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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the matter of:

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

Subcommittee on Safety Philosophy,  
Technology and Criteria

Docket No.

Location: Washington, D. C.

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1 UNITED STATES OF AMERICA  
2 NUCLEAR REGULATORY COMMISSION  
3

4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
5 SUBCOMMITTEE ON SAFETY PHILOSOPHY, TECHNOLOGY AND CRITERIA  
6

7 OPEN MEETING  
8

9 Room 1046

10 1717 H Street, N.W.

11 Washington, D.C.  
12

13 Wednesday, July 10, 1985  
14

15 The Subcommittee met, pursuant to notice, at 1:05  
16 p.m., David Okrent, Chairman of the Subcommittee, presiding.

17 ACRS MEMBERS PRESENT:

18 D. Okrent, Chairman

19 J. Ebersole

20 W. Kerr

21 C. Wylie

22 F. Remick

23 D. Ward

24 H. Lewis  
25

## 1     ALSO PRESENT:

2                   L. Lave, ACRS Consultant

3                   D. McClain, Consultant

4                   R. Savio, ACRS Staff Member

5                   P. Shewmon, ACRS Member

6                   C. Siess, ACRS Member

## 7     PRESENTERS:

8                   V. Stello

9                   T. Murly

10                  F. Rowsome

11                  T. Spies

12                  F. Gillespie

13                  B. Minogue

14                  M. Spangler

15                  Mr. Sniezek

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

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MR. OKRENT: The meeting will now come to order.

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This is a meeting of the Advisory Committee on Reactor Safeguards' Subcommittee on Safety Philosophy, Technology and Criteria. I am D. Okrent, Subcommittee Chairman.

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Other ACRS members in attendance at the moment are Mr. Ward, Mr. Remick, Mr. Wylie, Mr. Ebersole, and I suspect we may have one or two others during the meeting. The ACRS Consultants present at the moment are Mr. McClain and we will have Mr. Lave in a while.

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The purpose of this meeting is to continue to review the results of the NRC's proposed safety goal policy evaluation plan, and future use of safety policy. Richard Savio is the cognizant ACRS Staff Member 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 June 26, 1985. A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice, and it is requested that each speaker first identify himself or herself and speak with sufficient clarity and volume so that he or she can be readily heard.

We have received no written comments from members of the public; we have received no requests for time to make oral statements from members of the public.



1           There is an agenda. I will propose that we attempt  
2   to follow it unless subcommittee members want to propose  
3   modifications on timing or add subjects or so forth. I don't  
4   know that we need any preliminary discussion among the members  
5   before we begin hearing from others on the agenda, unless  
6   someone wishes to initiate such a discussion.

7           MR. KERR: Mr. Chairman, I guess I would be  
8   interested in what you consider to be the purpose of this  
9   subcommittee meeting, since I observe that we have a number of  
10  consultants available. It would be helpful to me to know.

11          MR. OKRENT: Sure. Well, as you know, the ACRS in  
12  fact was considering this subject at its June meeting, and was  
13  considering the preparation of a report to the Commissioners  
14  on Saturday of that meeting. The committee did not come to a  
15  final conclusion on Saturday.

16          Since the June meeting we have received copies of  
17  some additional material prepared either in draft form by the  
18  EDO -- I think it is draft form -- a memo by Mr. Denton, the  
19  EDO, which I think we had not seen at the June meeting, and  
20  the request, in fact, from the EDO to come down and meet with  
21  us, if I recall correctly. So it was the last step in  
22  particular that seemed to make a subcommittee meeting sort of  
23  the appropriate thing to do.

24          Since we are going to have a subcommittee meeting I  
25  thought if we could find one or two or three of our

1 consultants from outside what I will call the technical  
2 community who had participated with the committee and the  
3 subcommittee in earlier discussions when it was time to talk  
4 about NUREG-0880, if we could get them in at this time, and  
5 admittedly, on very short notice, to see in summary what their  
6 thoughts were; they wouldn't be starting cold since they had  
7 had the prior exposure. I feel we might as well take  
8 advantage of this at this subcommittee meeting. So there's a  
9 period of time allocated for comments by what I will call -- I  
10 don't know if Lester Lave considers these -- the economics of  
11 social science, but in any event, from non-engineers and so  
12 forth who are among our consultants.

13 MR. KERR: Thank you, that is helpful to me.

14 MR. OKRENT: Any other questions on history?

15 Okay. If not, why don't we proceed to Item II on  
16 the agenda which would have us hear from Vic Stello, I think.

17 MR. STELLO: Let me begin by saying that the purpose  
18 in writing the memo suggesting that it would be useful to come  
19 down and talk again with the subcommittee was in recognizing  
20 the last time that we were here that the committee itself had  
21 not yet reached the conclusion that there were a number of  
22 issues that we understand are in significant controversy  
23 within the committee that are also significant areas where  
24 there is not yet agreement within the staff on how to proceed  
25 with these issues. And I thought that it would be helpful and

1       beneficial to all of us if we could have an opportunity to  
2       talk some more about these particular issues.

3               I don't know if there is a particularly ideal way in  
4       which to proceed, but as I see it, there are about five  
5       particular issues that we have been looking at, and of these,  
6       I would hope that we could spend most of our time on two  
7       particular issues. And the two that I would single out of  
8       these five would first be the whole question of cost-benefit  
9       guidelines.

10              You have the results of Tom Murley who is with us  
11       today, and incidentally, I should have made you aware that  
12       there are a rather large number of the staff here that have  
13       been working on this, and all of them are going to have at one  
14       time or another something to say on these subjects.

15              But the first issue, the whole concept of  
16       cost-benefit. There are a variety of views on how to  
17       proceed. At one point, the whole question of cost-benefit is  
18       let's limit our cost-benefit discussion such that it is only  
19       the costs that are directly related to the safety issues and  
20       not averted costs, such as loss of the plant or purchase power  
21       or whatever.

22              The group under Tom Murley, the Steering group,  
23       made a recommendation to broaden that somewhat and include the  
24       cost of the plant and averted costs when evaluating core melt  
25       accidents. And only for that case.

1           There was some discussion, and there is now drafted  
2   in the paper that perhaps maybe that isn't the way to proceed  
3   and that this is really a very, very fundamental issue that in  
4   trying to make a decision, it seems that the best way to  
5   proceed is to have in front of you all costs, all benefits all  
6   of the time; to have that information because it is all  
7   important, displayed to the extent that you can, display it to  
8   the extent that you can calculate it and to the extent that  
9   you understand it. It doesn't mean that in every case it's  
10   necessary to do that, but if it's available, if you understand  
11   it, it ought to all be displayed to the decisionmaker before  
12   the decision is made.

13           It does not deal in any sense of the word with  
14   trying to put this in the form of an equation, which will say  
15   here is how you decide when the scale tips. The most  
16   important thing being that all of that information that is  
17   relevant to the decision be laid out.

18           It's my belief that that is what cost-benefit  
19   analyses are all about, is laying out to the best that we know  
20   all of the information related to the decision we are  
21   struggling with. That is the fundamental change that is now  
22   proposed in the paper.

23           Now, it's fully recognized that when you start to  
24   take on more and more the cost-benefit issue in that  
25   framework, you are starting to cause the safety mission of

1 this agency to be called into question as to whether we really  
2 have, in fact, stepped over the fence and started into the  
3 area of reeconomic regulation, because clearly there are times  
4 when the safety need may not demand the need for something,  
5 but from a pure economical point of view it may be wise to  
6 make a particular change or modification to the facility.

7 And we made that point by suggesting maybe the  
8 Commission needs to go to the Congress and get resolved with  
9 Congress as to what extent we ought to be in this area, if  
10 indeed we ought to be in it at all.

11 MR. REMICK: Could I ask a question? You mentioned  
12 that this is a possible change in the paper, and I'm not sure  
13 if I understand what you mean by paper. Is this an EDO paper  
14 or is this a task force report?

15 MR. STELLO: No. I made the distinction. There's a  
16 difference between what's in the paper that we have drafted --  
17 that is a draft of the paper that the EDO has not passed  
18 judgment on, so don't let's call it an EDO paper. You can  
19 call it --

20 MR. REMICK: Okay. The task force report is not  
21 being changed at this time? Okay.

22 MR. STELLO: But the task force report deals with  
23 the cost-benefit analysis in a different light; both the  
24 cost-benefit analysis in the report from the Steering  
25 Committee, the report that you referred to earlier as the



1 draft report, and the original version of the safety goal all  
2 treat this issue differently. And it is an area for which  
3 there is a great deal of controversy.

4 So I think that to the extent that can be discussed,  
5 I would suggest that that gets ventilated to the extent it's  
6 useful to continue to discuss it.

7 The other area I believe that warrants further  
8 discussion is the issue of the results of the PRA and how you  
9 evaluate them. You have Denton's memo which suggests changing  
10 the performance guideline from 10 to the minus 4 to 10 to the  
11 minus 5. It also has inherent in it a change of calling that  
12 a full, large-scale core melt. That obviously has some  
13 difficulty with it in terms of how do you apply the results of  
14 PRA technology in asking the technology can it, in fact, make  
15 the distinction between what is a full, large core melt and  
16 what might only be severe core damage, and asking it to make  
17 the distinction.

18 You have heard, and I am sure have read papers,  
19 where some have suggested that the difference between core  
20 melt calculated with current technology versus an actual  
21 full-scale meltdown, that the difference between these two  
22 numbers might in fact, based on their expert judgment, be a  
23 factor of 2 to 10 difference. If it were, in fact, a factor  
24 of 10, and calculating or using the results of PRA at 10 to the  
25 minus 4, would in fact be the same as a 10 to the minus 5 goal



1 for a full-scale core melt. I think that that's an area,  
2 again, that would benefit from considerable discussion because  
3 my view of the safety goal in fact is very simple. If you  
4 will, it's the template of how you should apply the results of  
5 PRA calculations. It is, in my view, no more than that.

6 We have the technology with us today, and I think if  
7 I look at the safety goal it is basically giving us, if  
8 you will, some sort of rough roadmap of how to apply those  
9 results which I think is useful and beneficial in the  
10 regulatory process.

11 Those are the two areas that I think we ought to  
12 spend most of our time on. There are three other changes that  
13 were mentioned last time that I wouldn't suggest we spend a  
14 lot of time on. If the committee wants other subjects, fine.  
15 Those are the two I feel are important.

16 MR. EBERSOLE: When you take up the subject of  
17 costs, strictly these extended costs, isn't it rather  
18 important to identify who will ultimately bear those costs;  
19 whether it is a risk-taking deal like a corporation or the  
20 public at large, and so forth?

21 MR. STELLO: I don't see the need to do that.

22 MR. EBERSOLE: Well generally, these costs are  
23 referred to as being a loss by the utility. But more often  
24 that not, of course, this is not correct; it is always passed  
25 to the ratepayers in the long run and it becomes a public

1       loss.

2               MR. STELLO:    Sure.

3               MR. EBERSOLE:   I mean the public at large; not a  
4       risk-taking fraction of it.   I think this somehow bears on the  
5       question of whether you should consider certain costs.

6               MR. STELLO:    Yes.   But I don't know that you had  
7       that much knowledge to the decisionmaker in being able --

8               MR. EBERSOLE:   I thought the PUC's would always tell  
9       you which will be costed to the public and which will be  
10      costed to the corporate figure.

11              MR. STELLO:    They help, but I don't think I would  
12      phrase it as "they always tell you much of anything."

13              MR. EBERSOLE:   Well, they should.

14              MR. REMICK:    I think you're glossing over, though,  
15      the real distinction being talked about of whether it's  
16      economic regulation versus health and safety; it's not a  
17      question of whose economics or who pays the cost.   It's a  
18      question of regulation of economics versus regulation --

19              MR. EBERSOLE:   Oh, right.   But if we do get into  
20      economics I think it would make a difference as to whether we  
21      considered the public at large being at an economic loss  
22      versus a specified fraction of it.

23              MR. STELLO:    There's one last point I was trying to  
24      make that I made earlier and I want to emphasize again.   It  
25      depends on what you think the decisionmaker is going to do

1 with these numbers and, you know, how rough the numbers are  
2 and what is it that you do with them.

3 If, for example, replacement power cost is \$500,000  
4 a day in a plant after it has lost over its 40 years you  
5 calculate some very large numbers, in billions of dollars.  
6 That is replacement power; someone has to pay for it, and it's  
7 set in front of you when you're trying to make a decision as  
8 to whether another feature in the plant, in costing a certain  
9 amount of money, whether that is in fact beneficial in light  
10 of that averted cost.

11 But I think Remy is right. You clearly, -- when you  
12 get into this business, you're raising fundamentally the issue  
13 of economic regulation. I think you are, and I think it is an  
14 issue. Now maybe I ought to let Tom explain it. Tom and the  
15 group have spent a lot of time in trying to rationalize this  
16 part of it out by articulating how to do the cost-benefit only  
17 for the case where you have the full-scale core melt, which  
18 clearly in that case, there is a definite safety implication  
19 for that case.

20 But they phrased it differently than I did.  
21 Remember, I said the paper says all costs, all benefits, all  
22 of the time. That's different. Maybe I should let Tom  
23 explain --

24 MR. OKRENT: Well, before you go on, I think we  
25 should not assume everybody agrees that that is economic

1 regulation. Some people think it is. But just let me make  
2 the observation, okay?

3 But you suggested focusing on two topics to the  
4 exclusion of others, and I can think of about one and a half  
5 that might warrant at least some time here. Median versus  
6 mean seems not -- not to be clearly resolved among the staff,  
7 although I notice trends which I applaud.

8 MR. LEWIS: But it's not an unmixed blessing.

9 MR. OKRENT: Well, yes. But more important, my own  
10 opinion is there is something called a criteria for action --  
11 that's not the term, but given an operating plant when you do  
12 certain things and when you don't do certain things and so  
13 forth, that also needs to be discussed.

14 MR. STELLO: I agree with you.

15 MR. OKRENT: You know what I'm referring to? 10 to  
16 the minus 3 to 10 to the minus 5.

17 MR. STELLO: Yes. But I think it's meaningless to  
18 discuss that issue until you have at least had the opportunity  
19 to discuss what is the performance objective; is it 10 to the  
20 minus 4, 10 to the minus 5. And I think it's a part of that.

21 MR. OKRENT: I agree that we wouldn't take the one I  
22 raised first, but I do want to talk about it this afternoon.

23 MR. STELLO: I think we are prepared and would like  
24 to discuss anything the committee wants, but I think we would  
25 also like the committee to take the time to discuss the things

1       that we think are important, too.

2               MR. LEWIS: I wasn't going to talk about the letter  
3       until, as the lawyers would say, you opened the issue  
4       yourself, and I am just curious about one thing while you are  
5       speaking. Harold, although he makes an egregious error on  
6       means versus median at the beginning of his letter, later on  
7       comes out generally in favor of means versus medians, and  
8       whereas most of things involve lots of words with small  
9       substantive changes, this is a small number of words with a  
10      very large substantive change.

11             I wonder whether you people are agreeable or feel  
12      warmly towards those suggestions.

13             MR. STELLO: I would be happy to start with that  
14      subject or continue with cost-benefit.

15             MR. OKRENT: We don't need to start with the  
16      subject, but you had suggested that we sort of limit the  
17      conversation, and personally, I am willing to run until  
18      9 o'clock. I can't speak for the other subcommittee members  
19      or anyone else.

20             MR. LEWIS: You like to work alone.

21             MR. OKRENT: Well, that is what I was afraid might  
22      occur, and I think I will bring the comments by Mr. Lave and  
23      Mr. McClain in roughly on schedule. In fact, I think maybe we  
24      should mentally get acclimated to the idea we may run beyond  
25      5:30. It sounds like there are enough important topics.

1           Why don't we begin with --

2           MR. WARD:   Could I ask one question?

3           Vic, when you say that the cost and benefit  
4 information would be displayed for the decision-maker, who is  
5 the decision-maker? I mean are you talking about the  
6 regulator or the utility or what combination?

7           MR. STELLO: In the context I used it, I used it  
8 clearly in the context of the regulator and the regulator's  
9 decision, but I also believe that since the utility has  
10 decisions to make, I think he would find that, in my view, a  
11 very useful tool. But we weren't making it in terms of in the  
12 sense of writing a policy for the industry, but rather for the  
13 NRC, and it is for the NRC decision-makers, and I said it is  
14 simply displaying all costs, all benefits, all of the time,  
15 and have that information in front of the decision-maker, and  
16 quite frankly, you recognize, not dealing with how much weight  
17 to give to what when.

18           Clearly, if you have a serious scenario where there  
19 is a very large release category possible, the safety end of  
20 the equation clearly, in my mind, personally for me, would get  
21 far more weight than any cost consideration at all, if at all.

22           On the other hand, if the particular issue in front  
23 of us has very little effect in terms of safety and the cost  
24 impact of doing it, it, in fact, is very high by definition.  
25 If it is not very important in terms of safety, then these



1     averted costs won't be very prominent in the display of  
2     information but rather the cost of doing it will take on more  
3     and more of a role.

4             MR. KERR: Let me see if I understand the context.  
5     When you talk about cost-benefit analysis, you aren't, except  
6     by indirection, talking about the quantitative goal, but  
7     rather you are talking about whether, having set the goal, a  
8     given plant attempts to move toward that goal by doing  
9     something that costs money.

10            That's the issue, isn't it?

11            MR. STELLO: Surely.

12            MR. KERR: Okay. So it's not the setting of the  
13     goal in which the CBA enters, although it enters in an  
14     operational sense, but rather, given that you have a goal, now  
15     what do you do to achieve it. And you judge whether what you  
16     do to try to achieve it is worthwhile by using cost-benefit  
17     analysis. That's the context in which we are discussing this?

18            MR. STELLO: Yes.

19            Incidentally, I have been doing an awful lot of  
20     talking, and any time anyone feels the need to add, be my  
21     guest.

22            MR. SPANGLER: I have something to suggest with  
23     regard to economic regulation. You know, the Kemeny  
24     Commission gave us an imperative to develop safety-cost  
25     tradeoffs, and of course, cost is economics. Clearly it is

1 economic resources, and it is a universal resource.

2 That is to say, you can use money that is spared in  
3 one application of technology for saving lives somewhere else,  
4 so it is a very versatile resource. And the way the problem  
5 was solved in Midland in the environmental impact statement  
6 process was to say that there was a trigger concept, namely,  
7 if the ecological-type environmental impacts were  
8 insignificant, you should not get involved in economics at  
9 all. That was pretty clear-cut.

10 However, they went on to say that once the trigger  
11 was there or exceeded -- that there were significant impacts  
12 on the ecology, then you should consider all costs to  
13 society. So this is a concept that I might say could be  
14 applied, if we wanted to as an agency, could be applied in the  
15 safety field. That is to say, if there are things that  
16 industry or utilities might do to improve reliability that  
17 have no significant implication for public health and safety,  
18 then that would be a clear-cut example of economic regulation  
19 and you would forget about it.

20 However, if you have accident scenarios under  
21 question, whether you want to reduce the risk or probability  
22 of an accident scenario because it has a high relevance to  
23 some safety goal, and you find that there are public health  
24 and safety impacts, then I think in parallel with the  
25 environmental impact statement decision procedure, it would be

1 important to consider all impacts on public interest  
2 regardless of what the economic manifestation was.

3 I am just suggesting that as a concept to be  
4 considered.

5 MR. OKRENT: Well, let's see. I am trying to think  
6 of what might be a reasonably orderly way to proceed and to  
7 give various members of the Staff a chance to make what they  
8 think are the more significant points that they would like to.

9 Let me for the moment suggest that this point you  
10 raised earlier, Vic, about the distinction between core melt  
11 and severe core damage, we not bring into this current  
12 conversation because I think it can be, in a sense,  
13 separable. If someone is defining a core melt frequency, just  
14 tell tell us which one he means and does he mean mean or  
15 median, for example, and is he trying to distinguish between  
16 severe core damage and core melt or not, for example.

