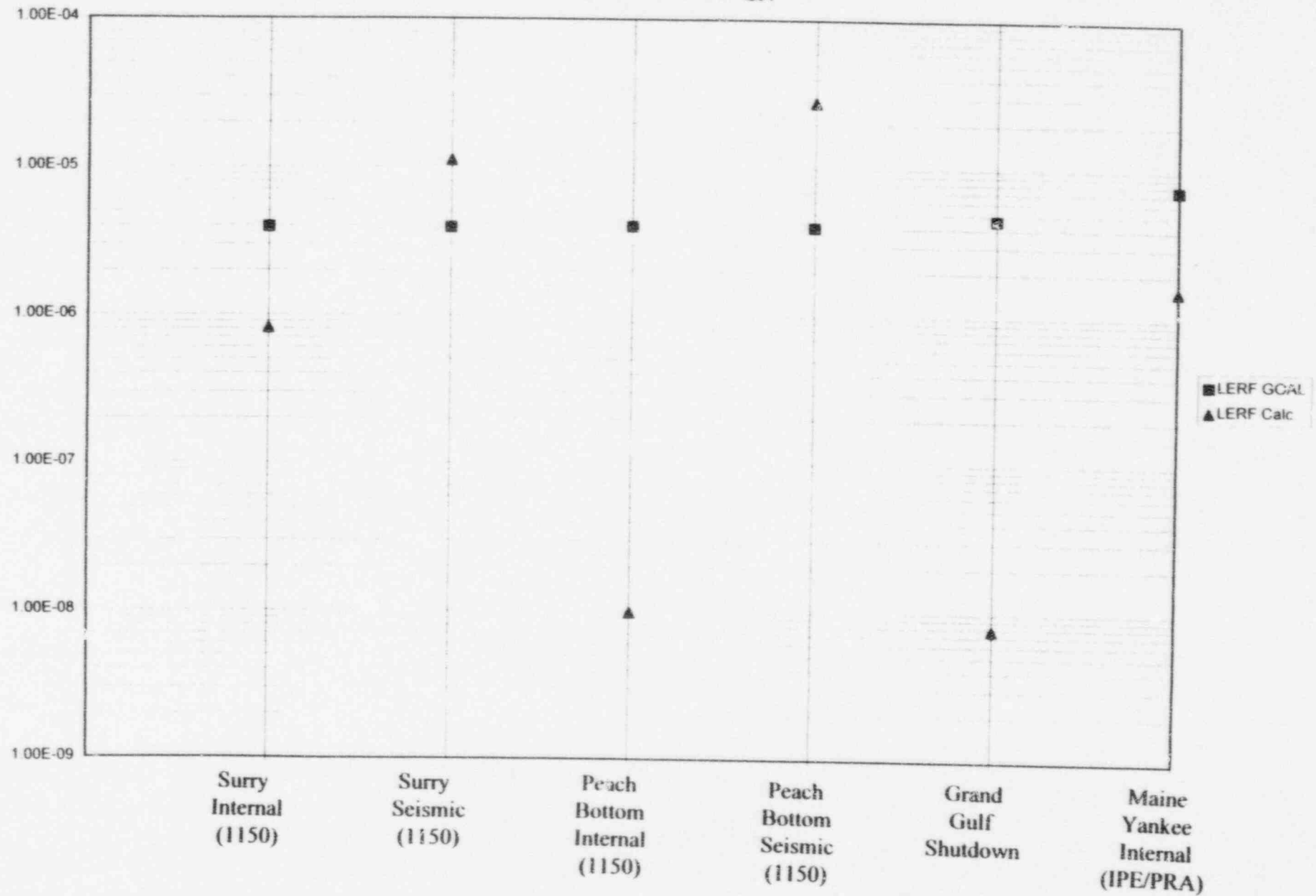
# Surry Individual Early Fatality Risk Internal Initiators



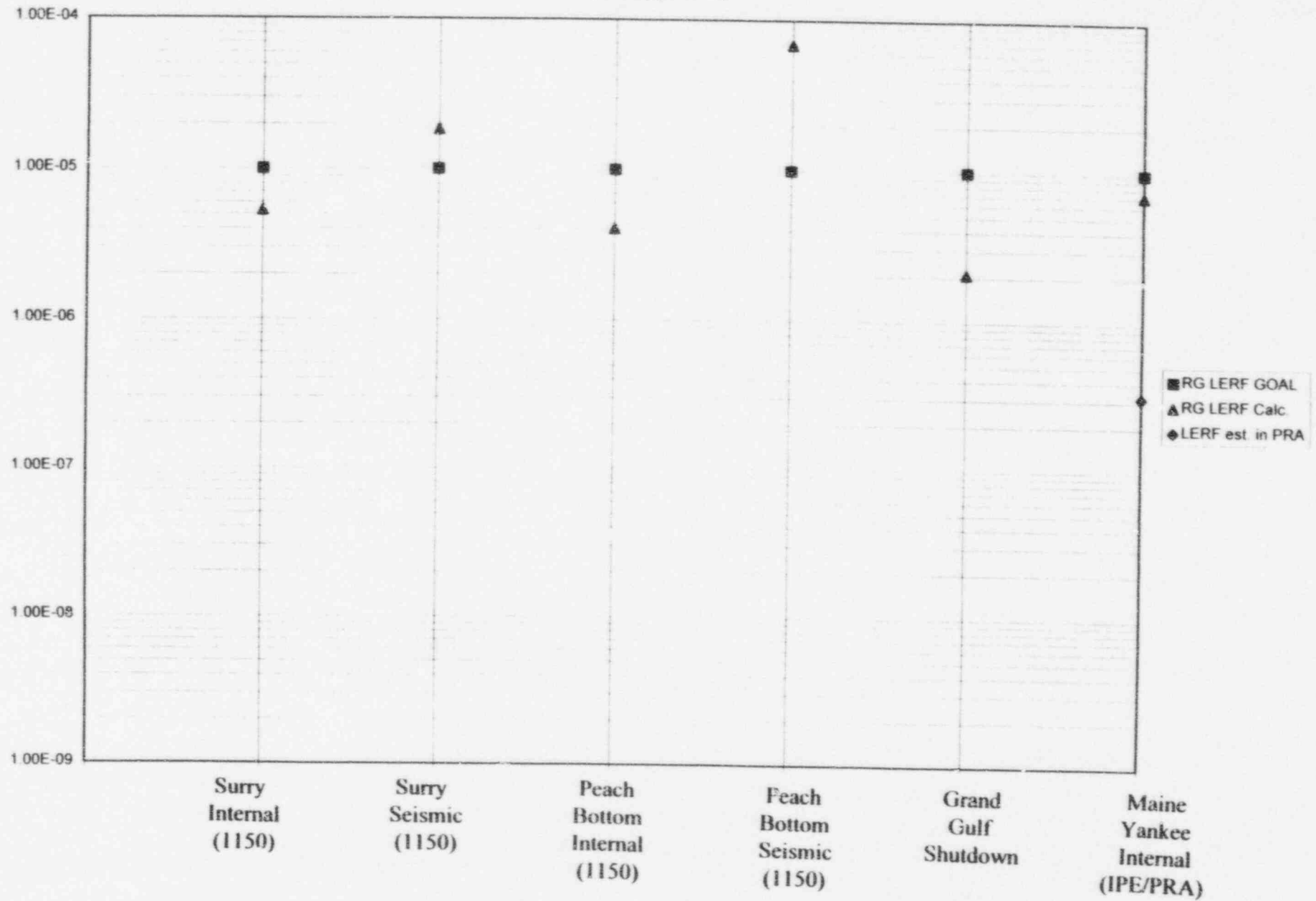
Individual Early Fatality Risk---NUREG-4551/IPE-PRA v Simple Estimator



Comparison of LERF Goal and Calculated LERF  
(Simplified Methodology)



Comparison of LERF Goal and Calculated LERF  
(RG Approach)





## Alternative Approach (Kress)

- ♦ Develop relationship between IEFF risk and source term as:

$$IEFF \sim \sum_{i=1}^{N_{rc}} RC_i \times ST^n$$

where:  $ST$  = the iodine release fraction for release category  $i$

$RC_i$  = frequency of release category  $i$

## Relative Importance of Fission Product Groups to Early Fatality Risk

Xe	0.1
I	1.0
Cs	0.1
Te	0.8
Sr	0.99
Ru	2.15
La	8.4
Ce	7.6
Ba	0.66

From NUREG/CR-5164 (BNL)  
Based on equivalent release fractions

## **Summary and Conclusions**

- ◆ **Simplified approach developed for estimating IEFF risk for comparison with safety goal QHO on plant specific basis**
- ◆ **Generally conservative, but not excessively conservative. More realistic than LERF definition based on ECFF and  $10^{-5}$  frequency goal**
- ◆ **Definition of LERF proposed that accounts for source term magnitude and release timing**
- ◆ **Possible to develop more detailed, less conservative, functional correlation with release magnitude, however need to use iodine equivalent release to account for impact of other species**