17 But let's leave the actual ability or whatever, how  
18 one would treat that, as a separate topic. I am not sure we  
19 can separate the question of what the core melt frequency  
20 goals should be from the question of cost-benefit. Clearly if  
21 you read the comments by Mr. Minogue, for example, or Mr.  
22 Denton or so forth, they are not intermingled with  
23 cost-benefit, but if we waited to discuss what Mr. Minogue and  
24 Mr. Denton said until we were done talking about cost-benefit,  
25 we would have omitted an important input. So I think somehow

1 those end up intertwined.

2           Anyway, I think one possibility -- I don't know if  
3 it would work -- is to say, well, let's start with various  
4 members of the Staff here and ask them to take up to five  
5 minutes to tell us what they think, individually or on behalf  
6 of which group they are speaking, are the important  
7 considerations and recommendations in that regard.

8           Would that work?

9           MR. KERR: May I ask, is there now in existence some  
10 document from which we speak, some proposed? I have heard  
11 references to an original document and to additions thereto.

12           MR. STELLO: Let me say it one more time to make  
13 sure it is clear. You have in front of you the results of the  
14 Steering Committee report, Tom Murley.

15           MR. MURLEY: And that is not going to be changed.

16           MR. STELLO: That is their report, now and  
17 forever. The EDO has got to make up his mind to what extent  
18 does he wish to agree or disagree with the changes and  
19 recommendations made in that report. We had started to do  
20 some Staff work to make some suggestions to EDO as to what he  
21 ought to do. In the process, we were drafting the report that  
22 you now have that I referred to as a draft report.

23           There were sets of comments that were received that  
24 I believed were raising very fundamental questions, and I  
25 suggested at that point let's stop and let's have another

1 discussion with the ACRS, who is also very concerned with some  
2 of these other points. And perhaps as a result of that  
3 discussion, it would help both you to come to some sort of  
4 resolution in terms of a committee position on this matter as  
5 well as provide useful information for the EDO in making his  
6 decision.

7 I was chastised last time that the committee makes  
8 its recommendations to the Commission. I recognize that, but  
9 I don't believe there is a prohibition on having the  
10 committee's views and understanding be a part of what it is  
11 that the EDO also decides.

12 I thought that exchange would be very, very helpful  
13 and useful, so there are two reports.

14 MR. KERR: All right.

15 Now, if you are willing to give some advice to the  
16 committee, if you were commenting as a committee, what would  
17 you comment on? Would you comment on the June 19th document,  
18 on Murley's document, on both of them, on those plus whatever  
19 input we get at the subcommittee meeting, or none of the  
20 above?

21 MR. STELLO: I would suggest all of them because the  
22 differences between the two reports are in the five areas that  
23 I have talked about. The last time I was here, I suggested  
24 that those are the five areas that we are contemplating change  
25 in, and in two of those particular areas, I said let's spend



1 some time on because they happen to be areas the committee has  
2 also been very, very interested in. And implementation,  
3 incidentally, Dave, was one of them, so it clearly is an issue  
4 we want to talk about; but I want to make sure we get these  
5 two.

6 Now, what I propose to do is to start to go through  
7 this in terms of the way it developed by having Tom Murley  
8 summarize why did the Steering Group decide the issue the way  
9 it decided the issue on cost-benefit, and then I think you  
10 ought to hear from Minogue and NRR and any other member of the  
11 Staff in terms of their views of what it ought to be and why,  
12 and I have already summarized my view of what I thought it  
13 ought to be. I think that issue, then, to the extent we are  
14 done discussing it, we are done, and the committee will have  
15 to decide.

16 MR. KERR: Well, maybe I should address the next  
17 question to my colleagues if someone told you that we should  
18 always write to the Commission. It seems to me that generally  
19 what we do is to comment to the Commission on what we perceive  
20 to be a Staff position. We do not, apparently, at this point  
21 have a Staff position because one does not yet exist, so it  
22 seems to me that if the comments are to be helpful, they are  
23 comments to the Staff.

24 That is not the case? We tell the Commission what  
25 we think the Staff position should be; is that what we are



1       doing?

2               MR. OKRENT: No. I have to assume -- you know, not  
3       every case is identical. In this particular case, the Staff as  
4       far as EDO is concerned is forming an opinion. NRR has  
5       expressed an opinion and the Office of Research has expressed  
6       an opinion. EDO has not formed its recommendation to the  
7       Commission. The Commission is actively interested in this,  
8       and I think we should prepare comments to the Commission, and  
9       I see nothing that binds us to --

10              MR. KERR: I'm sure we are never bound. I was  
11       simply trying to put our preparation of advice or whatever  
12       into some sort of context that I could understand.

13              MR. OKRENT: The last I knew, we did not have some  
14       final EDO recommendation to the Commission either.

15              MR. KERR: I did not participate in preparation of  
16       last month's letter, so I didn't raise the issue.

17              MR. OKRENT: Well, you started and then left.

18              MR. STELLO: Might I suggest that the committee  
19       might find it useful to just decide what its view is on these  
20       several issues that we talked about and give that advice to  
21       the public, and we will all use it. But it is really those  
22       issues, and there are not that many of them, that are the  
23       troubling issues. I don't believe that the language or the  
24       word-for-word kind of thing is really very useful now because  
25       I'm sure the Commission will do some of that themselves

1       anyway.

2               But in terms of advice as to how to handle these  
3       troubling issues, and the first one is cost-benefit, could I  
4       suggest we do what I said, start with where it began, which is  
5       with the Steering Group Committee, why did they do what they  
6       did, and then various members of the Staff that are here  
7       representing offices have a view, and hear their views.

8               I will try to summarize, and that is as much as I  
9       think we are going to have in the way of input on these  
10      particular philosophical questions to decide.

11              MR. OKRENT: Okay. Why don't we start and see how it  
12      goes. I will reserve the prerogative of changing our course of  
13      action.

14              MR. MURLEY: Mr. Chairman, as you know, I briefed  
15      this committee, I guess, a couple of times before, as well as  
16      the Full Committee. Perhaps some background is useful on the  
17      approach the Steering Group took. We kind of used sort of an  
18      informal guideline that there had to be a clear reason and a  
19      sound basis for changing the safety goals from what the  
20      Commission had put out for public comment.

21              The previous exercise had taken three years, as you  
22      know, lots of effort, lots of public comment. The committee  
23      commented on those goals several times, and the Commission  
24      listened to all these comments and then they made their  
25      decisions.

1           Then they asked the Staff to evaluate the goals for  
2 possible use in the regulatory process and make  
3 recommendations for any changes that we saw were necessary in  
4 the goals themselves.

5           The Steering Group did not interpret this direction  
6 to mean that we were to do a complete de novo review of all  
7 the goals. As I said, we felt there had to be a clear reason  
8 and a sound basis for changing what had been argued and  
9 discussed before.

10           We found the individual and societal goals -- that  
11 is, the one-tenth of a percent goals -- to be reasonable.  
12 They are essentially policy judgments by the Commission, and  
13 we found no basis for changing them.

14           Similarly, we looked at the core melt guideline and  
15 we found it to be, I say, generally consistent with the public  
16 risk safety goals. That is to say, if the core melt guideline  
17 were met, then as a general proposition, the individual risk  
18 goal would be met and the societal goal would be met, usually  
19 with a large margin. Therefore, we didn't see a sound basis  
20 for changing from the 10 to the minus 4 guideline.

21           I guess in retrospect, and I'm speaking for myself  
22 now, we should have been more careful and clear in defining  
23 what we meant by core melt. The goals themselves say  
24 large-scale core melt. We recognized and we discussed a lot  
25 amongst ourselves that the PRA does not measure that. It

1 measures the frequency of inadequate core cooling, the  
2 frequency of circumstances that can get you into inadequate  
3 core cooling. You-all know that.

4 That is not the same as large-scale core melt. We  
5 know there is a difference; we don't know how to measure the  
6 difference, so we have just assumed that that is an unknown  
7 conservatism that remains in the goals. Vic, I think, has  
8 focused some more light on it, and I think it is appropriate  
9 that that issue be addressed and cleared up.

10 You mentioned, Mr. Chairman, that it is very  
11 difficult to separate the issue of core melt guideline and  
12 cost-benefit guideline, and I agree with you. If there were a  
13 recommendation made to lower the core melt guideline without  
14 lowering the public risk guidelines, then because of the  
15 connection or the general consistency that I alluded to  
16 before, the only conclusion I can see for doing such a thing,  
17 lowering the core melt guideline, is a desire to reduce the  
18 economic risks from core melt accidents as opposed to public  
19 health risks.

20 To my mind, it follows that if one feels the need to  
21 reduce the core melt frequency, then one must also feel the  
22 need to reduce the public health risks because they go hand in  
23 hand. If not, then the only reason for doing so would be to  
24 reduce the economic risks of such accidents. So in that sense  
25 they are coupled, at least in my mind.

1 MR. KERR: Is it admissible to ask questions or  
2 should I wait until the end?

3 MR. MURLEY: Why don't you let me finish, and I will  
4 be done in about one minute.

5 With regard to the cost-benefit guideline, we  
6 followed that down the path of using it in how we would use it  
7 in regulation and in regulatory decisions. We followed it  
8 down that path to see where it would lead us. We found it  
9 generally leads to a dead end; that the \$1000 per man rem  
10 cost-benefit guideline in the original goals allows almost no  
11 substantial improvements to be made in reducing core melt  
12 frequency, just because it takes a very, very serious accident  
13 to have offsite consequences of man rem enough to get you  
14 dollars to fix things.

15 MR. WARD: Even with this conservatism about the  
16 difference between full-scale core melt and the concept?

17 MR. MURLEY: Yes. And having gone down that path,  
18 we asked ourselves how could we change it and how should we  
19 change it, and we felt that it was important -- it really gets  
20 down to the fundamentals of NRC safety philosophy, in our  
21 judgment, and that is the importance of defense in depth and  
22 the importance of maintaining your eye on core melt frequency  
23 as a separate entity in itself.

24 It was because of the fact that we felt it led us to  
25 a dead end in terms of safety improvements that we came up



1 with the recommendation that we did. It received an extensive  
2 amount of debate and discussion. That is not to say it's  
3 perfect, but we do feel that it is a way to allow improvements  
4 to be made in core melt frequency that maintains this defense  
5 in depth philosophy.

6 MR. REMICK: Tom, could you elaborate? I'm not sure  
7 I understand. Why should you make a change if it is not going  
8 to affect the public health and safety? You say you run into  
9 a dead end. That's because the improvements presumably cannot  
10 reduce public risk.

11 MR. MURLEY: Yes. What we have to do is go back, I  
12 think, to an even more basic question, and that is should we  
13 do cost-benefit analyses at all? Should this agency do them  
14 at all? And having decided to do them, then I think the  
15 question is you have to do them in an even-handed way. I mean  
16 I use the analogy of it's like sending the Staff out in the  
17 ring with one arm tied behind its back.

18 Having embarked on this road of doing cost-benefit,  
19 of taking cost and benefits into consideration in doing safety  
20 decisions, to me that's the fundamental question. Having done  
21 that, then I think you have got to do it in a way that is  
22 consistent with the rest of your regulatory philosophy. The  
23 set of goals that the Commission gave us to use, I believe, is  
24 not consistent with the defense in depth philosophy because,  
25 having followed it down the path, we find out it doesn't allow



1     you to do anything basically.

2             MR. REMICK: But at the same time, in your report  
3     you said that this should not be the only criteria; it's just  
4     further input into your decision. So it doesn't say that you  
5     cannot do it.

6             MR. MURLEY: Yes.

7             MR. REMICK: So I guess I don't follow that it  
8     affects defense in depth. I just don't follow that.

9             MR. MURLEY: I should mention that it was another  
10    recommendation of the Steering Group that none of this, what  
11    we are talking about today, none of it should be a replacement  
12    for what we do today. It's an overlay to what we do. So in  
13    that sense, you are correct that it doesn't prohibit the Staff  
14    from doing anything.

15            But it ought to be intellectually correct and it  
16    ought to be intellectually consistent, so we approach it in  
17    the sense of if it were to be used as the regulatory basis,  
18    how should it be? Does that make sense?

19            MR. REMICK: I understand what you are saying.

20            MR. MURLEY: Even though we are recommending that it  
21    not be rigorous, it shouldn't replace our current regulations  
22    or the way we do business. Nonetheless, it ought to be  
23    consistent as if it were elevated to such a status.

24            Jesse raised a question earlier about who should pay  
25    for these, or does it make any difference who pays for it. We

1 really didn't look at that question, and we ultimately  
2 concluded that any accident is going to be similar to TMI-2  
3 and you are going to find that the shareholders are going to  
4 pay some of it, the rate payers in the vicinity are going to  
5 pay some of it, and the taxpayers as a whole are going to pay  
6 a lot of it. So we don't see that that is changing, quite  
7 frankly.

8 MR. EBERSOLE: Let me ask you another question.  
9 The national demand is going to go upward. To the extent that  
10 you deny the availability of this nuclear power to produce  
11 electricity, it is going to be ground out by some other  
12 method. Fossil fuels. That carries it only health and safety  
13 to the public benefits and disadvantages.

14 I don't know whether we extend ourselves into  
15 comparative evaluations --

16 MR. MURLEY: No, the safety goals talk about that,  
17 but I think we have concluded that there is really not much we  
18 can do along those lines, so the Steering Group didn't.

19 One final point. Vic has taken our recommendation  
20 and is considering a variation which goes even  
21 further: namely, considering all the costs, all the benefits,  
22 all the time. We didn't consider that so it's hard to  
23 comment on it. I will just comment on it myself. We didn't --  
24 I don't think that is inconsistent with what we are proposing,  
25 but it has not been followed down the path to see where it

1 leads the way that the \$1000 per man rem has. That is, it  
2 hasn't been evaluated to see how it is going to work in  
3 practice.

4 It could well be, because it gets us so deeply into  
5 assessing costs and benefits for even relatively minor  
6 accidents, like steam generator tube breaks is the example  
7 that we did discuss in the report, that I'm not sure whether  
8 we even really want to get into that as an agency. That is  
9 why we limited it to core melt accidents, because it is clear  
10 that they did have a radiological consequence and a safety  
11 implication.

12 I guess that concludes the general comments.

13 MR. OKRENT: Wait a minute, now. I think Bill Kerr  
14 did have a question that we deferred.

15 MR. KERR: I do not at this point have a question.

16 MR. LEWIS: Could I ask three, you know, very short  
17 questions? They really don't require more than one-word  
18 answers.

19 You said you didn't find any problem, you said you  
20 found no problem with the one-tenth percents, and these are  
21 presumably the one-tenth percent probability of getting cancer  
22 from an accident, the one-tenth percent of --

23 MR. OKRENT: Of getting cancer or of being killed in  
24 an accident.

25 MR. LEWIS: Well, let me, in fact, just use that one

1 as a surrogate. Do you have in mind that the safety goal will  
2 be a floating safety goal according to what happens with the  
3 rate of cancer deaths in the community?

4 MR. MURLEY: That is how it is phrased, and I would  
5 say yes.

6 MR. LEWIS: You do have in mind that it will float  
7 with that. That is, if we cure other forms of cancer, we will  
8 put more stringent requirements on nuclear reactors?

9 MR. MURLEY: You can't tell radiologically-induced  
10 cancers from any others, so if you cure one, you are going to  
11 cure the other.

12 MR. LEWIS: And presumably, as the population ages  
13 and more of us start dying from cancer, we will be able to  
14 relax somewhat on you. That is what you have in mind?

15 MR. MURLEY: If that is the case.

16 MR. LEWIS: Well, that was a direct answer. I have  
17 to give you credit for that, although Vic is winning right  
18 now.

19 MR. LEWIS: The second question, along the same  
20 lines, is what do you think about the medians versus means  
21 thing? Do you think we should be talking about medians or  
22 means?

23 MR. MURLEY: I think it's a judgmental question.  
24 There are arguments on both sides. It's not clear.

25 MR. LEWIS: Well, you have answered my question if

1     you think there are arguments on both sides.

2             MR. MURLEY: Yes. We came down on the median --

3             MR. LEWIS: Well, let me ask it differently. What  
4     do you think on the average is the ratio between the median  
5     and the mean of, say, core melt probability?

6             MR. MURLEY: That is unknowable. We looked at some  
7     examples of some log normal distributions that had  
8     distributions that had 95 percent within a factor of plus or  
9     minus 10, 10 to the minus 4, plus or minus 10. And the  
10    difference between the mean and the median there is a factor  
11    of 2. If you take the log normal distribution and have a  
12    factor of 30 on either side contained in 95 percent of the  
13    area, then you find the difference is a factor of 6 between  
14    the mean and the median, and it gets worse from there.

15            MR. LEWIS: Well, I don't quite understand the  
16    statement that it is judgmental if we are talking about large  
17    factors. If you say one you are stating a core melt  
18    criterion, which is really quite different from what you state  
19    in the other case. It is not judgmental. You have to make up  
20    your mind. The median will in most of these broad  
21    distributions, as I think you have just said, be smaller than  
22    the mean, so --

23            MR. MURLEY: Well, here is how we came down on  
24    deciding, recognizing there were arguments on both sides. The  
25    argument for the median is the fact that it is invariant with



1 regard to the width of the distribution of so-called sigma.

2 MR. LEWIS: Ah, that is not so.

3 MR. MURLEY: Well, we have got the equations.

4 MR. LEWIS: Well, give me any distribution and I can  
5 define any point on it, and it is not invariant. It is  
6 invariant if you define --

7 MR. MURLEY: The mean changes, but the median does  
8 not.

9 MR. LEWIS: That is simply not true.

10 MR. MURLEY: Oh, okay.

11 MR. LEWIS: I understand the position now, though.

12 MR. MURLEY: Well, the argument is if the mean and  
13 the median start to deviate by these factors of 4 and 6, then  
14 our view was things are so uncertain, one should not be using  
15 such unknown distributions for decisionmaking anyhow. In that  
16 sense, it then becomes an academic question as to whether you  
17 use the mean or the median.

18 MR. LEWIS: Well, when you talk about core melt  
19 probability, the Rasmussen report, which we all remember with  
20 fondness, quoted an uncertainty in core melt probability of  
21 plus or minus a factor of 5, and it was widely believed that  
22 the uncertainty was, in fact, larger than that. So that was a  
23 particular case in which the difference between median and  
24 mean was judged to be fairly substantial.

25 I personally know of no real evidence that the

1 difference between the two has gone down a great deal in the  
2 sense that the distributions have gotten tighter. There are  
3 still major unknowns, as there were at that time. I don't  
4 think it's an empty question to ask what you are defining, and  
5 in fact, it has real implications for what safety level you  
6 are setting on reactors, and you have to define it very  
7 specifically.

8           You can define a mean without specifying the  
9 distribution. You cannot define a median without specifying  
10 the distribution.

11           MR. MURLEY: I really do think it's a second order  
12 question. I realize there are these differences, but the fact  
13 is this whole structure that we are constructing here is  
14 arbitrary. The tenth of a percent, it could have been a  
15 percent, it could have been a hundredth of a percent, but they  
16 chose a tenth. That is arbitrary. The means that you use to  
17 judge it have large uncertainties, whether you use the mean or  
18 the median.

19           My view of things is once -- that the safety goals  
20 ought to be used as a kind of a beacon, a regulatory  
21 yardstick, we called it, and that it ought to help us make  
22 decisions where we can. It ought not to be the only means we  
23 have to navigate through these shoals, but it ought to be  
24 there.

25           What we seem to be talking about in arguing means

1 and medians is what color the beacon ought to be painted or  
2 something like that. I just don't think it is --

3 MR. LEWIS: Well, I will just make one more comment  
4 and then shut up. The fact that a problem is hard is no  
5 reason to do part of it badly, and I think that this confusion  
6 about medians and means is a place in which it is being done  
7 badly. That is simply a statement I will make for the record.

8 MR. OKRENT: Can I ask Vic a question?

9 MR. STELLO: Before you do, can I respond to at  
10 least one of the questions? I don't believe that anyone ever  
11 even thought of floating reactor safety in terms of changes in  
12 the ability to cure cancer.

13 MR. LEWIS: Oh, so you disagree with what was said.

14 MR. STELLO: Yes. I think this is a view where  
15 there is sort of a perception of public risk and that is about  
16 where the public risk is going to be for some time. If there  
17 were any dramatic change in it, I think that it would go back  
18 to the original decision-makers. I think they had just a  
19 notion of what public risk was all about, and I think if you  
20 found shifts or changes in terms of the ability of technology  
21 and medicine to cure cancers, and they change, I think the  
22 decision-maker would go back.

23 I just don't think anyone was thinking about it  
24 floating all around. I think it was viewed as sort of a fixed  
25 --

1 MR. LEWIS: So we have two answers.

2 MR. KERR: I think there is evidence for Vic's  
3 position if you look, for example, at the \$1000 per man rem  
4 and how long it has been retained in its original form.

5 MR. REMICK: Could I just comment on that point?

6 MR. WARD: You know, against the base that I might  
7 say is changing somewhat more rapidly than the death rate for  
8 cancer can be expected to.

9 MR. REMICK: I would differ somewhat, with the  
10 realization that that base would be floating with time, with  
11 the thought being it would be a very gradual change. And then  
12 I agree with you if it diverted from what was originally  
13 intended, then the idea could be reconsidered. But there was a  
14 realization that it is something that would float with time.

15 MR. STELLO: The floating being within the noise  
16 level.

17 MR. LEWIS: The noise level?

18 MR. STELLO: Yes, that was the general feeling.

19 MR. LEWIS: What do you mean by noise?

20 MR. STELLO: Insignificant. In the decimal point  
21 beyond which we can calculate.

22 MR. LEWIS: I see. This is like the calculated risk  
23 which is never calculated.

24 MR. STELLO: Something like that. I don't believe  
25 anyone had the view that, you know, a tenth of a percent was

1 going to mean this year that there were 100,000 deaths in the  
2 United States, and next year it was going to be 40,000. Maybe  
3 101 or 999,999. I don't think anybody viewed it as  
4 significant change.

5 MR. LEWIS: Well, just as a suggestion, I think it  
6 would be good to be clear about whether you mean it to be a  
7 floating number or not because I can envisage a world in which  
8 it is just like when the cost of living index comes out each  
9 year. Salaries get adjusted and everything gets adjusted, and  
10 eventually you will get a number like .1698 percent, and you  
11 don't want to do that.

12 MR. STELLO: No, but I also don't want to give  
13 anybody the impression that there is any degree of precision  
14 in what we are doing.

15 MR. OKRENT: I would like to understand what you  
16 mean when you said earlier you propose that all of the  
17 information be displayed, that is, both costs and benefits.  
18 Were you going to compute any ratios at all?

19 MR. STELLO: You compute all the ratios you want  
20 then in terms of how you are making the decision.

21 MR. OKRENT: Not any single ratio? There was no  
22 preferred ratio that would be calculated?

23 MR. STELLO: The one that the Commission has  
24 suggested is \$1000 a man rem.

25 Not necessarily having changed that, but when you



1 make the decision, and the figure comes out to be different  
2 from \$1000 a man rem, it doesn't mean to me, that that means  
3 don't do it either. If it's \$50 a man rem, then I might view  
4 -- and to get back to this median/mean issue -- you can  
5 display -- you know what the uncertainties are, and I'll be  
6 very interested in what the uncertainties are. I could care  
7 less whether it's mean, median, or what. I want to know what  
8 the uncertainties are.

9 I'll take all of that into account when I make my  
10 decision.

11 MR. OKRENT: Well, let me say, I really don't  
12 understand what you really have in mind when you say "display  
13 all the information" -- let me finish, if I can -- because it  
14 could be, on the one hand, a proposal that, in fact, each  
15 piece of benefit and cost information be given serious  
16 consideration by the decisionmaker, and he develops a  
17 weighting method or whatever it is, or it could be, you will  
18 display these various costs and calculated benefits, both  
19 calculated, and you will compute the ratio in the current  
20 safety goal, which is what is effectively proposed in the  
21 backfitting rule, which I think has been approved, and in the  
22 severe accident policy statement, which I think has been  
23 approved, and that it would really be a subterfuge, if I can  
24 use a strong word, that people would look at the number, and  
25 the rest of it would be there, just like you can calculate the

1 median, give the number and say there is an uncertainty band  
2 of 10 or 100, and then go on and ignore it, using the median  
3 to give you the number to put into the cost/benefit  
4 calculation.

5 So I find myself not knowing what the intent of that  
6 particular recommendation in the draft EDO document is, in all  
7 honesty.

8 Mr. Kerr?

9 MR. KERR: I have some of the same misgivings,  
10 because I don't know what "all" means. Mr. Ebersole, for  
11 example, mentioned an important cost, and Mr. Murley said, I  
12 think properly, that we didn't know how to consider that.

13 Well, there is a great deal of uncertainty, and the  
14 greenhouse effect has a great deal of uncertainty in the  
15 number of deaths caused by the pollution of the use of fossil  
16 fuels.

17 But these are part of possible costs or whatever.  
18 But if you're going to talk about "all" costs, where do you  
19 stop? That's the principal difficulty I have with "all  
20 costs."

21 MR. STELLO: Well, I don't know whether David had  
22 asked a question -- I think he did -- and you added to it.

23 Let me try to identify the kinds of things that we  
24 are talking about in "all costs", "all benefits." You have  
25 some sort of a decision you are trying to make. You clearly

1 ought to be asking, what is the public health consequence  
2 associated with making it or not making it -- risk? How much  
3 do you know about it?

4 If you have a PRA analysis, what does it tell you?  
5 What are the uncertainties? What do you or don't you know  
6 about how you are going to change safety? What are the  
7 engineering judgments that go into the question of safety?

8 Safety should be, in our business, the first  
9 question that we talk about and spend most of the time talking  
10 about. But clearly, are there exposures, both offsite or are  
11 there occupational exposures, just as a result of implementing  
12 the particular activity?

13 Some of these things that we require to be  
14 implemented, you'll find the exposures to implement some of  
15 these things far exceed the total offsite exposure at TMI.  
16 They are exposures to real people. So you ought to know what  
17 that is. That is another cost, if you will.

18 Cost, I think you need to quit thinking in terms of  
19 dollars. It's a cost; it's real. If you put \$1000 a man rem  
20 to it, you can make a dollar value out of it, if you wish, but  
21 nevertheless it's real. Onsite property damage, offsite  
22 property damage, how much does it -- what is it? How big is  
23 it? Replacement power: How much, for how long? Do you have  
24 to shut the plant down, which will mean replacement power, or  
25 can you do it without the plant shut down if you're

1 considering a particular fix?

2 MR. EBERSOLE: Is it still effective life? I  
3 remember once seeing it, that stack emissions from a big coal  
4 burner have more long-term radioactivity in them and laydown  
5 potential than --

6 MR. STELLO: I have seen those calculations, too,  
7 yes.

8 MR. EBERSOLE: So every time you chop out a nuclear  
9 plant, you enhance the outpouring of this other stuff.

10 MR. STELLO: That's a true statement. And I think  
11 if we were sitting in a different room with a different  
12 government organization, we ought to be asking all those  
13 questions, and the people who have to make those decisions  
14 ought also. Maybe that's Congress where those questions get  
15 raised; maybe it's OMB or somewhere. I don't know. That's  
16 not our business clearly. We don't regulate coal plants.

17 MR. EBERSOLE: Well, we ought to identify our  
18 platform anyway.

19 MR. STELLO: Well, I have. Our platform is in the  
20 business with which we're charged to regulate.

21 MR. EBERSOLE: Not in a relevant sense to others.

22 MR. STELLO: Well, you know, there is that language  
23 in the safety goal that we ought to consider other forms of  
24 generating electricity and their impacts. I think that that  
25 is biting off far more, and if we do, quite frankly, we'll

1     never have any safety goal. If we have to include into the  
2     cost/benefit equation the impacts of importing oil from a  
3     foreign country or importing electricity -- right now, which  
4     we do; I guess Canada -- New England's importing about 12  
5     percent, and what's the impact of that in terms of the  
6     security of the country and the rest of it -- you can ask  
7     broader and broader questions, and they're useful to ask, but  
8     I think if we're going to try to frame a safety goal to use  
9     for purposes of helping us make regulatory decisions, you can  
10    make it so that you can't get an answer, and I don't think  
11    that's very useful.

12             But there are -- all benefits, all costs related to  
13    the decisions we have to make, not universal, not for all  
14    things for all times. I just don't think you can run -- and I  
15    know Bill has raised a good question. I know the concern is a  
16    genuine one. But I believe we're trying to just -- if you  
17    will again go back to the question I said I think we're really  
18    faced with.

19             We have a technology called PRA technology. Safety  
20    goal philosophy or policy is the application of that  
21    technology through a safety goal structure to the regulatory  
22    process. I think it's very, very important. It gives us the  
23    kinds of insights about reactor safety and allows us to  
24    examine and expose these fundamental questions.

25             That's what it ought to be. This discussion seems



1 to take on an aura of -- we don't have goals; we don't have  
2 philosophies; we have rigid, fixed standards. If it's \$1000 a  
3 man rem, fine, do it. If it's \$999.99, do it. If it's  
4 \$1000.10, don't.

5 That's nonsense. We have made decisions. We have  
6 imposed requirements for which we have been on all sides of  
7 the cost/benefit, for other reasons, other than --

8 MR. OKRENT: Excuse me, Vic, but I think you still  
9 really haven't indicated how the decisionmaker was going to  
10 use all of this information, nor have you defined -- and just  
11 to further confuse or exacerbate the melange on the table, one  
12 could look at Three Mile Island and say, in fact, that there  
13 was an adverse effect on health and safety, taking the reverse  
14 logic of Ebersole's point.

15 Because of Three Mile Island, less nuclear plants  
16 were built. And if you believe that nuclear plants are safer  
17 than coal plants, you increase the risk to the public health  
18 and safety. If you believe that the country suffered  
19 economically because of this, there is a strong correlation  
20 between general economic level and mortality rate. So there  
21 is clearly an increased risk to the overall public health and  
22 safety.

23 So this is a complex subject, and you have to be  
24 careful about biting off only that part that fits your  
25 argument.

1 MR. STELLO: Dave, I wasn't --

2 MR. WARD: Let me comment on that, if I may, because  
3 it's an interesting argument. But if you're going to make  
4 that argument, you have to say that the cause of this  
5 increased risk to public health and safety was not the  
6 accident at Three Mile Island, but the reaction to the  
7 accident at Three Mile Island.

8 MR. OKRENT: Well, I can't separate them.

9 MR. WARD: Well, they're different.

10 MR. OKRENT: I know, but I can't --

11 MR. WARD: Well, if you are going to treat them, you  
12 have to treat something differently.

13 MR. OKRENT: But the one followed the other.

14 MR. WARD: Well, all of these efforts that we are  
15 addressing are to treat the accident and not in any direct way  
16 the reaction to the accident, which was the cause of your  
17 problem.

18 MR. OKRENT: Forrest?

19 MR. REMICK: Vic, trying to respond to the comment  
20 you are floating, the idea of including all benefits and all  
21 costs appeals to me as a concept. It's exactly what NEPA  
22 requires for a major federal action on the part of the  
23 agencies looking at this when they write the environmental  
24 statements.

25 There are some problems with it, however, because

1     when you say "all costs and all benefits," you get led down  
2     the path that you say is not logical, where you have to  
3     consider all kinds of secondary costs and benefits. It's  
4     unending. And there are going to be people who are going to  
5     take you to hearing and to court on questioning, have you  
6     considered all and have you done it adequately? And I know  
7     from the Licensing Board activities, that can get into the  
8     costs of aesthetics. You're going to move a house, or you're  
9     going to put a cooling tower up. You know, where do you end  
10    it?

11           The other thing is, where it differs, in the NEPA  
12    cost/benefit comparison that the agency has to go through, the  
13    Appeal Board long ago said that there is an overriding benefit  
14    that overrides all costs, and that is, if there's a need for a  
15    power, that's overriding. That's a benefit that you can't  
16    override with costs. The you use all the costs to see how can  
17    you minimize cost to get that benefit. Can you do something  
18    that will reduce the costs, whether that's an impact to  
19    aesthetics or whether it's dollar costs?

20           But you don't have anything like that here. So you  
21    have no point of how you weigh these and where you draw the  
22    line. So it seems to me, you would open up unending debate  
23    and litigation on the decisionmaker of how he decided that.  
24    You don't have that Appeal Board decision and so forth, and  
25    you don't have something like the \$1000 a man rem to at least

1 use something to hang your hat on.

2 So it seems to me, although it appeals to me, it is  
3 consistent with what NEPA requires for major federal actions,  
4 it seems to me it's going to be openended and unending.

5 MR. OKRENT: It has been suggested that we try to  
6 let the various members of the Staff all have a fair chance to  
7 express their opinion.

8 MR. STELLO: We intended to have Bob Minogue deal  
9 with the cost/benefit and then NRR deal again with the  
10 cost/benefit and at least hear what everyone had to say before  
11 we get into too much further discussion.

12 Do you think it's possible to let the two of them  
13 say what they're going to say?

14 MR. OKRENT: Well, I won't guarantee it, but let's  
15 try.

16 MR. STELLO: Well, we just won't answer your  
17 questions until you let us finish. How is that?

18 MR. OKRENT: Well, that might be the best way. But  
19 anyway, why don't we try going on.

20 Bob?

21 MR. MINOGUE: Okay. I hope I can be heard okay.

22 [Mr. Minogue joins the conference table.]

23 MR. MINOGUE: I do have some general comments I  
24 would like to make. Frank Gillespie is with me, and he may or  
25 may not want to add some specifics at the end.

1 First of all, I am commenting and reacting to the  
2 report of the Steering Committee and not to other documents.  
3 I took this as being an assignment from the Commission to them  
4 to evaluate the application of the safety goal as proposed by  
5 the Commission in the context of regulation, and I will begin  
6 with the bottom line.

7 I think they did it quite well. In the course of  
8 carrying out this activity, Tom Murley briefed key members of  
9 the Staff a number of times, and then I had a number of  
10 supplementary briefings from Mal Ernst. So that while all  
11 this was going on, I think that generally we were kept  
12 informed as to what the committee was doing and specifically  
13 what the problems were that they were trying to address. And  
14 the bottom line to me is, I think they did a good job on this.

15 So in a sense, my main comment on their report is  
16 that I would support it as being a reasonable effort to lay  
17 out approaches that could be used to achieve the Commission's  
18 goals in the context of regulation, in the framework of the  
19 safety goals as the Commission proposed them.

20 I do have two comments I want to make, and I think  
21 they are both relevant to what you have been talking about.  
22 They are comments that are really more from the perception of  
23 the nature of the technology and the nature of the tasks that  
24 we have in regulation to deal with safety issues.

25 The first is one that you may call "defense in



1 depth," or I would prefer to refer to as the question of the  
2 balance between prevention of accident and mitigation of the  
3 consequences. I think it's essential that any regulatory  
4 approach that is used has got to find the proper balance  
5 between these two, particularly in light of the large number  
6 of uncertainties that I believe still exist regarding the  
7 characteristics of the plants, variations between plants,  
8 operational problems and so on that continue to arise.

9           It's really very critical that anything we do in  
10 regulation has the means available to deal with some of these  
11 questions in the context of the traditional wisdom of defense  
12 in depth.

13           The other issue relates to limitations in the PRA,  
14 and this refers both to the methodology and the database. The  
15 committee points out the significance of the PRA reference  
16 document, which in a sense was a taking of stock. I think  
17 they also recognized many of the weaknesses of the present PRA  
18 methodology. Many of these I know this committee recognizes  
19 very well, because they've raised them a number of times in  
20 other contexts -- the inadequacies of dealing with common  
21 cause failure modes and external hazards, inadequacies in  
22 dealing with various mechanisms of degradation in service,  
23 maintenance problems, human factors and so on, all of which  
24 can come back in terms of developing a real uncertainty as to  
25 what you have with PRAs.

1 I have a memo that I want to quote, that I think is  
2 particularly revealing on this, because it comes back even to  
3 the aspect of PRA that I think some people think is in pretty  
4 good shape, and that is the systematic assessment of designs.  
5 And I am quoting from a memo that Harold wrote on June 27th on  
6 station blackout.

7 It says: "I believe that the recent Davis-Besse  
8 events illustrate that in the real world system and component  
9 reliabilities can be greatly below those which we, in the  
10 industry, routinely assume in estimating core melt  
11 frequencies."

12 In my lexicon, that means that that particular plant  
13 in that mode was operating well beyond the design envelope,  
14 which really raises some questions regarding even that aspect  
15 of PRAs, which is widely regarded as being the best  
16 established.

17 I think these two broad areas -- the question of the  
18 balance between prevention and mitigation and the question of  
19 limitations on PRA -- are things that have to be faced in any  
20 activity to implement this concept of safety goals in the  
21 regulatory process. And I think the Steering Group has  
22 attempted to do that in a reasonable way.

23 Now let me take these in turn. I think the concept  
24 of cost/benefit analysis in considering onsite costs, to me,  
25 is a way of dealing with the question of precursors, dealing

1 with the questions of the course of operational upsets that  
2 may lead to severe accidents, in a way that will enable a  
3 significant increase in safety to be developed in a reasonably  
4 straightforward way. So to me, it's a very logical approach  
5 to apply.

6 I don't agree at all that it's economic regulation.  
7 I think it speaks directly to safety questions. It is  
8 occupational exposure, yes, but it goes beyond that. It goes  
9 to the fundamental question of what is the best way to prevent  
10 a severe accident, and how do you consider the results of  
11 your analysis, feeding it back into plant modifications.

12 Another advantage in doing this is that the industry  
13 itself, I think, at some point will -- particularly to the  
14 extent they become truly risktakers; somebody used that  
15 expression earlier -- will begin to recognize some of their  
16 own economic incentives, and I would expect, then, to use some  
17 of the same methodologies in assessing economic risks. And I  
18 think there's an advantage if the regulator and the regulated  
19 industry are talking the same language, coming at the problem  
20 of evaluating complex operating situations from the same  
21 perspective. I think that leads to more effective regulation.

22 So the bottom line of all this, I really do believe  
23 that the proposals made by the committee are "a" reasonable  
24 way -- and certainly not the only way -- of dealing with the  
25 question of taking into account some of the uncertainties in

1 the PRAs and their applications and taking into account some  
2 of the conventional wisdom dealing with the "defense in depth"  
3 concept.

4 MR. GILLESPIE: Mal Ernst is one of the primary  
5 authors of it, and our concern was strictly with "defense in  
6 depth" and whether it is \$9 billion that you are going to use  
7 as the measure of the lever, or you can establish some other  
8 kind of numerical predictor based on individual sequences or  
9 sums of sequences. The lever for that process is necessary,  
10 and it could be done maybe in a number of ways.

11 Our memo that Bob sent in reaction to this suggested  
12 another way which dealt with possibly individual sequences and  
13 sums of sequences. Both ways could probably be made  
14 effective.

15 MR. MINOGUE: I think there are a number of ways of  
16 coming at this. I wouldn't want to hang my hat on one  
17 particular approach, but I think it's important to be  
18 prepared, to not subject yourself to a test which in some  
19 cases may be meaningless.

20 If I take \$1000 per man rem as a go/no-go signal and  
21 say, well, if it comes out this way, I won't do a darn thing,  
22 I think that can really lead to a mistake. There are too many  
23 uncertainties in the PRAs and too many problems in terms of  
24 our understanding of these plants. I think if you do that,  
25 you are likely to disregard regulatory actions that, in fact,

1       could be very cost-effective in terms of reducing the risk.

2               MR. KERR: We are talking in the context of a set of  
3 regulations which were not born yesterday and which, at least  
4 every other day, we say include defense in depth, and which we  
5 think have produced a reasonably safe industry.

6               I don't understand why -- what are all of these  
7 things that we want to do to make the plant safer? The policy  
8 statement that I heard Dave say had been approved by the  
9 Commission -- I didn't realize; I knew it was close to it --  
10 says that existing reactors are fairly safe, and except for  
11 some cleanup of outliers, nothing need be done about them.