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**BRIEFING ON REGULATORY GUIDES AND  
STANDARD REVIEW PLANS IN SUPPORT OF  
RISK-INFORMED REGULATION**

**PRESENTATION TO  
ACRS SUBCOMMITTEE ON PRA**

**JANUARY 28, 1997**

**GARY HOLAHAN, NRR (415-2884)  
THOMAS KING, RES (415-5790)**

## INTRODUCTION

- DRAFT RGs AND SRPs HAVE BEEN PREPARED TO:
  - HELP IMPLEMENT THE COMMISSION'S AUGUST 1995 POLICY ON THE USE OF RISK INFORMATION IN THE REGULATORY PROCESS
  - PROVIDE AN ACCEPTABLE APPROACH FOR REACTOR LICENSEES AND STAFF TO SUBMIT AND REVIEW APPLICATIONS FOR PLANT SPECIFIC CHANGES TO THE CURRENT LICENSING BASIS THAT UTILIZE RISK INFORMATION
- SCOPE OF RGs/SRPs:
  - GENERAL GUIDANCE (DG-1061+ SRP)
  - APPLICATION SPECIFIC GUIDANCE
    - IN-SERVICE TESTING (DG-1062 + SRP)
    - TECHNICAL SPECIFICATIONS (DG-1065 + SRP)
    - GRADED QA (RG ONLY) (DG-1064)
    - IN-SERVICE INSPECTION (ON A LATER SCHEDULE)

## INTRODUCTION (CONT)

- SUPPORTING DOCUMENT:
  - NUREG-1602 - INFORMATION ON SCOPE AND QUALITY OF PRA ANALYSES
- OBJECTIVES OF RGs/SRPs:
  - DESCRIBE OVERALL APPROACH/EXPECTATIONS/PROCESS
  - PROVIDE PRINCIPLES AND GUIDANCE FOR DETERMINISTIC AND PROBABILISTIC ANALYSIS AND INTEGRATED DECISION MAKING
  - DESCRIBES PERFORMANCE BASED IMPLEMENTATION STRATEGY
  - PROVIDE GUIDANCE ON INFORMATION THAT SHOULD BE SUBMITTED FOR REVIEW.
- USE OF RG/SRPs IS VOLUNTARY FOR LICENSEES
- STATUS OF RGs/SRPs:
  - FINAL DRAFTS FOR ACRS REVIEW:
    - GENERAL RG/SRP (MINUS APPENDICES) - DRAFTS PROVIDED MID-JANUARY

## INTRODUCTION (CONT)

- APPLICATION SPECIFIC RGs/SRPs AND GENERAL RG APPENDICES - DRAFTS TO BE PROVIDED BY FEBRUARY 6, 1997
- GENERAL RG/SRP HAVE RECEIVED REVIEW UP THROUGH OFFICE DIRECTOR LEVEL
- HAVE RECEIVED COMMISSION FEEDBACK ON POLICY ISSUES (1/22/97 SRM)
- PURPOSE OF TODAY'S STAFF PRESENTATIONS:
  - UPDATE ACRS SUBCOMM ON CHANGES MADE TO GENERAL RG/SRP AS A RESULT OF NRC STAFF/MANAGEMENT REVIEW SUBSEQUENT TO LAST MEETING
  - SOLICIT ACRS SUBCOMM FEEDBACK ON OVERALL APPROACH/GUIDELINES
  - NO LETTER REQUESTED AT THIS TIME

## SCHEDULE

- FEB 6 OR 7, 1997
- FEB 6, 1997
- FEB 20-21, 1997
- MARCH 6 OR 7, 1997
- MARCH 14, 1997
- MARCH 24, 1997
- MARCH 31, 1997
- ACRS FULL COMMITTEE - STAFF PRESENTATION ON OVERALL PROGRAM/APPROACH AND GENERAL RG/SRP
- DRAFT GENERAL RG APPENDICES AND APPLICATION SPECIFIC RG/SRPs TO ACRS
- ACRS SUBCOMM ON PRA - REVIEW OF GENERAL RG APPENDICES AND APPLICATION SPECIFIC RGs/SRPs
- ACRS FULL COMMITTEE - STAFF PRESENTATION ON APPLICATION SPECIFIC RG/SRP
- ACRS LETTER
- PACKAGE TO EDO
- PACKAGE TO COMMISSION