12              Now what are all of these things that need to be  
13 done, that need this extra lever? I'm puzzled.

14              MR. MINOGUE: This comes to a basic perception. I  
15 think this is a complex and poorly understood technology which  
16 poses many dangers. It is regulated, to the best of our  
17 knowledge, in an effective way.

18              MR. KERR: Would you disagree, then, with the policy  
19 statement?

20              MR. MINOGUE: I am trying to answer your question.  
21 We have developed at considerable expense in this agency  
22 techniques for doing systematic analyses of plants and plant  
23 operations in order to improve the understanding. I would  
24 expect from that more focused regulation. It might be less  
25 expensive regulation. It certainly will be more effective



1 regulation.

2 So I think there is a parallel to this that speaks  
3 not just to eliminating problems which may exist, but also to  
4 reducing unnecessary burdens.

5 MR. KERR: I am trying to understand whether the  
6 viewpoint, as viewed by you, is at conflict with the policy  
7 statement on severe accidents, or is it in parallel with it?

8 MR. MINOGUE: I do not intend to state an issue of  
9 conflict with the policy statement. I haven't read the last  
10 version of it. The first version was drafted some years ago,  
11 and I certainly was on board on that. I haven't really  
12 focused on that.

13 But if you're asking me to say that I say there are  
14 no unanswered to questions --

15 MR. KERR: I didn't say "no." The impression I get  
16 --

17 MR. MINOGUE: I don't say that for a minute. I  
18 think there are a lot of unanswered questions. And  
19 Davis-Besse certainly presents a lot of these regarding the  
20 effectiveness of the regulatory approach and the nature of the  
21 hazards.

22 MR. KERR: The impression I get is that there is a  
23 great deal out there that needs to be done to improve the  
24 safety of an industry that is very risky.

25 MR. MINOGUE: Well, we agree on that, so we have in

1 hand here a tool --

2 MR. KERR: And that is your view?

3 MR. MINOGUE: Yes. We have in hand here a tool --

4 MR. WARD: No, he didn't say that was his view.

5 MR. KERR: There is an industry out there that is a  
6 very high-risk industry, and a great deal needs to be done  
7 about it.

8 MR. MINOGUE: If the industry were not a high-risk  
9 industry, the Congress would not have found it necessary to  
10 establish a special regulatory commission to deal with  
11 safety. We could all go home.

12 MR. KERR: I don't understand --

13 MR. MINOGUE: Well, I have answered your question.  
14 I think what we have here --

15 MR. LEWIS: I don't think, if you look at the law,  
16 that it says it's a high-risk industry. It says that you have  
17 to limit the risk.

18 MR. OKRENT: Well, I think you are using the word  
19 "risk" in different --

20 MR. LEWIS: Well, yes. But Congress did not say  
21 that this is a high-risk industry.

22 MR. MINOGUE: Well, I think this is a complex  
23 technology that is poorly understood, in view of the wide  
24 differences among these plants, and I think continuing  
25 experience shows I am right.

1 MR. LEWIS: Well, that's a different statement.

2 MR. MINOGUE: Well, fine. We will put it on those  
3 terms.

4 You know, this meeting is talking about how you use  
5 the methodology of PRAs in an effective way to help you focus  
6 regulations, so that what you do is more targeted on real  
7 problems, more cost-effective, not targeted on problems that  
8 are not real. We probably do a lot of things that deal with  
9 non-issues, so I think there is room for improvement in both  
10 directions.

11 MR. KERR: Now we aren't talking about existing  
12 regulations, because they are already in force. We're talking  
13 about something beyond existing regulations. Nobody has said  
14 we're going to eliminate existing regulations.

15 MR. MINOGUE: Yes. I was going to make a comment  
16 earlier, but I got sidetracked. That's one of the points, of  
17 course, that Murley makes in his memo, which is right-on, that  
18 what they are talking about is an overlay on the current  
19 practice, and I really see it as a refinement in the sense  
20 that I think that as you begin to develop a better ability to  
21 use these tools, both the regulators and the industry are  
22 likely to look to modifications in operations or operational  
23 capabilities that may have a distinct payoff in terms of  
24 reducing the economic risk and reducing the safety risk to the  
25 public.

1           But I would not tie the safety risks to an  
2           assumption that all of these analyses are rigorously correct.  
3           I think there are enough flaws in the methodologies and in the  
4           database that all of these should be used with great caution.

5           MR. OKRENT:   Mr. Ward?

6           MR. WARD:    Bob, I think you suggested that one  
7           reason for wanting to use cost/benefit analysis, beyond the  
8           \$1000 a man rem, was because you think there are a number of  
9           uncertainties in the whole methodology of estimating risks and  
10          so forth.

11          MR. MINOGUE:   Yes, that's right. I think the  
12          problem is that you may do an analysis --

13          MR. WARD:    Well, let me ask my question. I  
14          understand that. But have you considered just putting a  
15          multiplier on the \$1000 per man rem and making it a  
16          semi-arbitrary multiplier, and making the whole business  
17          simpler, but still getting the benefit you want?

18          MR. MINOGUE:   Yes. If we could get the uncertainty  
19          bounds down. And in the budget process, I have made this  
20          speech a number of times.

21                 I think one of the problems we have here is that the  
22          limitations in the PRA methodology and the limitations in the  
23          database are sufficiently large that it makes it really  
24          difficult to apply that approach in a rigorous way. If you  
25          start putting in safety factors, it assumes you've got a

1     pretty good handle on how wide your uncertainty band is, and I  
2     don't think we're at that situation.

3             So I would see it -- and I think this is really what  
4     the Murley group has proposed -- that you use this as an  
5     add-on to what you already do, to improve your understanding,  
6     to improve your insights, so that you can be more effective.

7             I don't think a multiplier will do it. A simple  
8     small safety factor over a number that is fairly arbitrary  
9     anyway is not the solution.

10            MR. WARD: Well, I keep hearing, though, the  
11     argument that, you know, the desire to use these other costs  
12     which are very complicated and controversial to estimate is  
13     merely to get a better lever on making plants safer. So the  
14     fundamental reason is not the concern about these costs, but  
15     simply sort of a gut feeling or something somewhere that  
16     plants should be made somewhat safer.

17            I'm saying, if it's coming from sort of an arbitrary  
18     origin, why not just keep it simple and keep away from the  
19     complications and controversy of the elaborate -- or some of  
20     the more elaborate features of cost/benefit analysis?

21            MR. MINOGUE: Well, I hope I'm not coming across as  
22     an advocate for extensive cost/benefit analysis. What I am  
23     really saying is that you should not rule out consideration of  
24     some plant modification based on some simple formula like the  
25     \$1000 a man rem, given the uncertainties, that you really need



1 to look back at the onsite costs to give yourself a more  
2 realistic handle on the probable cost of what it is you are  
3 considering as an alternative to improve the effectiveness of  
4 regulation.

5 MR. GILLESPIE: One of the problems, I think, with  
6 using a simple multiplier is, if you are going to multiply the  
7 \$1000 a man rem, you have already assumed that you know you  
8 are going to have offsite consequences. And the uncertainty,  
9 I guess, in the minds of my staff and the Division is, once  
10 you get to the point of progressing into an accident, the  
11 predictability from that point on -- will the operators act  
12 appropriately; will they do everything they should; will all  
13 the equipment work -- the uncertainties of all of that, and to  
14 be able to distinguish between not having an onsite release  
15 and having an onsite release, given you have had some  
16 transient or some event at the plant that is bad, gives us the  
17 feeling that the "defense in depth" concept, the best thing to  
18 do is, if it appears to make sense and make sense, you know --  
19 cost/benefit is how it's been approached -- if it appears to  
20 make sense, just to make that machine safer by lowering the  
21 core melt frequency, by lowering the challenges to get you into  
22 that regime of high uncertainty -- we're not hung up on  
23 cost/benefit.

24 I know I've talked to Mal, and we've talked to  
25 Bob. We all feel fairly strong about this. You want to get



1 at the problem before you get to the point where you're  
2 worrying about, am I going to proceed to a release or not,  
3 because I've already got the accident?

4 And that's our hangup. We really don't have a good  
5 proposal on how to write that into regulation, and if you want  
6 to say that's a consensus gut feeling, I think that's what it  
7 is. And I don't know what to put the safety factor on,  
8 because I'm dealing with things where people are going to tell  
9 me, "Well, that's a bad accident, but it doesn't lead to a  
10 release."

11 Well, it doesn't lead to a release, if everything  
12 goes okay. That's where we're coming from. It's hard to get  
13 much past that. It's hard to get details, because we don't  
14 really have details on how you implement the regulations.

15 MR. MINOGUE: The big driver for me is the  
16 differences between these plants. If they were all  
17 standardized, I doubt if I'd be making this speech. But  
18 they're all different. And what we have learned from the PRAs  
19 is that the plant-specific features are significant, and you  
20 really have to worry about all the combinations of things that  
21 can go wrong and things that aren't considered in the PRAs  
22 and the things that may be outside the envelope of what was  
23 considered.

24 You put it all together, and I think you end up with  
25 the position that Frank has stated better than I did. I

1       should have let you talk.

2               MR. LEWIS: I just hope to clarify my understanding  
3       of what has been said about the \$1000 a man rem, because --  
4       and I hope I am wrong -- but what I think I'm hearing is an  
5       argument for openended regulation, which is, of course, what  
6       the safety goal was designed to limit.

7               And in particular, twice, in talking about the \$1000  
8       a man rem, you have correctly emphasized the uncertainty which  
9       we all know is there, and said that because of that  
10      uncertainty, if you took it too seriously, you might be  
11      precluded from making plant modifications that would, as you  
12      said, be cost-beneficial, although I'm not sure how you would  
13      know that in the face of the uncertainty.

14              But you didn't mention that if you took it seriously  
15      or because of the uncertainty, you might be saving yourself  
16      from making plant modifications that don't, in fact, make any  
17      substantial contribution to safety. And I am worried that  
18      what I am hearing is a very conservative interpretation of  
19      safety goals in view of the uncertainty, which then drives you  
20      toward what I think Mr. Ward suggested. You might as well  
21      just put a multiplier on it. Or if you are not willing to put  
22      a multiplier on it because you say you don't really know what  
23      the uncertainty is, with which I agree, then you are in  
24      effect saying, "Throw the whole thing out and go back to  
25      openended regulation."

1           But the Commission started this whole damn thing --  
2   forgive me -- to try to get away from openended regulation.  
3   So how are you making peace with that?

4           MR. MINOGUE: Well, I will answer you by accepting  
5   the premise that you made, and I apologize for not making this  
6   clearer.

7           I am a safety-oriented, regulatory-oriented guy.  
8   But quite certainly, you are correct. It is a two-edged sword  
9   that cuts in both directions. And in fact, doing what I'm  
10   talking about might lead you not to do things, if you looked  
11   at them carefully, on the basis that they are not  
12   cost-effective and that they do not really reduce the risk in  
13   any significant way.

14          MR. LEWIS: Well, twice you went in the other  
15   direction.

16          MR. MINOGUE: Well, like all regulators, I am a  
17   natural worrywart. But you're right, this cuts in both  
18   directions. I agree with that. In fact, there are some  
19   specific cases where the kinds of assessments that we are  
20   talking about have led to removal of requirements, rather than  
21   application of requirements.

22          A good example would be the decision recently of the  
23   Commission to publish a rule on double-ended guillotine break  
24   and pipe restraints as an example of the kind of assessment we  
25   are talking about leading to removal of a requirement on the

1 basis that it was not cost-effective and, in fact, might be  
2 counter to safety.

3 MR. LEWIS: Well, let me say one other thing, and  
4 that is, as a physicist, I really have trouble understanding  
5 the concern about uncertainty that there seems to be in this  
6 agency, because I was brought up to believe that when you  
7 measure anything, you measure two things. You measure the  
8 number, and you measure the uncertainty. It's just a part of  
9 life. We always do things in the face of uncertainty, and we  
10 never say you shouldn't make a measurement because you can't  
11 do it with absolute precision. You do it anyway, because  
12 there is a body of knowledge which includes the numbers and  
13 the level of uncertainty. And you have to make your  
14 discipline work within those constraints. You don't throw  
15 away the discipline just because there is uncertainty.

16 And yet I hear that all the time around here, that  
17 because there's uncertainty in the numbers, you can't use  
18 them. It just ain't so.

19 MR. MINOGUE: Yes. I think part of the problem is  
20 that there is an extensive program in place, subject to some  
21 budget constraints that are pretty severe, to try to deal with  
22 some of these issues -- the uncertainty in the database, the  
23 uncertainty in the completeness of treatment, the  
24 incorporation of external events and other things.

25 These are areas where, of course, this committee has

1     made quite a voice. An intensive program to eliminate these  
2     uncertainties or -- I'm sorry; "eliminate" is the wrong word  
3     -- to reduce these uncertainties and to better quantify these  
4     uncertainties is ongoing, and as that is done, I think at some  
5     future date the application of the safety goal might be a lot  
6     cleaner. But today, I think the uncertainties tend to  
7     dominate the problem.

8             MR. LEWIS: Well, I guess what I'm saying is that  
9     whatever the uncertainties, the numbers are useful and  
10    important. And I don't see any magic line of uncertainty at  
11    which suddenly the safety goals become good and below which  
12    they're bad. And that's yet what I'm hearing around here.

13            Even things that have an uncertainty of a factor of  
14    10. Heck, you know, I sometimes do cosmology back in my home  
15    life. A factor of 10 is magnificent precision for some of the  
16    things that we do. Nobel Prizes are given for things that  
17    aren't certain to a factor of 10. There's nothing magic or  
18    dreadful about uncertainty. It's a part of life.

19            And I don't even believe that a program to narrow  
20    the bands of uncertainty -- whatever that means -- is as  
21    important as a program to learn how to regulate in the face of  
22    uncertainty.

23            MR. OKRENT: I think we had better go on to hear  
24    more from the Staff. Thank you, Bob.

25            We can come back to Bob. But let's hear -- who is



1 next? Do you want to come up to the table, Timmy? Come on  
2 up. We can hear you better.

3 [Mr. Speis joins the conference table.]

4 MR. SPEIS: Okay. I'm Themis Speis. I'm going to  
5 speak for Harold Denton. He is not here today.

6 I will only address one subject, the cost/benefit.  
7 I will not talk about his memo.

8 MR. OKRENT: I think you should address other  
9 points. He had a major recommendation in his memo, which I  
10 assume you should discuss.

11 MR. LEWIS: I'd like to hear somebody defend the  
12 calculation in the first paragraph of his letter.

13 [Discussion off the record.]

14 MR. OKRENT: I think what I said earlier to you,  
15 Vic, was, at least in my own tunnel vision, the safety goal  
16 itself was not unlinked from the cost/benefit question, and we  
17 have heard some others alluded to the same thing. And  
18 Harold's memo raises this, I think.

19 MR. ROWSOME: In fact, this is only a talking list,  
20 and the memo you have in your handout will do better than the  
21 talking list, in any event, so no particular significance  
22 should be attributed to what's here.

23 [Slide.]

24 First of all, I should identify myself, Frank  
25 Rowsome, and say that the NRR view of the Steering Committee's



1 evaluation report is that it is generally a good document, and  
2 with a few exceptions, we believe it should go forward to the  
3 Commission and endorse it.

4 Harold Denton personally is concerned that severe  
5 accidents are too likely. You questioned how this number  
6 arose. It arose because the mean time between accidents is  
7 the inverse of the industry mean frequency, so you have to  
8 make a conversion in your head or on the back of an envelope  
9 between a mean and a median in order to draw an inference on  
10 the mean time between accidents.

11 MR. LEWIS: That's what I concluded, Frank, and I  
12 concluded that he had added a factor of three between mean and  
13 median. But where did this factor of three come from?

14 MR. ROWSOME: That comes from conventional usage  
15 that at its best is -- in PRA are good for about a factor of  
16 three difference. It is sometimes larger than that in  
17 particular cases where the uncertainties are particularly  
18 large, but as simply a number to grab when doing  
19 back-of-the-envelope calculations, we tend to use a factor of  
20 three. We have no rigorous basis for it.

21 MR. LEWIS: Well, isn't that an overstatement,  
22 Frank? You know as well as I do that the difference between  
23 the median and the mean goes as the exponential of the square  
24 of the uncertainty. So a change of a factor of two in  
25 uncertainty changes the difference between median and mean

1 enormously.

2           So it is a number which one grabs off the back of an  
3 envelope which is nearly always wrong, but appropriate for the  
4 back of an envelope; right?

5           MR. OKRENT: Well, let him proceed, please.

6           MR. LEWIS: Well, anyway, you have defended it.

7 Congratulations.

8           MR. ROWSOME: Harold feels that accident frequency  
9 is too high for essentially two reasons:

10           One is that it is his reading of this job and  
11 Congress' intent and the public will that we ought not to have  
12 -- ought not to be running a high probability of having  
13 another severe accident in the projected lifetime of the  
14 plants we can see out there. And in part because to assume  
15 that severe accidents are not direct threats to public health  
16 and safety is placing rather more eggs in the containment  
17 basket than Harold feels comfortable with taking. Even  
18 though a best estimate PRA may suggest that the majority of  
19 core melt sequences are mitigated, we do not have enough  
20 faith, enough confidence in the state of the art that produces  
21 such estimates to believe that this is a non-problem from the  
22 public health and safety point of view.

23           Harold Denton therefore believes that a somewhat  
24 more stringent standard than a median of 10 to the minus 4  
25 frequency for vessel meltthrough or for severe core damage or

1 whatever you choose to define should be a part of the goals.

2 He does not have a strong personal feeling about  
3 where you draw that threshold, whether it is vessel  
4 meltthrough or large scale core melt. We simply chose the  
5 phrase we did to capture what we believe to be the intent of  
6 the steering committee, and we were not quibbling with the  
7 intent of the steering committee, but didn't mean to make an  
8 issue out of vessel meltthrough as the criterion.

9 That wasn't the point of the comment. The point of  
10 the comment was that we think the likelihood of severe reactor  
11 accidents is too high as defined in the original safety goal  
12 proposal in NUREG 0880.

13 MR. OKRENT: Frank, is that a median or a mean, that  
14 less than 10 to the minus 5?

15 MR. ROWSOME: I think the office would be amenable  
16 to compromise on that. I haven't spoken to Harold  
17 specifically about it. His point is not that 10 to the minus  
18 5 as a median is sacred or 10 to the minus 5 as a mean is  
19 sacred. His point is that we ought to strive to do better  
20 than the current projections are.

21 MR. OKRENT: I understand that, but nevertheless a  
22 number is there. Has it been -- do you feel it has been  
23 defined in this memo, or just was left undefined?

24 MR. ROWSOME: Elsewhere in the memo you have seen us  
25 recommend the use of the mean. If it were calibrated to the

1 mean, I don't think that we would have to be as stringent as  
2 10 to the minus 5. If it were calibrated to the median, I  
3 think we would have to be that stringent.

4 MR. OKRENT: Okay.

5 MR. LEWIS: But that's an argument for defining it,  
6 isn't it?

7 MR. ROWSOME: That is a personal view and not  
8 necessarily that of Harold Denton. I haven't spoken to him  
9 about that dimension of the interpretation of things.

10 MR. WARD: Could I just check on something you said  
11 here, Frank? What you said then is you are not trying to make  
12 an issue of distinguishing between full scale core melt and  
13 something lesser or -- I mean the onset of the possibility of  
14 core melt, but you are just simply moving the number down from  
15 10 to the minus 4 to 10 to the minus 5.

16 MR. ROWSOME: Well, elsewhere we have a comment --  
17 Themis wants to put something on.

18 MR. SPEIS: I'd like to clarify one point that you  
19 made. It is unfortunate that Harold is not here to speak for  
20 himself. When you said that he picked the 10 to the minus 5  
21 because of the frequency of core melts are unacceptable, I  
22 think that could be one of the points. But in addition, there  
23 has been something like the following, that it hasn't been  
24 clear from the steering group support what the 10 to the minus  
25 4 was, whether it is a large scale core melt, but that doesn't

1 mean -- is there a containment inside the vessel, or does it  
2 mean that the vessel is penetrated and the containment is  
3 challenged? See, he was trying to be more precise, and by  
4 choosing the 10 to the minus 5 goal, what he means by that is  
5 that not only do you have a large scale core melt, but the  
6 vessel has been penetrated and the containment is ready to be  
7 challenged.