## JANUARY 22, 1997 SRM

- STAFF PRESENTED FOUR POLICY ISSUES, OPTIONS AND RECOMMENDATIONS IN AN OCTOBER 11, 1996, SECY PAPER
- 1/22/97 SRM PROVIDES COMMISSION GUIDANCE ON POLICY ISSUES:
  - PERFORMANCE BASED REGULATION:
    - DON'T LIMIT PERFORMANCE BASED APPROACHES TO RISK INFORMED INITIATIVES
    - COMMISSION ASKED FOR FURTHER PLAN FOR PERFORMANCE MONITORING
  - USE OF SAFETY GOALS FOR PLANT SPECIFIC APPLICATION:
    - COMMISSION APPROVED PLANT SPECIFIC APPLICATION
    - REQUESTS LEGAL ANALYSIS

JANUARY 22, 1997 SRM (CONT)

- RISK NEUTRAL VS. RISK INCREASE:
  - COMMISSION APPROVED SMALL RISK INCREASES UNDER CERTAIN CONDITIONS
  - ASKED FOR DEFINITION OF "SMALL" AND "UNDER CERTAIN CONDITIONS"
  - STAFF ASKED TO MONITOR CUMULATIVE CHANGES IN RISK
  - STAFF SHOULD DEVELOP A METHODOLOGY FOR ASSESSING CHANGES IN RISK THAT USES STATISTICAL CONCEPTS AND GIVES CONSIDERATION TO UNCERTAINTIES
- APPROVE ACCEPTABLE ALTERNATIVES FOR ISI UNDER 10 CFR 50.55A:
  - COMMISSION APPROVED STAFF RECOMMENDATION

## MAJOR CHANGES IN GENERAL RG/SRP

- EMPHASIS ADDED ON OVERALL EXPECTATION OF IMPROVED SAFETY BY COMPREHENSIVE CONSIDERATION OF RISK INFORMATION
  - RISK REDUCTION
  - BURDEN REDUCTION
  - CUMULATIVE IMPACT OF CHANGES IN RISK
- SAFETY GOAL SUBSIDIARY OBJECTIVES DEFINE INSIGNIFICANT RISK. CHANGES IN RISK BELOW THOSE VALUES ARE CONSIDERED "SMALL"
- FIGURES OF CDF VS  $\Delta$ CDF AND LERF VS  $\Delta$ LERF REMOVED
- REGIONS DEFINED WHERE:
  - CALCULATED RISK INCREASES ARE NOT ACCEPTABLE ( $>10^{-4}$  CDF;  $10^{-5}$  LERF)
  - CALCULATED RISK INCREASES ARE LIKELY TO BE ACCEPTABLE ( $<10^{-5}$  CDF;  $10^{-6}$  LERF)
  - CALCULATED RISK INCREASES WILL RECEIVE INCREASED MANAGEMENT ATTENTION

## MAJOR CHANGES (CONT)

- EXPANDED DISCUSSION OF UNCERTAINTIES
- UPDATING APPENDICES

## OVERALL APPROACH

- EXPECTATION IS THAT, OVERALL, UTILIZATION OF RISK INFORMATION IN EVALUATING CLB CHANGES WILL RESULT IN IMPROVED SAFETY:
  - RISK REDUCTION
  - BURDEN REDUCTION
  - CUMULATIVE IMPACT OF CHANGES IN RISK
- DEMONSTRATE THAT CERTAIN FUNDAMENTAL SAFETY PRINCIPLES ARE MET:
  - MEET REGULATIONS (OR PROPOSE A CHANGE/EXEMPTION)
  - MAINTAIN DEFENSE-IN-DEPTH
  - MAINTAIN SUFFICIENT SAFETY MARGIN
  - NO SIGNIFICANT INCREASES IN RISK TO PUBLIC HEALTH AND SAFETY
  - IMPLEMENT UTILIZING PERFORMANCE BASED MONITORING AND FEEDBACK STRATEGIES