8           So in his mind there has been a factor of anywhere  
9 between two and 10, I think, as mentioned earlier, between  
10 this 10 to the minus 5 and 10 to the minus 4 that is in the  
11 steering group's report.

12           I hope this clarifies things.

13           MR. WARD: Okay. So that means that the TMI-2  
14 accident was not one of those things.

15           MR. SPEIS: It was the 10 to the minus 5 -- it was  
16 not. It was not.

17           MR. OKRENT: I guess I need to ask, then, did the  
18 steering group, when it talked about making the core melt  
19 frequency guideline more important, it did not suggest  
20 changing the 10 to the minus 4, but now the question is, was  
21 it a core melt that penetrated the vessel, or did it include  
22 severe core damage that is terminated as well in 10 to the  
23 minus 4, as you recall?

24           MR. MURLEY: As I said, I don't think we really  
25 grappled with that question. We discussed it a lot, but

1 finally we didn't come to a conclusion. We recognized that  
2 the original Commission statement said large scale core melt,  
3 and I think in our minds we had it that that is the kind of a  
4 core melt that melts through the vessel. That's what we had  
5 in our minds.

6 We also recognized that you can't measure that.  
7 PRAs simply don't do it. So we knew there was this undefined  
8 factor. People talk of two to 10, but I'm not sure we even  
9 know that. But there is an undefined factor that we regarded  
10 to be a conservatism and that's the way we left it.

11 MR. ROWSOME: If you are happy with this discussion,  
12 I will go on to the next point, the cancer risk guideline.

13 MR. LEWIS: Is that a prerequisite?

14 [Laughter.]

15 MR. ROWSOME: NRR has no problem whatever with the  
16 tenth of a percent figure as statements of acceptable  
17 individual risk.

18 We do have qualms about it as a surrogate for  
19 aggregate societal risk. As the calculation suggested, there  
20 are circumstances in which a plant could comply with the  
21 individual risk, mortality risk guidelines, and still pose  
22 quite substantial aggregate societal risks, or do substantial  
23 aggregate societal damage.

24 And, therefore, we believe the goals are flawed as a  
25 delineation of acceptable risk with respect to offsite



1 radiological effects.

2 MR. REMICK: Could I ask a question? I agree with  
3 what you're saying, but there seems to be an inconsistency  
4 because of that same situation. If you did have the \$1000 a  
5 manrem and you could impose it, that would mean a lot of  
6 dollars to reduce the risk available; right?

7 In other words, you're saying it's possible to have  
8 a large population exposure because of a large population.  
9 That's a lot of manrems and at \$1000 a manrem, that's a large  
10 pool of money to make a change.

11 So it seems to me to be somewhat of an inconsistency  
12 there.

13 MR. OKRENT: Excuse me. Can I try an answer to  
14 that? I have to disagree in the following way:

15 My understanding of the goals, as the Commissioners  
16 have interpreted them, is if you meet the goal, there is no  
17 more cost-benefit analysis for improvements.

18 So it's when you don't even meet this permissive  
19 goal that there would be the cost benefit analysis, and Frank  
20 is saying that if this were really just met by a hair, it  
21 would really not be so acceptable.

22 MR. STELLO: Dave, let me say I've got to disagree  
23 with you. That's not what the paper said that you have in  
24 front of you, either of them.

25 MR. OKRENT: No, I'm talking about 0880 and

1 Commission's safety policy.

2 MR. STELLO: Okay, I'm talking about the two pieces  
3 in front of you in terms of what the proposals are. That is  
4 not what they are.

5 MR. OKRENT: Well, again, I will let Frank speak for  
6 himself, but I believe he was addressing -- and I think what  
7 he said was that the Commission's -- where it says that cancer  
8 risk guideline is too lenient, that's the Commission's cancer  
9 risk guideline.

10 MR. REMICK: Do you want to respond to my comment,  
11 Frank?

12 MR. ROWSOME: Yes, let me quickly respond to it.

13 Both the plant performance guideline and the  
14 cost-benefit guideline provide some tools to close this  
15 loophole. Nevertheless, we are issuing to the public and the  
16 industry and the world at large a statement of how safe is  
17 safe enough. And those elements of that statement that  
18 directly address offsite radiological risk we believe ought to  
19 delineate without any substantial logical gaps what is in fact  
20 acceptable offsite radiological risk, even though we may have  
21 regulatory tools with which to fill those holes from other  
22 avenues.

23 The plant performance guideline has a different  
24 character. It doesn't talk to offsite radiological risk, and  
25 the cost-benefit has a different character, and that is not by

1       itself sufficient to trigger a regulatory action. It is  
2       merely a filtration process that one puts on the  
3       decisionmaking of how to respond to unidentified safety  
4       problems.

5               So that we believe there ought to be a quantitative  
6       design objective among the safety goals that identifies when  
7       the aggregate societal risk is too large.

8               MR. REMICK: You aren't proposing one?

9               MR. ROWSOME: We did suggest some possibilities. It  
10       could be done in terms of aggregate number of latent  
11       casualties, either all or just cancer fatalities. It could be  
12       done in terms of property damage. It could be done in terms  
13       of personrem.

14               We have got some suggestions of how to calibrate one  
15       that would be consistent with what we believe to be the  
16       philosophy of the other goals and it would be consistent with  
17       recent decisions made by the Commission, such as the Indian  
18       Point decision and others, that would capture what we believe  
19       to be the same level of stringency that has generally  
20       characterized agency action of late in the other safety goal.

21               MR. WARD: Can I ask a question? Dave, I am  
22       confused about what you said a minute ago. I thought early on  
23       in this meeting Dr. Kerr asked a question, a sort of  
24       stage-setting question here, and I thought the answer was that  
25       all of this cost-benefit analysis, including use of the \$1000

1 a manrem, was to evaluate whether a plant needed to be moved  
2 toward the goal --

3 MR. OKRENT: That's right.

4 MR. WARD: But what you said was you implied it was  
5 to be used once the goal was achieved.

6 MR. OKRENT: No, it would not be used at all. And  
7 so what I said was -- in other words, the ACRS recommendation  
8 said you would use ALARA even after the goal was made.

9 MR. WARD: Right. Well, I misunderstood. Just  
10 scratch it.

11 MR. OKRENT: NUREG 0880 and the policy does not have  
12 applicability.

13 MR. STELLO: Again, let me repeat that both  
14 documents suggest doing it after the goal.

15 MR. OKRENT: You mean the Staff documents?

16 MR. STELLO: Both Staff documents.

17 MR. LEWIS: As kind of an ALARA concept.

18 MR. STELLO: That's right. And it gives it between  
19 1 times 10 to the minus 3 to 3 times 10 to the minus 5, you  
20 continue to do it. And that's page 22 of the documents.  
21 They're both the same in that regard.

22 MR. OKRENT: There are some qualifications we need  
23 to talk about on that recommendation when we get to that  
24 point, but let's go on.

25 [Slide.]

1 MR. ROWSOME: The next point is on cost-benefit.  
2 NRR is in fact comfortable with the proposal of the steering  
3 committee on cost-benefit analysis, and are prepared to concur  
4 in it.

5 NRR has not been asked to review and formally  
6 comment on Vic Stello's draft, so I cannot speak for the  
7 office in reacting to that proposal.

8 We did, however, feel that broader documentation for  
9 the Commission on this point was desirable. The Commission  
10 has repeatedly asked NRR in meetings on a wide range of policy  
11 and even some case where issues about the pros and cons of  
12 weighting in onsite losses and the like. They have asked us  
13 about the legal basis, they have asked us about the pros and  
14 cons, they have asked us about whether or not doing so would  
15 constitute overregulation or economic regulation or not. And  
16 we don't see in the literature that has been provided to the  
17 Commission the kind of Staff work that we believe the  
18 Commission has implicitly asked for in these cases.

19 So we would like to see the issue of overregulation  
20 and underregulation and the relationship of cost-benefit to  
21 this question developed more broadly.

22 [Slide.]

23 Let me turn to the next point.

24 MR. LEWIS: Before you get on to that, I wonder if I  
25 might ask or make one statement and then ask a question. I

1 really do believe that NRR has the responsibility, when it  
2 recommends a number and a factor of 10, to specify whether  
3 that number is a median or a mean unambiguously, so that we  
4 don't waste so much time.

5 I know you'll understand that point, Frank, but it  
6 seems to me it's really a disgrace that we go on, meeting  
7 after meeting after meeting, asking whether a number is a  
8 median or a mean and getting waffled answers to it, because  
9 the Staff somehow doesn't know or doesn't care or whatever.  
10 That's the statement. Okay.

11 The question is how do you, on this factor of 10  
12 reduction, whether it's median or mean, how do you respond to  
13 cynical and nasty people -- not me -- who may say to you that  
14 the purpose of this whole package consisting of the safety  
15 goal, the backfit policy, the severe accident statement, is  
16 somehow to put an end to this accusation of unfounded  
17 regulation? It is meant to send some answer, as you said, to  
18 the question of how safe is safe enough.

19 A cynical person might say that the factor of 10  
20 might be motivated by the terror that the Staff has that  
21 this might inhibit them in doing unlimited regulation,  
22 unbounded regulation, and give them a factor of 10 more  
23 breathing space to do it before it becomes a serious issue.

24 How would you respond to that nasty and unreasonable  
25 accusation?



1           MR. ROWSOME: Let me say first of all that the  
2 Commission itself in its formulation of NUREG 0880 indicated  
3 that these were goals to strive for and not necessarily goals  
4 that all plants can meet, nor is there any expectation that  
5 all plants will be ratcheted into meeting it. They were  
6 intended to be targets to strive for.

7           MR. LEWIS: Of course, you have worked here for a  
8 number of years yourself.

9           MR. ROWSOME: Yes. And in addition, as I said  
10 before, I believe it is Harold Denton's feeling that we really  
11 do need to objectively improve or reduce the likelihood of  
12 incurring another severe reactor accident.

13          MR. LEWIS: I am just wondering whether -- I am  
14 sorry. My cynical person for whom I am speaking is wondering  
15 whether he really isn't at odds with the Commission on that  
16 point.

17          MR. ROWSOME: Well, let me further say that I  
18 believe -- I can't really -- to capture Harold Denton's  
19 feeling here, but I think that we have in the past erred by  
20 over-regulation, under-regulation, misregulation fairly  
21 frequently, and that it should be one of the high priorities  
22 if this agency to do a very much better job of discriminating  
23 over-regulation and under-regulation.

24               I personally yield to no one in my enthusiasm to try  
25 to tackle that problem.

1           MR. LEWIS: And I yield to no one in my respect for  
2 your devotion.

3           MR. ROWSOME: And I do endorse this, nonetheless. I  
4 do not think it would necessarily yield over-regulation,  
5 although it might enlarge the window a little bit for it. But  
6 the process we are dealing with here is an attempt to be a  
7 little bit more disciplined, a little bit more systematic, be  
8 a little more thorough in our safety analyses to identify the  
9 usefulness and productivity of reactor safety requirements.

10           I think it is in the discipline that we bring to  
11 this process rather than exactly how we calibrate the  
12 thresholds that is going to distinguish whether or not we  
13 engage in misregulation in the future or over-regulation in  
14 the future.

15           MR. KERR: Let me add just a short question. Frank,  
16 you said -- and I think it is a valid representation, if I  
17 remember correctly -- that these numbers are to be used as  
18 goals and that there is not the expectation that every plant  
19 can meet them, and yet a great deal of emphasis has been  
20 placed on the need for leverage to move plants closer to these  
21 goals.

22           Now, I am a little bit at a loss to know why all the  
23 leverage is needed if the goals are only references. When one  
24 talks about leverage, the implication is that one is going to  
25 try to move something, so I am puzzled.

1           MR. ROWSOME: Well, first and foremost, the intent  
2 of the goals are as guidance for reactor safety standards  
3 development, principally but not exclusively in the context of  
4 generic standards, and they will become, I believe,  
5 supplementary guidance for the regulatory analysis of  
6 standards development packages.

7           We do mean to amend the regulations to try to bring  
8 them into sharper focus on what matters to public health and  
9 safety, and it is in that context that we need to have the  
10 machinery in place to accomplish standards development.

11           NRR had some problems with the provisional  
12 implementation guidance in the back of Volume I of the  
13 Steering Committee's report. It proposes to exclude safety  
14 improvement -- well, it displays a matrix of what actions you  
15 take given that you have given a PRA on a plant or PRAs in  
16 support of reactor safety standards development, and suggests  
17 that you will consider taking regulatory action if a plant  
18 fails to meet one of the mortality risk guidelines with  
19 adequate margin for uncertainties, and suggests, however, if a  
20 plant does meet the mortality risk guidelines but has a core  
21 melt frequency in the range of  $3 \times 10$  to the minus 5 to 10 to  
22 the minus 3, that regulatory action would not normally be  
23 taken.

24           There is one exception, and that is if an individual  
25 sequence has a particularly high frequency above 10 to the

1 minus 5, we have troubles with both of those. One has to do  
2 with the point that Harold led off with, and that is his  
3 belief that these accident frequencies are just too high. And  
4 second of all, the exception about the singular accident  
5 sequence, which has a high frequency, which I think the  
6 Steering Committee feels fills this hole in the logic, that  
7 the number of sequences, how you identify an individual  
8 sequence, whether it is one or many, is in the eye of the  
9 beholder, and there is no standard for that.

10 Really, where you set the threshold for taking  
11 action or not really ought not to depend on how many  
12 subsequences are involved; it should depend on the overall  
13 safety profile of the plant, and perhaps cost.

14 Finally, we think the formulation is a little  
15 simplistic because it does not allow for margins to be used to  
16 compensate for known biases or omissions or whatever in the  
17 PRA. We don't think those guidelines are quite mature enough  
18 yet to be put forward for endorsement by the Commission.

19 The next point. The dismissal in the Steering  
20 Committee's report of the ALARA proposal, as we read it,  
21 conflicts with the severe accident policy statement, at least  
22 for new standard plants, where the guidance suggests  
23 improvements in reactor safety are desirable, cost-effective  
24 improvements are to be sought.

25 We believe that it would be useful to distinguish

1 different standards for a diminimus cut-off that apply in  
2 context in which the interests of stabilizing the regulations  
3 are served by setting high standards, as they would be in  
4 accepting a new standard plant, and where the interest of  
5 stabilizing the requirements favors acceptance, as in the  
6 backfit consideration on an operating plant, and that it is  
7 probably not desirable and probably not consistent with the  
8 severe accident policy to use the same diminimus standard for  
9 both.

10 I think it is safe to say that the Office believes  
11 that Commissioner Asselstine's proposed statement of  
12 regulatory philosophy that he proposed in the context of the  
13 severe accident policy discussion, which we have all agreed ot  
14 address in the context of safety goals, is, in fact, fairly  
15 good commentary but not good policy, not a good policy  
16 statement.

17 NRR agrees that greater emphasis on preventing  
18 severe core damage accidents -- I won't quibble about where  
19 the threshold is defined -- is, in fact, warranted, but the  
20 language we use to do this ought not to appear to transfer the  
21 responsibility for plant safety from licensees to the Staff  
22 and as the Asselstine language could be read to imply.

23 That concludes my summary of the NRR --

24 MR. EBERSOLE: This business of resting the  
25 responsibility on the licensees brings up this conflict all



1 the time about the licensees being the least ones or the ones  
2 who know the least about the design and safety features of the  
3 plant, nearly all of that expertise being in the architect  
4 engineer and vendor sector. What is to be said about that, if  
5 anything?

6 MR. ROWSOME: Well, none of us have really addressed  
7 this in the context of safety goals. None of the parties, not  
8 we, NRR in commenting or the Steering Committee or even the  
9 draft EDO report, to my recollection. On the other hand, NRR  
10 is becoming increasingly sensitive to the need, as we become  
11 more and more dependent upon PRA in our decisionmaking, to at  
12 least monitor, if not actually have enforcement tools to  
13 verify that PRA assumptions are coming true.

14 As you know, the Staff and the ASLB recommended a  
15 safety assurance program for Indian Point that would have  
16 obligated the licensees to track whether their operating  
17 experience was consistent with the PRA assumptions, among  
18 other things, in order to have some rather automatic feedback  
19 to alert us if things were significantly worse in terms of  
20 human performance or equipment reliability and the like than  
21 the PRA assumptions.

22 The Davis-Besse incident, as you heard earlier,  
23 sensitized Harold Denton to that problem, as well. So that as  
24 PRA becomes more and more important, either in case work, as  
25 it is in those plants in which PRAs are required for



1     licensing, in the new standard plants, as an example, in fact  
2     the CP rules call for it for all new plants, truly new plants,  
3     the new CPs. And as it becomes more important in generic  
4     standards development, we need to have a better handle on  
5     reality of those assumptions.

6             I think that when we find the regulatory tools with  
7     which to do this, we will have, I think, answered or partly  
8     answered your question.

9             MR. LEWIS: I wonder if I could just explore a  
10    little more deeply this famous factor of 10, and I won't go  
11    into it too deeply because Harold isn't here to defend it, so  
12    I understand that, but as I understand it -- and correct me if  
13    I misunderstood you, Frank -- it comes from a feeling he has  
14    that we don't want to have another accident before the next 20  
15    years. That's really the basis for it. And then he has  
16    translated that into a proposed limit on severe accidents.

17            Is that correct?

18            MR. ROWSOME: With one exception. I think he is  
19    motivated as much or more by the concern that we do not want  
20    to put all our eggs in the containment basket and that there  
21    is a dimension of public health and safety concern rather than  
22    just a lack of comfort with high probabilities of core damage  
23    that is in his motivation.

24            But you are quite right, it is that kind of thinking  
25    and not being wedded to 10 to the minus 5 that gave rise to

1 the comment.

2 MR. LEWIS: The reason I asked is that in a certain  
3 sense, you know, we are being dragged kicking and screaming  
4 into learning by experience, and eventually we will know how  
5 to do it; so that there is a deep problem with taking a  
6 proposed goal for now and multiplying it by 20 years in order  
7 to find what will happen over the 20 years even if the quality  
8 of the plants isn't changed dramatically. We simply have to  
9 get smarter as time goes by. That is what happened in the  
10 aviation industry. It hasn't happened in the automobile  
11 industry, for some reason.

12 I think a related thing was said in a report from  
13 ten years ago, which was said slightly differently. It was  
14 said that in any given year, the probability of a major core  
15 melt accident or an accident with consequences to the public  
16 should decrease sufficiently rapidly so that the integral was  
17 integrable, and it could be kept small, which is another way,  
18 a physicist's way, obviously, of putting it.

19 I wonder whether we don't get drawn into bad  
20 conclusions, if that is indeed the origin of Harold's number,  
21 taking current standards and multiplying by 20 years when we  
22 might well get along with a dedication to learning by  
23 experience so that the probability goes down even if no major  
24 physical change in the plant is made. It's a different  
25 philosophy.

1 MR. OKRENT: Of course, there were major physical  
2 changes made in some plants.

3 MR. LEWIS: Yes, there would inevitably be some  
4 major changes, but they will be directed changes generated by  
5 experience, and that is inevitably -- you know, I would be  
6 ashamed if the probability of a core melt in ten years were  
7 the same as it is today.

8 MR. KERR: We sort of implicitly assumed that the  
9 changes we are going to put into these plants will decrease  
10 risk, and indeed, that we can probably do something to reduce  
11 the core melt frequency by a factor of 10; yet I and others  
12 have suggested over the years that we ought to look at the  
13 changes that occurred as a result of TMI-2 to see whether  
14 indeed core melt frequency has been significantly decreased.

15 And I am told almost every time I raise this issue  
16 that you can't really calculate things that carefully.

17 Now, if the extensive changes that were made as a  
18 result of TMI-2 cannot be shown to have decreased risk by a  
19 factor of something, I don't see how one is going to ever know  
20 whether one has reached this factor of 10 improvement that is  
21 being proposed.

22 MR. WARD: Well, also a follow-on to that because  
23 the experience we have had with accidents or near accidents --  
24 and people keep talking about Davis-Besse -- are due to  
25 failures which PRA, for example, really isn't even analyzing

1 in any adequate sense at all. I mean even the TMI sequence,  
2 and certainly the Davis-Besse sequence, as I understood it.

3 MR. KERR: Are we putting Davis-Besse into the core  
4 melt category?

5 MR. WARD: No, no, no. But that is part of our  
6 experience. I mean it is this sort of event which causes NRR  
7 or Mr. Denton or whomever to be concerned that the frequency  
8 of major accidents may be greater, predicted over the next 20  
9 years to be greater than we would like it to be; but the cause  
10 of those accidents is probably -- when we have another one, it  
11 is going to be something that hasn't been predicted by the PRA  
12 anyway and isn't being dealt with by the cost-benefit analysis  
13 or any of these analyses.

14 MR. OKRENT: With that comment, I am going to  
15 propose that we take a 10-minute, not a 15-minute, break, and  
16 we will start again at 3:25 and we will look for comments from  
17 Mr. Lave and Mr. McClain, and then we will come back after  
18 that and hear more comments from the Staff.

19 [Recess.]

20 We will reconvene the meeting.

21 Why don't we take the two speakers alphabetically?

22 I should note that I tried to get someone with a  
23 legal background who I knew who had some experience with 0880  
24 and a psychological background, but they were both on travel,  
25 or weren't coming back, or were just coming back about

1     that, but in any event, would you be so kind to open the talks,  
2     Lave?

3             MR. LAVE: I think, by the way, that the order we  
4     are going to talk in is probably appropriate in the sense that  
5     now having said a word about what we are going to say, I think  
6     it is the right order.

7             Just to react to a couple of things, I always find  
8     it refreshing to come down to Washington, to leave academia  
9     and all of our talk about theory and the assumptions, and come  
10    down and get this hard piece of reality that I've seen in the  
11    discussions so far today.

12            Let the record reflect a pause after I said that.

13            [Laughter.]

14            VOICE: And put quotes around "reality".

15            [Laughter.]

16            MR. LAVE: Secondly, although I understand that we  
17    are not always using words precisely, just let me remind you  
18    guys that anybody who has been around a state PUC knows that  
19    what we are talking about here couldn't remotely be called  
20    economic regulation. All right?

21            The concept you are trying to get at is a good  
22    concept, but don't call it economic regulation, because the  
23    rest of the world is going to misunderstand.

24            One other point that I guess I thought I knew for  
25    certain, and then just got fuzzed up in some of the comments

1 this afternoon, had to do with the four goals in 0880.

2 It seems to me those are "ors," not "ands." That  
3 is, if you said that in order that the NRC is striving that a  
4 change would have to meet all four of those before the NRC was  
5 going to try and achieve it, that would be the craziest thing  
6 I ever heard of in my life.

7 It has got to be that if a proposed change fails any  
8 one of those, that the Commission at least is going to look  
9 into doing something about it. Not that it has to fail all  
10 four before you do anything about it.

11 And so in that sense the cost guideline is an ALARA  
12 -- that is, it is an operational ALARA. It says that even if  
13 you pass the above three and a benefit-cost analysis still  
14 showed that you ought to get more safety, then you ought to go  
15 ahead and do it.

16 At least that's the sense that I'm talking about.

17 MR. OKRENT: Excuse me. I think the Commission's  
18 position is that if a plant meets the quantitative design  
19 objectives which are interpretations of their qualitative  
20 safety goals that -- that there are for existing plants no  
21 further improvement sought upon an ALARA basis.

22 MR. KERR: I thought that's what Dr. Lave was  
23 saying.

24 MR. LAVE: Well, let me just say it again and be  
25 very clear about it. Independent of what you decide to



1 backfit and so on, having four goals can either be interpreted  
2 as saying four statements, that if a particular plant fails  
3 all four you will do something about it, otherwise you won't.  
4 If it only fails three of the four, you won't do something  
5 about it.

6 Or you could say if it fails any one of the four,  
7 then you will look into doing something about it, and in this  
8 case I am sure the Commission must have meant, even if they  
9 didn't say it, even if they said to the contrary, that if a  
10 plant design or an existing plant failed on the four goals,  
11 then they would at least think about doing something about  
12 it. Not that it had to fail all four before you were going to  
13 consider it. Just a point of logic.

14 MR. OKRENT: All right. I don't know -- when you  
15 say four goals, which four do you have in mind?

16 MR. LAVE: The 2.1 percent, the 10 to the minus 4,  
17 and the benefit-cost.

18 MR. OKRENT: All right. The last one only comes in  
19 if you are testing something. That's what I was wondering  
20 about -- that's why I was wondering about your statement of  
21 four.

22 MR. LAVE: All right. Let's see. You guys have a  
23 copy of the memo that I was internally forced to produce, even  
24 though not asked to produce one. So let me run through what  
25 are the major points and you guys can read and argue with that

1 as you see fit.

2 The first point is that I think that there is a  
3 reason to have and retain a benefit-cost guideline in addition  
4 to the other three goals.

5 I think that ALARA is helpful and that having an  
6 operational ALARA in addition to the other three above is very  
7 helpful.

8 Over the past three years when we haven't been doing  
9 some things with respect to the NRC's quantitative safety  
10 goals, I have looked into safety goals for a lot of other  
11 agencies in a lot of other situations.

12 One of the conclusions that you get out of that  
13 literature is that it is extremely difficult to define safety  
14 goals that everybody salutes the flag. That what is one  
15 person's trivial risk is another person's  
16 jump-up-and-down-and-throw-your-body in front of the tractor  
17 to stop it risk.

18 And the NRC quantitative goals, the first three, are  
19 helpful. There are other agencies that have come up with  
20 other ones, but I think that the benefit-cost kind of ALARA  
21 concept, where you define that in part in terms of the \$1000  
22 per personrem is helpful.

23 And I think that if somebody comes in and starts  
24 throwing themselves in front of the tractor that you are at  
25 least always left with a fourth one, even if the other three

1       should happen to disappear somehow.

2               A second point: Conceptually using benefit-cost  
3       analysis with \$1000 a manrem is an incomplete way of looking  
4       at it and is going to lead to biased results. It is pure  
5       tactical theory. You guys have done it wrong.

6               What you should do follows from the following banal  
7       observation:

8               When you are optimizing safety, you optimize safety  
9       by setting marginal benefit equal to marginal cost. That is,  
10      you continue improving safety up to the point where the  
11      marginal costs of an additional increment in safety is just  
12      equal to the marginal benefit, and presumably benefits are  
13      greater than costs at that point. Total benefits are greater  
14      than total costs. Technically that has got to be true.

15              Now, if the NRC is doing a benefit-cost analysis by  
16      including on the benefit side only the cost of public health,  
17      then what we are doing is including only one part of the  
18      benefits. And if your criteria is simply that benefits  
19      defined in terms of \$1000 a manrem have got to be greater than  
20      the cost of fixing it, then although there is some projects  
21      that will lead you to do it, that that result will be a biased  
22      result.

23              Let's separate the benefits into two components:

24              One of the components being the public health  
25      component. \$1000 a manrem. And then the private cost

1 component. Okay. Namely, damage to reactor core in terms of  
2 the cost of fixing it, the cost of decommissioning that  
3 reactor, replacement power, and so on.

4 The optimal amount of safety is taken, adding those  
5 two marginal benefits together, the public and the private,  
6 and setting that equal to the cost of additional safety.

7 The problem here is that the way you guys have got  
8 it separated now, you have divided the benefits into two  
9 portions. One portion is the public health benefit which you  
10 used to make some decision, and then the utility is using the  
11 private part of it; that is, the damage to the reactor core,  
12 replacement power and so on, as the other part.

13 So what you have done is to split the benefits in  
14 half, when you should have been adding them together. So that  
15 technically what you've got is something which is wrong and  
16 it's biased, it's biased to give you too little safety.

17 So I was not at all surprised with the Staff  
18 comments that said gee, almost nothing seems to meet the  
19 benefit-cost test when we do it at \$1000 a manrem.

20 MR. KERR: Well, does it follow then that you  
21 consider the NRC responsible for regulating the financial  
22 strength of utilities?

23 MR. LAVE: Let me get to that in a second.

24 I did anticipate that that question would be asked.

25 MR. LEWIS: Can I just, though, on the same point,

1 wonder whether the complaint you make can be fixed by changing  
2 the \$1000?

3 MR. LAVE: No, it cannot be. That was that comment  
4 that Mr. Ward made before, and it is wrong, because what it's  
5 doing is, it's looking at the wrong thing. It said even if  
6 you used a million dollars a manrem, what that would do would  
7 be to place a tremendous emphasis on the public health  
8 component, but it wouldn't be taking account of the profit  
9 cost component.

10 So what you'd be winding up doing is having another  
11 biased measure of safety. In this case we couldn't tell  
12 definitively whether you were introducing too little safety.

13 MR. LEWIS: I understand that.

14 MR. LAVE: It would just be wrong.

15 MR. LEWIS: I understand the theoretical point.  
16 What I'm asking is whether in a practical sense if you look at  
17 most accident scenarios, whether you couldn't surrogate the  
18 private costs through the public -- I'm sorry, the benefit  
19 -- if the ratio is not all that different.

20 MR. LAVE: Okay. I cannot comment on that. I would  
21 tell you that if you did it that way -- I mean if you found  
22 out that that was operationally true and you did it that way,  
23 then you had better say up front in the clearest possible  
24 language that for the current time, using as an approximation  
25 the following, and that at some time when that approximation

1 ceases to be a good one any more, we are not endorsing the  
2 concept.

3 MR. LEWIS: Well, there are other philosophical  
4 points. Actually I think the \$1000 is about 30 times too  
5 high, anyway, but that's another matter.

6 MR. LAVE: Well, as you can see from my written  
7 comments, \$1000 a personrem is equivalent to \$5-10 million a  
8 cancer. If you take a look at the FDA or the EPA and their  
9 regulation, they are requiring safety levels of about 10 to  
10 the minus 6 per lifetime for exposure to various chemicals.  
11 Not exactly, but I mean around that range. And FDA claims  
12 that they are calculating their 10 to the minus 6 very  
13 conservatively, and I would guess that they are probably using  
14 a value of a cancer prevented of on the order of \$5-10  
15 million.

16 MR. LEWIS: And we could name other agencies that  
17 are going higher, but that doesn't make them all right.

18 MR. LAVE: Sure. As I say, the most elusive and  
19 difficult concept is to get people to agree on some safety  
20 goal number, and I commend the Commission for having sort of  
21 stuck its head in the meat grinder with the .1 percent, and I  
22 think they are very useful, but -- I would have predicted they  
23 would have had even worse trouble than they had.

24 MR. OKRENT: I might make one comment. If you  
25 calculate the dose out to 500 miles instead of 50 miles, for



1       example, I believe one gets perhaps three times -- certainly  
2       more than two times the manrem.

3               So when the Commission is only calculating it out to  
4       50 miles, which is what the safety goal says, they are  
5       underestimating the integrated dose, admittedly very small  
6       amounts to lots of people, but nevertheless if every millirem  
7       is the same or milli-millirem, then in fact it is no longer 5  
8       million, but maybe it is only 2 million per person.

9               I just wanted to make that observation.

10              MR. LEWIS: But there are nowadays, I think -- I  
11       may be wrong in this -- there are very few real biologists who  
12       understand these things, who believe that the last millirem is  
13       the same as the next millirem.

14              MR. OKRENT: I can't say. The last time I spoke to  
15       a real biologist, he was using the linear. That's all I can  
16       say.

17              MR. LEWIS: I have spoken to some fairly recently,  
18       and they laugh.

19              MR. LAVE: Well, we have this NAS committee that  
20       fired its chairman, Ted Bradford, over that issue. Just one  
21       other point about this, and that is that theoretically  
22       speaking one of the problems with some of the utility  
23       decisions is that as we know from TMI-2, utility stockholders  
24       and managers are not responsible for the full cost of a  
25       mishap. That is, that in fact the managers are hardly

1 responsible at all.

2 But even the utility stockholders are not  
3 responsible for all that.

4 So that means that when the NRC is trying to  
5 safeguard the public welfare, the full social costs have to be  
6 taken into account, and the utility stockholders or utility  
7 managers are not motivated to do that.

8 So just strictly from an incentive viewpoint, the  
9 incentives are right now, and there are good reasons why it is  
10 that the NRC ought to be taking account of full social costs.

11 The next point. It gets exactly to Hal's point.

12 Wait a minute. Is Lester Lave saying that the NRC  
13 ought to be in the business of making all the decisions that  
14 utility managements have traditionally been entrusted with?

15 And the answer to that is no, not exactly. I think  
16 that what you people have been speaking about is economic  
17 regulation; namely, going over into the area of having the NRC  
18 specify some decisions which have been within the purview of  
19 utility managers really is a big factor. Government  
20 regulatory agencies have very limited abilities to manage  
21 what's going on out in the field in detail. And I am not  
22 casting any aspersions on you guys at all. It's just you are  
23 not there on the site with the plant. You're not even on site  
24 with making capital decisions. And it is very hard to control  
25 these things in detail. And your ability to look at these

1 things in detail just isn't very good.

2 And what probably means is that for decisions that  
3 don't have important safety components, you really don't have  
4 an alternative to leaving those up to the utility. You just  
5 don't, because you're not going to be able to manage them in  
6 detail.

7 One of the things that's gone on in other agencies  
8 that has gotten them into trouble is that they thump their  
9 chest and claim that they are really regulating decisions in  
10 detail, when in fact they are not and couldn't possibly.

11 The Occupational Safety & Health Administration is  
12 responsible for protecting every man and woman over their  
13 entire working lifetime against any degradation in physical  
14 function. Yeah, sure, right? You have talked to their staff  
15 lately. You know that they are just within that close of  
16 getting it. It's an impossible goal.

17 And what's wrong with it is that when it is stated  
18 as a responsibility of the agency, everybody complains they  
19 are not doing their job. You guys shouldn't even try and  
20 claim that you are remotely getting close to that.

21 And so although the complete benefit-cost analysis  
22 is theoretically what ought to be done here, there is a lot of  
23 practicality, and I assume that Doug is going to talk about  
24 some of that practicality.

25 One final thing. That is, whenever you speak about

1 cost analyses, you want to be careful that you learn by the  
2 mistakes of other people and don't go in naively into this  
3 thing. Benefit cost analysis has been around in the Federal  
4 Government since the 1930s when the Army Corps of Engineers  
5 was required by law to do benefit cost analysis on every  
6 waterway. Those benefit cost analyses were to prevent a pork  
7 barrel, and it worked really well over fifty years, hasn't it?

8 (Laughter)

9 I guess it hasn't.

10 I really like benefit cost analysis. I think it is  
11 a marvelous tool. But I think anybody who thinks that it is  
12 going to do anything more than it can do, is really deceiving  
13 themselves.

14 I think that the problem with saying that you  
15 ought to consider all benefits at all costs at all times is  
16 that that is even conceptually impossible to do. That is,  
17 that the ripple effects that go out in terms of both benefits  
18 and costs extend forever. And the usual thing that we say to  
19 our students is: "No, no, not all benefits and all costs,  
20 just the important benefits and the important costs."

21 And then when I talk with somebody from the Edison  
22 Electric Institute and hear from them what are the important  
23 benefits and costs, and then go talk with somebody from the  
24 Sierra Club or one of the other organizations around here what  
25 they consider are the significant benefits and costs, I just

1 don't get any agreement at all. And so, you ought not to be  
2 deceived.

3 The other reference today had to do with  
4 Environmental Impact Statements. I am one of those people who  
5 think that Environmental Impact Statements are a huge waste of  
6 time and money, because nobody has ever tried it to specify  
7 what really is important in what is going on. So, you produce  
8 reams of stuff which is all qualitative, and nobody knows what  
9 to do with it. And the only real function it serves is to  
10 "make everybody a little bit more environmentally conscious."  
11 And you slow down the process.

12 I think those are crazy aims. We could  
13 legislatively slow down the process and make everybody more  
14 environmentally conscious and not spend so much money doing  
15 it.

16 MR. LEWIS: You miss only one point, Lester, and  
17 that is I have worked with Army Corps of Engineers, and I  
18 assure you they know what the important benefits are.

19 MR. LAVE: Oh, yes. I have worked with them too,  
20 and I have all these wonderful statements from them about  
21 doing benefit cost analysis. If you have time, I will tell  
22 you some of them.

23 (Laughter)

24 But anyway, the point of all this is I think benefit  
25 cost analysis can be helpful, but don't by any manner of means

1     either overstate how accurate it can be, how easy it is to do,  
2     or how you can do it without controversy because none of those  
3     things are going to happen. And, besides that, it doesn't  
4     take account of any distribution of benefits or equity.

5             MR. OKRENT: Are there questions now for Mr. Lave?

6             MR. LAVE: I think you probably all ought to listen  
7     to Doug first.

8             MR. OKRENT: All right. Then we will have questions  
9     for both of you. Go ahead.

10            MR. McCLAIN: Well, in many ways I am going to  
11     amplify Lester's comments less than he would have expected,  
12     and end up repeating a number of them.

13            I, too, enjoy my visits down to Washington. As  
14     somebody who is trained in philosophy, I always feel it is a  
15     strange place to come. But I do feel right at home today.

16            The NRC's safety goals --

17            MR. WARD: If it is, I don't want to dissuade you  
18     from the fact that this is not a strange place to come.

19            (Laughter)

20            MR. McCLAIN: The NRC's safety goals under review  
21     contain two important elements for guiding regulatory policy.

22            One is the reliance on probabilistic risk analysis  
23     and interpreting safety goals; and the other is the use --  
24     limited and significant ways of cost benefit analysis, which  
25     trigger regulatory actions for setting priorities in



1 allocating NRC resources.

2 Both in theory, and as safety goals are implemented,  
3 these two concepts are mixed blessings. Much of the debate  
4 over the current evaluation of the safety goals quite  
5 naturally reflects different views about how best to realize  
6 the benefits of using these two quantitative techniques  
7 without suffering their weaknesses.

8 I agree completely with Lester that the NRC is to be  
9 applauded for actually getting both feet into it, by trying to  
10 come down on the numbers. And that is the difficult task.

11 I won't, in my comments, be addressing or saying  
12 much about the particular numbers chosen. A few remarks in  
13 passing only. But, rather on how different concepts are  
14 related, different important concepts I think are related in  
15 this attempt to apply quantitative goals.

16 MR. REMICK: Just a moment.

17 It would help me if I knew what your background is.  
18 Are you at a university? It would help me.

19 MR. McCLAIN: Yes, I am at the Center for Philosophy  
20 and Public Policy at the University of Maryland, and have done  
21 -- my research over the past eight or nine years has been  
22 focused largely on technological risks and application of risk  
23 analysis and cost benefit analysis to regulatory decisions;  
24 examining the philosophical moral issues involved in it.

25 MR. REMICK: Thank you very much.

1 MR. OKRENT: I should note, we looked for people who  
2 have, in fact, been at the Harpers Ferry panel, if you  
3 remember on 0880. And both of these two were, as well as the  
4 others who we sought.

5 MR. McCLAIN: I will address my comments to three  
6 general issues.

7 First, the cost benefit issues. Second, PRA and  
8 quantitative safety goals. And finally, I will say or offer a  
9 comment or two about how I see the issues involved in  
10 implementation.

11 Of course, many people have worked long and hard on  
12 safety goals for many years. I received a pound's worth of  
13 recent comments in the mail this past weekend, so it should  
14 not be surprising -- I hope you won't find it surprising if I  
15 have nothing terribly original to add.

16 To put my cards on the table from the outset, I find  
17 myself basically sympathetic to the ACRS reports to  
18 Dr. Palladino of June 8th. And, judging from the comments  
19 today, even more equally sympathetic to the comments of the  
20 Office of Nuclear Regulation Research. I agree with many of  
21 their specific reservations; the ACRS's reservations; and also  
22 with their general view that the NRC is not ready to reaffirm  
23 and implement the 1983 Safety Goal Policy Statement in its  
24 original, or even some slightly modified form.