## OVERALL APPROACH (CONT)

- **SUBSIDIARY OBJECTIVES OF COMMISSION'S SAFETY GOAL POLICY USED TO DEFINE BENCHMARK RISK LEVELS BELOW WHICH CHANGES ARE CONSIDERED INSIGNIFICANT:**
  - $10^{-4}/\text{RY}$  - CDF
  - $10^{-5}/\text{RY}$  - LARGE EARLY RELEASE FREQUENCY (LERF)
- **PROPOSED CLB CHANGES SHOULD BE RISK NEUTRAL OR DECREASES, IF THE PLANT'S CDF OR LERF IS ABOVE THE BENCHMARK VALUE**
- **PROPOSED CLB CHANGES SHOULD BE MADE IN SMALL INCREMENTS (<10% OF BENCHMARK CDF/LERF VALUES) AND WHEN WITHIN A FACTOR OF 10 OF THE BENCHMARK VALUES, THE MORE ANALYSIS AND MANAGEMENT REVIEW WILL BE NECESSARY.**
- **FLEXIBILITY PROVIDED TO ALLOW LICENSEES TO PROPOSE:**
  - **EXTENT OF UNCERTAINTY/SENSITIVITY ANALYSIS APPROPRIATE FOR PROPOSED CHANGE**
  - **PACKAGING OF SEVERAL CHANGES TOGETHER**
  - **APPROPRIATE CONFIDENCE LEVEL FOR DECISION**

### OVERALL APPROACH (CONT)

- SCOPE OF ANALYSIS REQUIRED TO SUPPORT PROPOSED CHANGE AND JUSTIFY PLANT'S BASELINE CDF/LERF
- SCOPE OF ANALYSIS SUPPORTING THE CHANGE SHOULD COVER ALL SSCs, OPERATING MODES, INITIATORS AFFECTED BY THE CHANGE.
- PERFORMANCE MUST BE MONITORED TO HELP VERIFY KEY ASSUMPTIONS AND CHECK AREAS OF LARGE UNCERTAINTY



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## **Regulatory Guide DG-1061**

**An Approach for Using PRA in Risk-Informed Decisions on  
Plant-Specific Changes to the Current Licensing Basis**

**Mark A. Cunningham**  
**Division of Systems Technology**  
**Office of Nuclear Regulatory Research**  
**(301) 415-6189**

**Presentation to ACRS Subcommittee on PRA**  
**January 28, 1997**

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## Overview of Presentation

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- Overall structure of DG-1061
- Key elements
  - Principles
  - Expectations
  - Evaluation of defense-in-depth and safety margins
  - Evaluation of risk impact
  - Implementation and monitoring program

## Structure of DG-1061

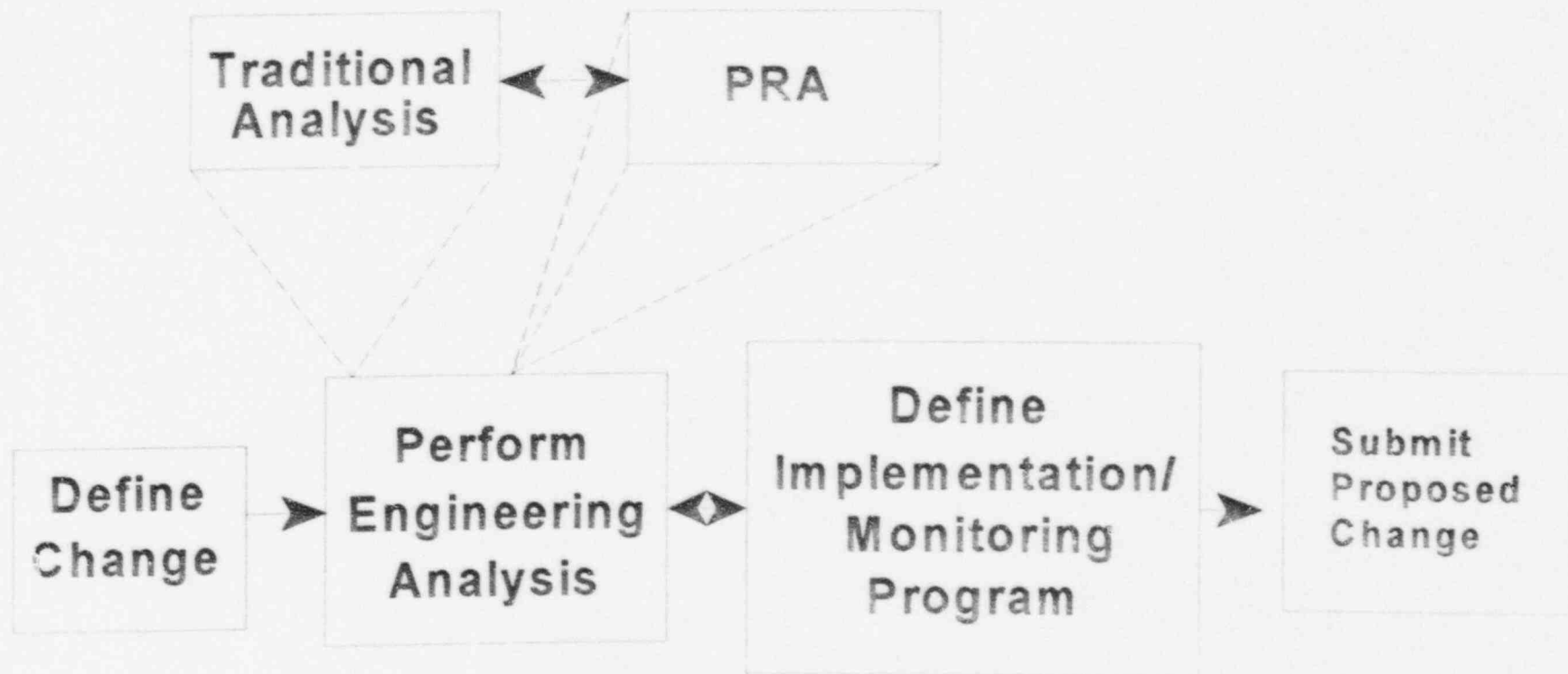
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### Purpose of Guide

- To provide general guidance concerning one approach that the NRC has determined to be acceptable for analyzing issues associated with proposed changes to a plants's current licensing bases (CLB) and for assessing the impact of such proposed changes on the risk associated with plant design and operation.

## Structure of DG-1061 (cont.)

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## Key Elements - Principles

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1. The proposed change meets the current regulations. This principle applies unless the proposed change is explicitly related to a requested exemption or rule change (i.e., a 50.12 "specific exemption" or a 2.802 "petition for rulemaking").
2. Defense-in-depth is maintained.
3. Sufficient safety margins are maintained.
4. Proposed changes, both individually and cumulatively, result in no more than insignificant increases in the risk to the health and safety of the public.
5. Performance-based implementation and monitoring strategies are proposed that address uncertainties in analysis models and data and provide for timely feedback and corrective action.

## Key Elements - Expectations

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- All safety impacts of the proposed change are evaluated in an integrated manner as part of an overall risk management approach in which the licensee is using risk analysis to improve operational and engineering decisions broadly and not just to eliminate requirements the licensee sees as undesirable. The approach used to identify changes in requirements should be used to identify areas where requirements should be increased, as well as where they could be reduced.
- The acceptability of proposed changes should be evaluated by the licensee in an integrated fashion that ensures that all principles are met.
- Core damage frequency (CDF) and large early release frequency (LERF) can be used as suitable metrics for making risk-informed regulatory decisions.
- Increases in estimated CDF and LERF resulting from proposed CLB changes will be small.

## Key Elements - Expectations (cont.)

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- The scope and quality of the engineering analyses conducted to justify the proposed CLB change should be appropriate for the nature and scope of the change and should be based on the as-built and as-operated and maintained plant.
- Appropriate consideration of uncertainty is given in analyses and interpretation of findings.
- The plant-specific PRA supporting licensee proposals has been subjected to quality controls such as an independent peer review.
- Data, methods, and assessment criteria used to support regulatory decisionmaking must be scrutable and available for public review.

## Key Elements - Defense-in-Depth

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### Guidelines for maintaining defense-in-depth

- a reasonable balance among prevention of core damage, prevention of containment failure, and consequence mitigation is preserved
- over-reliance on programmatic activities to compensate for weaknesses in plant design is avoided
- system redundancy, independence, and diversity are maintained commensurate with the expected frequency and consequences of challenges to the system
- defenses against potential common cause failures are maintained and the introduction of new common cause failure mechanisms is avoided
- independence of barriers is not degraded
- defenses against human errors are maintained

## Key Elements - Safety Margins

---

### Guidelines for maintaining sufficient safety margins

- codes and standards or alternatives approved for use by the NRC are met
- safety analysis acceptance criteria in the current licensing basis (e.g., FSAR, supporting analyses) are met, or proposed revisions provide sufficient margin to account for analysis and data uncertainty