25 But now I will explain some of the specific concerns

1 I have

2 First, cost benefit guidelines. A few comments  
3 about those. One, about including costs averted.

4 The proposed safety goals change the cost benefit  
5 guidelines to include these averted costs. I find it puzzling  
6 that this has proven to be as controversial as it is. The  
7 Steering Group Report I think is right regarding including  
8 these benefits as a matter of logical consistency since the  
9 cost of replacement power is considered in determining whether  
10 a modification will be cost beneficial.

11 If the Commission is going to use cost benefit  
12 guidelines, then I can think of no reason why all costs and  
13 benefits should not be considered.

14 I do not agree that the effect of including these  
15 averted costs is to capture the intentions of those who want  
16 the defense-in-depth philosophy to remain in force. I just  
17 note this in passing. Both defense-in-depth or using  
18 cost-benefit guidelines main lead to increased safety, but I  
19 think they have little else in common.

20 Moreover, as the Steering Group has pointed out, the  
21 costs of major accidents, even where there is no external  
22 damage is borne to a large extent by the public. And, even if  
23 it were borne by the owners, however, the owners turn out also  
24 to be a substantial segment of the public.

25 So, I think there are further reasons to include

1     these averted costs.

2             The opposition to including these costs as I  
3     understand it, is that it involves the NRC in economic  
4     regulation. I agree with Lester that this is a far cry from  
5     economic regulation. We are still in the realm of safety.  
6     But, the distinction in any case is not hard and fast.

7             If it is to escape economic regulation altogether,  
8     it would have to abandon its cost-benefit guideline. But it  
9     would not be reasonable to do this altogether. Once we  
10    get into the realm of cost benefit, you are into the world of  
11    economics, and into looking at regulations, including safety  
12    regulations in an economic way.

13            So, I think that if you are going to swim in this  
14    pool, you can't just swim in part of it.

15            Next, a comment about the various risk thresholds,  
16    as I would call them.

17            The cost-benefit guidelines are meant to apply when  
18    the range of probabilities for a core melt accident fall  
19    between three to ten to the minus fourth and ten to the minus  
20    third. Below that range, no action to that range of  
21    probabilities, no action will be taken unless it is determined  
22    that there is sufficient uncertainty in the probabilities.  
23    And above that range, actions will not require a cost-benefit  
24    justification, although cost effectiveness may be considered.

25            And we could argue about the numbers. I certainly

1 regard ten to the minus third as too high, but I will not  
2 pursue that issue. Rather, I will comment briefly on the  
3 concept -- on the idea of thresholds.

4 The case for an upper bound on probabilities above  
5 which safety considerations alone, and not cost-benefit  
6 guidelines should apply seems obvious. It is less obvious  
7 that there should also be a lower bound. I would reject this.

8 Although you may need a lower bound to determine how  
9 to allocate your own resources at NRC, I do not see why low  
10 probability problems, once identified, should not be fixed if  
11 it is cost-beneficial to do so. Here too, I think,  
12 consistency demands removing this lower bound.

13 A three times ten to the minus fifth probability is  
14 not insignificant, especially if the problem is generic and  
15 spread over many reactors.

16 Furthermore, I think it is naturally in the spirit  
17 of the defense-in-depth idea, and also the ALARA concept, to  
18 address low probability problems when it is technically and  
19 economically reasonable to do so.

20 Now, a few comments about PRA and quantitative  
21 safety goals.

22 First one -- and I know this isn't the main concern  
23 here, but I thought I should address these issues anyway.

24 First, about the relationship to the qualitative  
25 goals. The qualitative safety goals are important whether or

1 not they are perceived to be so. It was decided, in debates  
2 about the original safety goal document, that they should be  
3 listed first, and in some sense should be prior.

4 Without the qualitative goals, the quantitative  
5 design objectives are arbitrary.

6 I've never found the qualitative goals as they are  
7 stated, totally acceptable, and I still think they are  
8 insufficient.

9 Some of you, if you have extraordinary memories, may  
10 recall that at the Harpers Ferry Workshop in July 1981, I  
11 coauthored a dissent from the proposed goals in which we  
12 suggested a different formulation for qualitative goals.

13 We dissenters thought that qualitative goals should  
14 state that any significant likelihood of a catastrophic  
15 reactor accident or a core melt with serious radioactive  
16 releases is intolerable.

17 That should be at least a goal.

18 I mention this bit of history because Commissioner  
19 Asselstine has now independently proposed something quite  
20 similar. I think such a goal is clearly warranted and has  
21 important implications which I will mention presently.

22 The general point is that the NRC has a moral and  
23 I believe legal mandate to try to assure that an accident as  
24 bad as TMI or worse will not happen again. And it is fitting  
25 to reflect that mandate in a statement of safety goals.



1           Suppose there is such a serious accident. I think  
2           the public realizes that this is always a possibility. But,  
3           if an accident occurs -- I may be wrong, I recognize it is  
4           very dangerous to speak for the public -- but if an accident  
5           occurs, just imagine the response if it should be pointed out  
6           that such an accident is to be expected and that it falls  
7           within a ten to the minus fourth safety goal.

8           I think the response would be that the NRC was  
9           supposed to make sure that nuclear power plants were safe.  
10          Not that it was supposed to merely make them as safe as  
11          automobiles or cancer risks or whatever.

12          That may be the best we can reasonably accomplish,  
13          but our goals should be set higher.

14          Now, I just have one comment about the risk numbers  
15          chosen, a philosophical point about the numbers.

16          I think the quantitative goals are incorrectly  
17          conceived in one important respect, and this has to do with  
18          the meaning of societal risk.

19          The safety goals incorporate two perspectives on  
20          risk, which are the risks to an average individual living in  
21          the vicinity of a plant, and the risk to the population in the  
22          vicinity of a plant.

23          The latter is supposed to be an interpretation of  
24          societal risk goals. But this latter perspective is really  
25          only a middle ground, although an important one between the

1 individual perspective and an even broader perspective that  
2 looks not just at the population near a plant, but the entire  
3 society.

4 From this broader perspective, which I would  
5 identify in defense of a purer form of the societal  
6 perspective, there are also safety concerns which reflect not  
7 just our concern with the population in the vicinity of any  
8 given nuclear plant, but also our concern with the chances of  
9 any serious accidents anywhere in the U.S.

10 This broader perspective, which I would maintain the  
11 NRC is supposed also to represent, is particularly important  
12 for the ten to the minus fourth design objective for core melt  
13 probability. This broader perspective, I think, is reflected  
14 in Harold Denton's June 12 memorandum to Mr. Dirks, where he  
15 points out, correctly or not, that the ten to the minus fourth  
16 objective, if it was just met in all plants, there would be a  
17 50 percent chance of a serious core melt, and a ten percent  
18 chance of two core melts over the next 20 years.

19 I don't want to try to defend those numbers, but if  
20 those numbers are correct, and I think they were stated that  
21 if this was a goal, and this goal was met, this would be the  
22 probability for accidents throughout the U.S.

23 It doesn't strike me that that is a risk that can be  
24 claimed to be justified.

25 With a larger number of plants, of course the risk

1 of an accident with core melt happening somewhere increases.  
2 But there is a genuine concern that the NRC tried to prevent a  
3 single such event. A concern that will surely manifest itself  
4 swiftly and decisively if such an accident happens.

5 So, the core melt might have to be adjusted, not  
6 because of the risk to the population around any particular  
7 plant, but because of a risk of an accident due to the sheer  
8 number of plants.

9 The one-mile and ten-miles distance selection --  
10 just one more comment here about numbers -- I think are  
11 improvements over the current safety goals, but I do not find  
12 them entirely adequate. In particular, changing the  
13 fifty-mile selection to ten miles will do better at reflecting  
14 the average individual risk to the part of the population most  
15 at risk. But it does so at the cost of ignoring the possible  
16 wider ranging effects, which as Mr. Denton points out with his  
17 hypothetical Indian Point example, could be significant.

18 Now it seems to me that the only acceptable  
19 alternative here for setting a quantitative goal will be a  
20 more complex measure, which will mean introducing some  
21 multi-attribute model, and that may make things uncomfortably  
22 difficult. But I see no way around that.

23 And finally, about PRA and the issue of  
24 uncertainty. I do not believe that the current proposal  
25 significantly reflects the uncertainty that is inevitably a

1 part of PRAs and of cost-benefit analyses. This uncertainty  
2 is the central reason why it is unacceptable to allow  
3 quantitative risk estimates to supplant the defense-in-depth  
4 traditional philosophy of the NRC. It's largely because of  
5 the uncertainty in PRAs that many people, including myself,  
6 are concerned that the probability analyses might be used to  
7 undermine arguments for design changes or backfitting which  
8 stem from a recognition of specific weaknesses.

9 I realize this points to the heart of a major  
10 controversy, but I think the burden of justification should  
11 remain heavily on those who would resist safety changes, and I  
12 think that this burden cannot be met convincingly in most  
13 cases with PRAs.

14 I think this issue has to be addressed much more  
15 explicitly and fully in a safety goal statement. How real a  
16 problem is this? As I understand it, from some very  
17 unofficial sources, this kind of confrontation concept  
18 frequently, was this an issue, for example, at Davis-Besse  
19 Plant? Did we know about problems in the back-up feedwater  
20 pumps, and was the PRA used in an effort to move away from  
21 standard engineering controls that would have corrected a  
22 known defect?

23 So I believe we should learn from this incident.

24 The most glaring way in which uncertainty is not  
25 sufficiently acknowledged in the safety goals proposal is in

1 the failure to state containment performance guidelines. This  
2 seems a bit perverse to me, as if there was a greater explicit  
3 concern with the safety of the core than with the probability  
4 of the release of radioactive material into the environment.

5 Now many of my objections to the current would be  
6 met if the 10 to the minus 4 goal for core melt was replaced  
7 with something like a 10 to the minus 6 or even perhaps 10 to  
8 the minus 5th goal for core melt with release of hazardous  
9 material.

10 Just briefly then, about implementation. I think  
11 that the safety goals, if used well, are a good idea. I think  
12 that there are many benefits from having safety goals, from  
13 doing PRAs and cost-benefit analyses, and I know of at least  
14 some cases where merely going through the exercise led the  
15 industry to change practices at particular plants, once bad  
16 risks have been pointed out to them.

17 There are incentives there, and it's good to use  
18 these natural incentives for safety in these very expensive  
19 plants.

20 I read with interest the suggestions that the  
21 implementation should be gradual and phased in and also the  
22 comment that for areas other than generic safety requirements,  
23 experience in the trial use of safety goals is lacking.

24 I think that if we take these comments seriously,  
25 they reinforce a reason not to move very quickly away, or



1 perhaps not away at all, from "defense in depth" and from the  
2 ALARA concept to be somehow replaced by PRAs and the  
3 cost/benefit test. And I recognize that all the comments here  
4 have suggested that these are not meant to replace the  
5 traditional philosophy.

6 But I think the real question in implementing these  
7 goals is what kind of incentives they create and what the  
8 effects will be about when the NRC Staff or the regulatory  
9 agency spots a specific problem and when they are met in  
10 response with the PRA suggesting the overall risk is  
11 acceptable, I think it's a real open question about whether  
12 the "defense in depth" philosophy will win out in that  
13 situation or whether greater confidence will be put in the  
14 PRA.

15 And despite the best intentions of the people here,  
16 it is not at all clear to me what is going to happen over the  
17 next ten or twenty years as the regulatory, as the NRC and  
18 industry confront each other over potentially expensive  
19 regulations.

20 MR. OKRENT: Bill?

21 MR. KERR: In the early part of your statement, I  
22 got the impression that you felt that at least a part of the  
23 goal should say that it's the responsibility of the NRC to  
24 prevent serious accidents. And in terms of safety goals, this  
25 could be translated to mean -- and I'm not sure whether you



1 would translate it that way -- to make the probability of  
2 serious accidents zero.

3 MR. McClain: Let me respond to that with two  
4 issues.

5 One, about the goal regarding any future accidents.  
6 My main point there was to suggest that there aren't simply  
7 two main levels of work here, an individual level and a  
8 societal level, for which there are risks at each level.  
9 There is the individual risk -- that is, the risk to the  
10 average individual around the plant. There is another  
11 perspective from which there's the risk to the population as a  
12 whole around the plant, and I think there's a broader  
13 perspective still that says the risk of an accident anywhere  
14 in the U.S.

15 These represent different, if you will, more  
16 comprehensive perspectives, and I think that the suggestion of  
17 Commissioner Asselstine really says something about this  
18 broadest perspective, which is in a pure sense the societal  
19 perspective, ought to be reflected in the safety goal policy.  
20 And I'm saying I agree with that.

21 I don't say that -- I don't believe this is a zero  
22 risk concept. To say that -- in the following sense -- to say  
23 that you have as a safety goal that there shall never again be  
24 an accident as bad or worse than TMI is not to say that we  
25 will have a standard of regulation zero risk.

1           MR. SHEWMON: How is it different? Because it's  
2 strange to me that if you set that as a goal and you do  
3 anything more than sort of put it in a corner and say, "I will  
4 worship it once a year," like something or other, then you  
5 have to regulate to it. And that means if there is any  
6 conceivable accident or some rather inconceivable ones, that  
7 you have to start requiring people to design plants to cope  
8 with it.

9           MR. McCLAIN: The question is whether you state that  
10 as a goal or whether you don't state that as a goal, and what  
11 effect that might have, not just on regulations, but also on  
12 quantitative design objectives. By not stating it as a goal,  
13 you have the possible result that what looks like an  
14 acceptable risk to the individuals living in the vicinity of  
15 the plant and to the population around the plant might turn  
16 out, when you add up all the plants together, to be a risk  
17 that looks pretty high.

18           And I'm saying at least to have a qualitative goal  
19 that takes the broader societal perspective would for one to  
20 look at the kinds of concerns and take seriously the kinds of  
21 concerns that I think are reflected in Mr. Denton's letter.

22           And I think that how they translate specifically  
23 into design criteria, I don't know, but it may be that you  
24 will want to lower what you treat as the goal, the acceptable  
25 risk, of 10 to the -4th. If, in fact, it means 50 percent

1 chance of a core melt or if we said something close to that, a  
2 core melt with release, if those were the probabilities of an  
3 accident like that happening, I honestly don't believe you  
4 could claim that you are regulating safety in a way that the  
5 public would consent to, because I don't think the public  
6 would find that level of risk acceptable.

7 MR. SHEWMON: But what bothers me, the last half is  
8 okay, but when you say that we should have as a goal no  
9 serious nuclear accidents forever and ever, or at least for  
10 another hundred years or whatever, then it seems to me that  
11 you are saying, indeed, if you're going to do anything more  
12 than sort of put it up for window dressing and ignoring it, you  
13 sort of shift things down a couple of orders of magnitude, and  
14 that, then, gets extremely difficult to implement.

15 MR. McCLAIN: Well, whether you shift it down a  
16 couple orders of magnitude or not, I don't think it  
17 automatically leads to zero risk. It may, because of the  
18 sheer number of plants, require shifting the goal down a  
19 magnitude, and you may not like that, you may not think that  
20 that's a very good or easy way to operate.

21 I think that this is a concern that you could take  
22 seriously, and I note that Commissioner Asselstine, at least,  
23 has taken it seriously.

24 MR. KERR: Now Commissioner Asselstine -- and I say  
25 this at the risk of misinterpreting him, but I did discuss

1     this with him at some length -- in his initial language, he  
2     said that the goal should be that if another TMI occurred  
3     between now and the year 2000, regulation, the regulatory  
4     process, should be considered a failure. In effect, that says  
5     that we want to make the probability of that occurring zero.

6             I don't have any quarrel with your saying that the  
7     current goal is too high. I mean, one can negotiate about  
8     that.

9             But what I thought I heard you saying was that the  
10    goal should, in effect, say that the probability of a very  
11    serious accident is zero. And I just considered -- I consider  
12    saying that to the public to be misleading.

13            MR. McCLAIN: Let me try and say it once more, and  
14    then if it doesn't work, chalk it up to my failure to be able  
15    to communicate here.

16            I don't think -- I do not think that it follows  
17    naturally from saying that we should have as a goal that  
18    another accident this serious should not happen -- I don't  
19    think it follows from that, that that means we should regulate  
20    to zero risk. I think that it might be a reasonable way to  
21    meet that if you say that the probability of a single such  
22    accident happening, given if all the individual plants are  
23    meeting a safety goal, is -- and now you set some level.

24            If that level turns out to be 50 percent, then I  
25    think -- then I think you perhaps are not meeting that goal.

1 MR. KERR: But that is saying that you think the  
2 current goal is too high or too small.

3 MR. McCLAIN: But that's not the same as zero risk.

4 MR. KERR: No. But I could make a plausible  
5 argument for the fact that the NRC Staff had as a goal before  
6 TMI-2 that no TMI-2 should ever occur. Now certainly I don't  
7 think anybody would have said that they found the TMI-2  
8 accident acceptable.

9 So there isn't anything wrong with saying that,  
10 except it's sort of meaningless, I think. And it seems to me,  
11 what we are trying to find out is whether it makes sense to  
12 talk about quantitative safety goals. We are leaving the  
13 quantitative out of this, I thought -- it was shorthand -- and  
14 that everybody understood we are talking about quantitative  
15 goals. And if a goal is to be quantitative, it's either zero  
16 or something. It doesn't just express good intentions, it  
17 seems to me.

18 Maybe I'm missing -- I must be missing something.

19 MR. McCLAIN: Let me pick just a hypothetical  
20 number, then, and I'm not proposing this as the number that  
21 you can set.

22 If the design criteria for a core melt with release  
23 was set at some level for each individual plant, such that if  
24 that was met, the probability of a single accident happening  
25 over the next twenty years was, say, less than 20 percent --



1 and I am picking that number out of the air -- I would say  
2 that that could be defended as a reasonable attempt to  
3 regulate nuclear power so that no such accident happens again.

4           There is a risk involved, but that's a reasonable  
5 attempt. I would say if you set the objective so that the  
6 probability of a single accident happening over twenty years  
7 was 90 percent, then you haven't met that goal. And 50  
8 percent, I think, is very controversial.

9           MR. KERR: Okay. With that translation, I think I  
10 understand what you're talking about.

11           We have in our conversation today sort of implicitly  
12 assumed that as the number of nuclear power plants increases,  
13 the likelihood of an accident somewhere in the U.S. will go  
14 up. I think Harold has questioned that, and I certainly  
15 question it, too, because it is not obvious to me that that  
16 will occur at all. Indeed, I could foresee the possibility  
17 that if nuclear power really became popular again and people  
18 got into it and then worked on it, then the likelihood of an  
19 accident in the U.S. might well go down with an increasing  
20 number of nuclear power plants.

21           I don't think it will happen accidentally, but it  
22 certainly could in, it seems to me, the normal progression.

23           MR. McCLAIN: I'm glad you made that point, and I'm  
24 sure people have questions to address to Lester as well, but I  
25 would like to correct what I said in my comments.



1 I don't mean to assume that there is some iron law  
2 that as the number of plants increases, you know, there's a  
3 rigid law saying that the probability just goes up. I think  
4 that it's entirely conceivable that the point that you are  
5 making and that Hal makes, it might be that, given the  
6 circumstance in which the number of plants increase, that the  
7 overall probability of an accident happening goes down.

8 So I don't mean to suggest that that's the case,  
9 that it's the case one way or the other. I just think -- all  
10 I'm trying to say is that I think that there is this wider  
11 perspective that isn't reflected in the goals. I think this  
12 is the perspective that Commissioner Asselstine calls  
13 attention to, and I think that this is a reasonable  
14 interpretation of the meaning of societal risk, and that that  
15 perspective ought to be reflected in the goals.

16 MR. WARD: Is part of the problem that we are just  
17 calling this the wrong thing? I mean, you seem to be  
18 suggesting that a goal is a "Hitch your wagon to a star" kind  
19 of thing. I mean, the FAA may say its goal is to regulate the  
20 air transport business so that there are no fatal accidents,  
21 but it isn't devoting or asking for the resources or really  
22 trying to do that. But in one sense that is the goal.