## Key Elements - Risk Impact

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### Elements of acceptance guidelines

- For a plant with a mean CDF at or above  $1\text{E-}4$  per reactor year or with a mean LERF at or above  $1\text{E-}5$  per reactor year, it is expected that applications will result in a net decrease in risk or be risk neutral.
- For a plant with a mean CDF of less than  $1\text{E-}4$  per reactor year, applications will be considered which, combined with the LERF guidelines described below:
  - Result in a net decrease in CDF or are CDF-neutral;
  - Result in increases in calculated CDF that are very small (i.e., CDF increase of less than  $1\text{E-}6$  per reactor year); or
  - Result in an increase in calculated CDF in the range of  $1\text{E-}6$  to  $1\text{E-}5$  per reactor year, subject to increased NRC technical and management review and considering certain factors.

## Key Elements - Risk Impact (cont.)

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AND

- For a plant with a mean LERF of between  $1\text{E-}6$  and  $1\text{E-}5$  per reactor year:
  - Result in a net decrease in LERF or are LERF-neutral;
  - Result in an increase in calculated LERF of up to  $1\text{E-}6$  per reactor year, subject to increased NRC technical and management review and considering certain factors;

OR

- For a plant with a mean LERF of less than  $1\text{E-}6$  per reactor year:
  - Result in a net decrease in LERF or are LERF-neutral;
  - Result in increases in calculated LERF that are very small (i.e., LERF increase of less than  $1\text{E-}7$  per reactor year); or
  - Result in an increase in calculated LERF of up to  $1\text{E-}6$  per reactor year, subject to increased NRC technical and management review, and considering certain factors.

## **Key Elements - Risk Impact (cont.)**

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### **Factors in decision making**

- **The scope, quality, and robustness of the analysis (including, but not limited to, the PRA), including consideration and quantification of uncertainties;**
- **The base CDF and LERF of the plant;**
- **The cumulative impact of previous changes (the licensee's risk management approach);**

## Key Elements - Risk Impact (cont.)

### Factors in decision making (cont.)

- Consideration of the Safety Goal screening criteria in the staff's Regulatory Analysis Guidelines, which define what changes in CDF and containment performance would be needed to consider potential backfits;
- The impact of the proposed change on operational complexity, burden on the operating staff, and overall safety practices; and
- Plant-specific performance and other factors, including, for example, siting factors, inspection findings, performance indicators, and operational events.

## Key Elements - Risk Impact (cont.)

### Comparisons with guidelines

- Reasonable assurance of meeting risk principle
- Test for reasonable assurance:
  - Quantified uncertainties - probability distribution does not result in low confidence that guideline is met
  - Unquantified uncertainties
    - Choice of modeling assumptions does not overly bias results in favor of change
    - Unmodeled contributors do not alter the decision

## Key Elements - Implementation and Monitoring

### Goal

- To assess SSC performance under the proposed CLB change by establishing performance-monitoring strategies to confirm the assumptions and analyses conducted to justify the CLB change.

### Implementation

- Implementation of the regulatory changes should ensure that no unexpected adverse safety degradation occurs because of the changes.
- Plan should be developed to ensure that any unexpected problems and deficiencies are detected and corrected prior to becoming a significant safety problem.



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## OVERVIEW AND DISCUSSION OF SRP CHAPTER 19

Use of PRA in Plant-Specific, Risk-Informed Decisionmaking

Robert Jones  
Mark Rubin  
Mike Cheok

Presentation to ACRS Subcommittee on PRA  
January 28, 1997

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## Overview

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- Purposes of this SRP are to:
  - provide review guidance to the staff for risk-informed reviews of licensee proposals for changes to the plant's CLB
  - identify the roles and responsibilities of the various organizations in the NRC in the review process
  - provide conclusions expected in the staff's evaluation findings



## Overview (continued)

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- SRP was written in parallel with draft guide DG-1061 and reflects the guidance given in DG-1061
- Anchored on the key principles and staff expectations for risk-informed regulation

## Overview (continued)

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- SRP was written to cover a range of review efforts. The level of review will be application specific. For example,
  - It is expected that full scope reviews are needed for applications where there are direct applications of the numerical values of risk indices and where a broad set of scenarios and plant operating modes may be affected.
  - Lesser scope reviews may be appropriate for other applications, e.g., for some temporary plant changes, or for changes that rely mostly on qualitative risk insights.

## Discussion of SRP Guidance

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The rest of this presentation will deal with the guidance provided in the SRP. A summary of each SRP sub-section will be discussed.

## Definition of the Proposed Change

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- Determine that the impacts of the proposed change has been adequately identified
- Identify if this impact can be supported by the analyses and data cited
- Verify that the analysis process addresses the principles and expectations identified in DG-1061

## Evaluation of Defense in Depth

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- Verify that system redundancy, diversity and independence is maintained commensurate with the expected frequency and consequence of challenges to the system
- Ensure that the proposed change maintains appropriate safety within the barrier defense in depth concept
  - change does not result in significant increases in the existing challenges to the integrity of the barriers
  - probability of failure of each barrier is not significantly changed by the proposal
  - new or additional failure dependencies are not introduced among barriers

## Maintenance of Safety Margins

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- Reduction of margin should appropriately reflect the current understanding of existing uncertainties in engineering evaluations
- For example, to evaluate the effects of a proposed change on safety margins, the reviewer should establish that:
  - engineering codes and standards or alternatives approved for use by the NRC are met, or deviations are justified
  - safety analysis acceptance criteria in the CLB are met, or proposed revisions provide sufficient margin to account for analysis and data uncertainty

## Characterization of Change in Terms of PRA Model Elements

- The reviewer should identify portions of the PRA affected by the issue being evaluated. This will help define the scope and level of detail of analysis required for the evaluation of the change process.
- The reviewer should verify that the effects of the proposed changes on SSCs are adequately characterized in the PRA elements.

## Scope of Risk Analysis

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The reviewer should verify that:

- The licensee addresses all modes and all initiator types; OR
- The licensee demonstrates that the application does not unacceptably degrade plant capability, and does not introduce risk vulnerabilities for plant modes and initiator types not included in the PRA; OR
- If the proposed change impacts unanalyzed plant modes or initiator types, the licensee demonstrates that a bounding analysis of the change in plant risk from the application meets guidelines that are equivalent to the acceptance guidelines specified in DG-1061.



## Level of Detail of Risk Analysis

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The reviewer should verify that:

- The PRA is detailed enough to account for important system and operator dependencies
- Risk insights are consistent with the level of detail modeled in the PRA

## Quality of the PRA

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The reviewer should verify that:

- There is reasonable assurance of PRA adequacy as shown by the licensee process to ensure quality and by a focused scope application-specific review by the staff
- Results are robust in terms of uncertainties and sensitivities to the key modeling parameters
- Key performance elements for the application have been appropriately classified and performance is backed up by licensee commitments

## Risk Impact and Treatment of Uncertainty

- The reviewer should verify that the change in risk is within the guidelines defined in DG-1061
  - change in risk is appropriate for the base risk
  - level of technical and management review is appropriate for the risk increase
  - cumulative and synergistic effects from previous applications have been addressed
  - appropriate risk management practices are being factored into plant operating decisions

## Risk Impact and Treatment of Uncertainty (continued)

- Appropriate consideration of uncertainties is provided, e.g.,
  - uncertainty in the risk change was small compared to the margin between the estimated change and the allowable change
  - events contributing to an increase in risk are not subject to significant uncertainty
  - decisions not invalidated through use of credible alternate assumptions or analysis models

## Integrated Decisionmaking Process

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- Results from traditional engineering analyses and risk analyses have been used to ensure that the principles for risk-informed decisionmaking have been met
- Potential analysis limitations, uncertainties and conflicts are resolved by use of conservative results, or by use of appropriate implementation and monitoring strategies, or by use of appropriate compensatory measures
- The integrated decisionmaking process is well-defined, systematic, repeatable, and scrutable

## Implementation and Monitoring Strategies

The reviewer should verify that:

- The implementation process is commensurate with the uncertainty associated with the results of the engineering evaluations
- The proposed monitoring program could adequately track the performance of equipment covered by the proposed changes
- The performance monitoring process also includes the tracking of performance of SSCs which support the underlying basis for the decisionmaking

## On-going Staff Activities

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### Appendix A: Guidance for a Focused-Scope Application Specific PRA Review

- Use of Appropriate Data
- Initiating Events
- Determination of Success Criteria
- Modeling of Common Cause Failures
- Modeling of Human Performance

### Appendix B Expert Panel Issues

### Appendix C Categorization of SSCs with Respect to Safety Significance

- Use of Importance Measures
- Role of an Expert Panel in Categorization