23 Should we be calling this something else? A  
24 standard or some other name?

25 MR. McCLAIN: This came up, I remember, in the

1 discussion of the first round of the safety goals, where I was  
2 asked whether the qualitative goals ought to be thought of  
3 aspirational goals. I take it you think that this kind of  
4 goal of no accidents is aspirational. And I see no point in  
5 having a goal like that in a document like this that's really  
6 supposed to help, you know, set design criteria and help  
7 people in the NRC, who will actually make decisions about  
8 regulations.

9           So I don't think that a purely aspirational goal  
10 serves any function at all. But I do think that the  
11 qualitative goals are linked to the design criteria, and I  
12 think they are linked in the document here, and I think that  
13 adding a goal of reflecting the broader perspective I'm  
14 suggesting also has implications for design criteria of the  
15 kind I've tried to spell out hypothetically.

16           So I don't think that this is a document that ought  
17 to have just aspirational goals. I write those essays myself.

18           MR. WARD: Okay. But you seem to say that your  
19 example of 90 percent would be clearly unacceptable, 20  
20 percent might be acceptable, 50 percent probably isn't  
21 acceptable. That is getting kind of to be a narrow  
22 interpretation.

23           As a matter of fact, I think the ACRS made an  
24 estimate in a letter last October, and our suggestion was that  
25 the probability of another TMI accident was more like 10

1 percent or something, wasn't it? I think Dr. Okrent demurred  
2 from that estimate, and the Staff --

3 MR. OKRENT: I was closer to what the Staff was  
4 saying.

5 MR. WARD: You were closer to 50 percent. But I  
6 find it hard to believe that when we keep hearing that the  
7 risk methodology we have isn't any better than a couple orders  
8 of magnitude, that those shades of differences should  
9 influence us.

10 MR. McCLAIN: This is obviously a part of the  
11 problem with actually trying to pick a number. All I'm trying  
12 to say is that this is a consideration that I think ought to  
13 be reflected, and it -- but it's not reflected in the two  
14 quantitative criteria. I mean, as they stand now, it could be  
15 that they lead to a probability that is very high of having a  
16 single or two such accidents occur over the next twenty years,  
17 depending on the number of plants and other considerations.

18 And I'm saying that factor ought to be taken into  
19 account. If that number got high enough -- and I'm not about  
20 to suggest what the real number is or even what "high enough"  
21 ought to be --

22 MR. WARD: No. You did suggest something.

23 MR. McCLAIN: Well, I said 90 percent, right.

24 MR. WARD: And then you gave a lower bound. You  
25 said 20 percent might be okay.

1 MR. McCLAIN: Yes. I would think that, you know, a  
2 20 percent chance of a single accident of a TMI type happening  
3 over all the plants over the next twenty years, that would be  
4 pretty good, I think, and I think you could defend that as  
5 fulfilling that aspirational or qualitative goal that I think  
6 I was suggesting.

7 MR. WARD: Unless it happens.

8 MR. LAVE: Could I get some ancient history which  
9 might help a little bit?

10 Prior to the Harpers Ferry workshop, there was a  
11 workshop out at Palo Alto, and in my panel out there was  
12 Darrell Eisenhut, who was making a real pain in the ass of  
13 himself, who kept on saying, "Why are we here?" And he said,  
14 "I like the job the NRC's been doing. Why are we here? Leave  
15 it alone. It ain't broken; don't try and fix it."

16 And I think finally after he had said that for six  
17 or seven times and it was clear that we weren't going to get  
18 any further, one of the NRC Staff -- I think Bernero, but I'm  
19 not sure -- said, "It's broken," okay?

20 [Laughter.]

21 MR. LAVE: He said, "Look, this has all gotten so  
22 complicated that we're not exactly sure what we're doing. In  
23 any case, we're sure we're not consistent in what we're  
24 doing. So it's broken, and we desperately need some help in  
25 trying to get it together. We need some glue, some

1 consistency to do all this."

2 And now are quantitative safety goals to do it?

3 They are at least one way of trying to do it. One of the  
4 things that my panel wound up doing was making a distinction  
5 between three levels of goals that we could talk about.

6 At the highest level would be some goals which were  
7 immutable. An example of this would be that nuclear power  
8 shall be at least as safe as any other means of generating  
9 electricity. That would be an immutable standard, never  
10 changed, okay, not subject to any controversy. It would just  
11 clearly be what it was that we wanted to do.

12 The second level would be something like guidelines,  
13 and I think these quantitative safety goals we're talking  
14 about would be more like guidelines. They would be  
15 quantitative; they would be subject to change over time, and  
16 part of all this would be reflected by the earlier comments  
17 of, "Do you want these things to float?" That is, if we  
18 manage to cure cancer, then, you know, get the cancer rate  
19 down to a tenth of what it is now, then what are you going to  
20 do with these other safety goals?

21 And the answer is that, as guidelines, they would be  
22 up for periodic reconsideration, that the immutable goals at  
23 the highest level would be there forever. The guidelines you  
24 might think of looking at once every decade. And then at the  
25 lowest level, you would be talking about standards, which

1 would be what gauge pipe do you use, how good is the quality  
2 of the stainless steel, and so on.

3 And the hope was not that you could have a  
4 one-to-one relationship between each one of these levels, but  
5 that the levels would be consistent, and that the highest  
6 level statements would help with the second level statements,  
7 and that they would help with the third level statements.

8 And again, this was all in terms of the NRC Staff  
9 saying, "Gee, when we're going out and trying to make a  
10 decision about what quality of stainless steel or what gauge  
11 pipe, you know, we've got to have something to look to. And  
12 we're never going to have anything which will tell us in  
13 detail, but at least give us something to look to that can  
14 give us some help with all that."

15 So we had talked about these three levels of things,  
16 and I think that we're a little bit muddled, as I think the  
17 Commission is a little bit muddled, in trying to have  
18 quantitative safety goals sort of as if they were at the  
19 highest level, when, in fact, they're only at the middle  
20 level. And I think Doug is talking about now what would be  
21 the highest level goal, something that says, "Nuclear power  
22 shall be safe," okay? And that means that we regard it as a  
23 regulatory failure every time there's a TMI-2.

24 And I think it is. That's a regulatory failure  
25 every time -- we realize it's going to happen. We realize



1     that human beings are around. Just as the FAA regards every  
2     time that you have a commercial airline crash, that's a  
3     regulatory failure, and the FAA then sends people out to work  
4     and figure out why it happened, give you a rule that will help  
5     to prevent that in the future.

6             That's all fine, and I think one can deal with that.

7             MR. SHEWMON: If you want to clarify on that, I'm  
8     going to go to a different subject.

9             MR. EBERSOLE: I just wanted to comment on  
10    Dr. McClain's observation about Davis-Besse, the preexisting  
11    arguments about whether it was an adequate or not.

12            I wondered if you had looked at the preexisting  
13    arguments prior to, one, the Browns Ferry fire; the  
14    preexisting arguments prior to or related to the control  
15    system failure, you know, the scrambled up volume failure at  
16    Browns Ferry? There were lots of them. The one prior to  
17    Salem; certainly the ones that preexisted prior to TMI-2.

18            I notice the consistent aspects of these. There  
19    were always hordes of arguments that these plants were sitting  
20    ducks for the very thing that happened, yet nothing was done  
21    about it. And I think we need to examine these steady  
22    influences that we have that keep things from being done, and  
23    now which has just been precipitated by the new Davis-Besse  
24    incident.

25            Somewhere along the line, we've got to change our

1 viewpoints and do something before things happen.

2 MR. McCLAIN: I couldn't agree more with that, and I  
3 don't want to pretend that, you know, the knowledge that these  
4 were sitting ducks and the resistance to changing those had  
5 anything -- I mean, that problem existed before PRAs came to  
6 be used, so PRAs cannot be the sole cause of that.

7 I'm, just saying that when one considers  
8 implementation -- this has been a concern that's been  
9 reflected by people who have opposed using PRAs -- the concern  
10 that when you find a specific flaw and look at it, then it can  
11 be responded, "Well, look it, we meet the overall risk  
12 objective," and there's something dangerous in that.

13 MR. EBERSOLE: Yes.

14 MR. McCLAIN: In the uncertainties of the PRAs and  
15 something you might know about a design flaw. I'm saying that  
16 when you look at the implementation of these goals, you just  
17 have to think about those possible confrontations, what kind  
18 of incentives, what the effect of using these goals will be.

19 It may be overall better than worse. There are  
20 going to be some good consequences from it and some bad  
21 consequences of it. I don't think enough thought has gone  
22 into all of that.

23 MR. EBERSOLE: Well, I think it's pervasive in the  
24 PRA business, that more often than not the numerical analysis  
25 has been used as an escape route, so as not to do anything.

1 And it's easy to use that way.

2 MR. LAVE: Let me revive another controversy now, if  
3 you want. This is for Dr. Ebersole. That is the one that  
4 says, gee, what is the Commission to do if as a result of  
5 these safety goals and the analyses that you wind up either  
6 killing a particular reactor -- that is, having the costs go  
7 so high that nobody is going to build it -- or other penalize  
8 nuclear power, whereas the coal plants go on getting built and  
9 killing their 40 to 80 people a year, year in and year out?

10 I think that the answer is that if this were not the  
11 Nuclear Regulatory Commission but the Energy Regulatory  
12 Commission, then that would be a relevant comment. Okay? It  
13 is not. And the only thing that the NRC can do is try and  
14 keep its own house in order and make sure that nuclear plants  
15 meet the safety goals and that the safety goals are well aired  
16 and that people have confidence in the regulation --

17 MR. KERR: Well, you had just convinced me that an  
18 economist should look at all aspects of the problem, and now  
19 you are telling me that the Nuclear Regulatory Commission  
20 cannot act as an economist, I guess.

21 MR. LAVE: But Bill, what is the alternative? The  
22 alternative is to say, no, no, we are going to make nuclear  
23 power less safe than our goal in order to keep a coal plant  
24 from being built. Now, I can understand in the social context  
25 why you would say even a less safe nuclear plant is better

1       than a coal plant.

2               MR. KERR: I'm not talking, necessarily, about  
3       safety. I'm talking about considerations in the process of  
4       determining how one regulates. You know, what sort of  
5       standares one sets, and also how one carries them out, whether  
6       one should take a broader perspective than simply nuclear  
7       power.

8               Let me say that you haven't convinced me entirely  
9       that one should take all these costs into account because of  
10      the difficulty of identifying them all. I can much more nearly  
11      buy your statement that the important costs should be taken  
12      into account, particularly when I think of the most recent  
13      waterway installed in Mississippi.

14              MR. EBERSOLE: Don't say anything about Tennessee.  
15      You make me think a little bit, though, about the case, and I  
16      think it was Sequoyah, where it was required that the effluent  
17      water have less radioactivity in it than that which came into  
18      the plant as a point of beginning because of the Y-12 and X-10  
19      plants being above it and, you know, operating in isolation  
20      from reality, at least did some queer things.

21              MR. OKRENT: Well, look. I'm going to try to see  
22      whether we have any comments or questions specifically to the  
23      matters that Mr. Lave and Mr. McClain tried to focus on. Did  
24      the Staff want to raise any questions to Mr. McClain or  
25      Mr. Lave?

1 MR. MURLEY: One point. I don't know who made it,  
2 but it has come up several times today, about the Davis-Besse  
3 and its relationship to PRA, and is that somehow some kind of  
4 failure? If it is a failure, it is not because the Staff  
5 didn't do its PRA homework and didn't know that there were  
6 problems there. The Staff looked at auxiliary feedwater  
7 systems for all the PWRs, as you know, after TMI, and it found  
8 problems. And even though all the plants met our regulations,  
9 we found that they didn't have the reliability that we thought  
10 was there.

11 Some utilities went ahead and took that analysis at  
12 face value and fixed their plants up. Calvert Cliffs comes to  
13 mind. Some didn't. Some fought it. It is that kind of a  
14 stalemate that we got into. I call it a regulatory stalemate  
15 and not a failure to analyze the problem.

16 MR. EBERSOLE: Yes, but what is missing is the  
17 hammer. There is no hammer.

18 MR. MURLEY: Yes.

19 MR. EBERSOLE: And isn't that a part of the  
20 regulatory process?

21 MR. MURLEY: Yes, it is. And the hammer we have is  
22 our regulations. We are not proposing, I don't think -- I  
23 don't know if anyone is proposing that we make these safety  
24 goals to have the force of our regulations, so that even if we  
25 get into a case where we find that a plant does not meet our

1 safety goals, it is not at all clear that we are going to make  
2 them or how we are going to make them improve unless we  
3 somehow can find a way in our regulations to do that.

4 But that is an issue that I think is still going to  
5 be with us for a long time.

6 MR. McCLAIN: Since I was the one who mentioned  
7 Davis-Besse, I should say right off that I have very limited  
8 knowledge of the background to that and/or the event itself,  
9 but I had heard that, in fact, the problem with the backup  
10 feedwater pumps had been identified by the NRC.

11 MR. MURLEY: Yes.

12 MR. McCLAIN: And that the plant also met the  
13 overall safety goal and that the operators of that particular  
14 plant -- well, I may be wrong, but that the operators of that  
15 plant had used the fact that they had met the safety goal as a  
16 way of resisting any pressure to make this particular change.

17 I may be completely on that. If I am, then forget  
18 about Davis-Besse and ask about that possibility happening.  
19 This is just something that I think ought to be addressed in  
20 the question of implementing these goals.

21 MR. MURLEY: But I don't know that they used safety  
22 goal arguments.

23 MR. EBERSOLE: May I just say this? They can meet  
24 the regulations, as they did, by -- well, one principle, of  
25 course, is did they meet the requirements for redundancy in



1 the critical systems, and they did. But that has got nothing  
2 to do with how reliable the redundant complex is, and there is  
3 nothing in the regulations that says how reliable it has got  
4 to be.

5 MR. OKRENT: I am going to rule that we are not  
6 going to try to solve Davis-Besse today. It may or may not be  
7 on the agenda, I can't recall specifically, as an item, not  
8 just a list of cats and dogs.

9 MR. WARD: What do you mean?

10 MR. OKRENT: Is it on the agenda for the Full  
11 Committee meeting?

12 MR. WARD: Yes, but we are just going to hear a  
13 ten-minute description of it. We aren't going to be  
14 discussing this sort of thing.

15 MR. OKRENT: Does anyone want to raise any other  
16 questions with McClain and Lave?

17 MR. XERR: I would just like to express my  
18 appreciation for their presentations. I found them very much  
19 to the point.

20 MR. OKRENT: I think that is a good point, Bill. I  
21 certainly very much appreciate their coming here on very short  
22 notice, and I apologize for the short notice, but the  
23 subcommittee meeting had, in effect, a rather short fuse.

24 Thank you for your participation.

25 I am going to propose that we go back to see what

1 comments members of the Staff may wish to add to those made in  
2 the earlier part of the afternoon.

3 MR. SNIEZEK: Does any of the Staff have any  
4 comments they want to add?

5 MR. SPANGLER: I have a couple. I am Miller  
6 Spangler.

7 I have some views on this question of means versus  
8 median. I feel that median serves only one purpose for me in  
9 terms of decision making. It adds kind of a benchmark  
10 perspective, but you can't do anything with it  
11 calculationaly. Mean, however, is a concept which you can  
12 use in safety-cost tradeoff analysis or additive nature of  
13 risk or whatever. You can multiply with it and you can  
14 calculate with that concept.

15 There is a legitimacy, however, beyond the use of  
16 mean to consider other points in the distribution of the risk,  
17 and that might therefore -- the use of means in  
18 decision-making might be supplemented by taking some  
19 meaningful point in the probability density function. Say a  
20 worst case analysis. I don't mean a ultra-worst case  
21 analysis, but something within the band of uncertainty that  
22 makes sense.

23 Now, I know that in discussing risk issues with  
24 other members of the Staff, there is a concern that when you  
25 get to different severe accident scenarios, that one scenario

1       that has a low probability but a very high consequence ought  
2       to be given --

3               MR. KERR:   Excuse me.   I just want Dr. Lewis to know  
4       that this is in support of means.

5               MR. LEWIS:   Oh, good. Thank you.

6               MR. SPANGLER:   One idea of using a worst case  
7       analysis to supplement mean is that where you have a low  
8       probability scenario, severe accident scenario, but have  
9       unusually high consequence, and given that there is a lot of  
10      uncertainty surrounding even the estimation of a probability  
11      density function as well as the uncertainty surrounding the  
12      estimation of a mean, is that one ought to proceed a little  
13      bit more cautiously or prudently, or whatever the popular  
14      phrase is, about those kinds of scenarios.

15              To that extent, I think the Staff feels that the use  
16      of a mean should be supplemented by additional analyses in  
17      certain special circumstances in order to ascertain a margin  
18      of conservatism.

19              So that is one point of view I would like to put  
20      forward.

21              Another point of view about safety goals is, to my  
22      mind, the safety goals do not adequately serve as surrogates  
23      for other societal risks, a point of view which our  
24      consultants have brought out, and therefore one has to ask  
25      what purpose they really do serve.   My feeling is that they

1     serve basically two purposes. One purpose is that they serve  
2     as anxiety benchmarks, not public anxiety, necessarily, but  
3     regulator anxiety benchmarks, what level of anxiety is  
4     merited.

5             And just to use an analogy to get the point across,  
6     we use parents who raise children frequently plugging a  
7     thermometer in their mouth or elsewhere, and if the  
8     temperature reading is 100 or 101, a parent doesn't feel that  
9     much anxiety is merited, but if it goes up to 104, that merits  
10    a lot of anxiety, or 105, and you are going to put the kid in  
11    the shower, call a doctor, or do something that is sort of  
12    unusual.

13            The other one is a cautionary level at 100 or 101,  
14    where you watch the child, you keep it from doing extreme  
15    things, and your caution level is raised. But I think that is  
16    a proper use or one proper use of safety goals, as an anxiety  
17    benchmark, and they don't need to be internally consistent  
18    with each other.

19            The most constraining one, as has been pointed out,  
20    is the individual called fatality benchmark, and the latent  
21    cancer fatality is less constraining, and I suppose if we  
22    really brought into the end of the focus the one comparing  
23    coal and nuclear risks, that would be even less constraining.  
24    But these can be successive levels of concern as benchmarks.

25            My own suggestion that I have repeated many times

1     about coal versus nuclear is I don't think it has any place in  
2     most regulatory decisions regarding fixes. I think where it  
3     may have some merit in putting things into perspective is  
4     where, like an Indian Point decision, where you are going to  
5     shut down a whole plant and real large bucks are at stake, or  
6     if you are going to build a new plant where real large bucks  
7     are at stake.

8             And in fact, our environmental impact statement  
9     process in licensing a new plant has required that kind of  
10    comparison. So it isn't a matter of not doing it because it  
11    complicates litigation. In fact, I think the antinuclear  
12    people who tend to stretch out hearings really wouldn't find  
13    it very comfortable at all to prolong a hearing on the  
14    comparison of coal to nuclear risk. I think the uncertainty  
15    of coal risk is every bit as bad as nuclear risk.

16            They wouldn't get very far and I don't think they  
17    would spend very much time extending -- it might have the  
18    opposite effect, of shortening some of these hearings because  
19    it is an important aspect of societal impact at that stage  
20    where you are choosing to invest very large resources in one  
21    technology or another.

22            I think at that point NRC really does have a legal  
23    handle on that question. So so much about the coal.

24            The other main use of safety goals, in my view, is  
25    that it sort of structures the intellectual logic about how



1 safe is safe, and it gives a forum for PRA analysis. I think  
2 PRA, which is fault tree and event tree, and as complex and  
3 controversial as it is, provides far and away the best  
4 opportunity for a learning curve.

5 We can find out where we agree and where we  
6 disagree. We can develop research programs on specific  
7 technical issues based upon that sort of thing. We can learn  
8 about unique vulnerabilities to try to find productive ways of  
9 mending them.

10 So those are some of the supplemental views that I  
11 would like to give.

12 MR. OKRENT: Thank you.

13 Are there other --

14 MR. SNIEZEK: Dr. Okrent, I have queried the Staff  
15 and no one has any other comments.

16 MR. OKRENT: I see. Thank you.

17 I have a note that Mr. Stello had to leave but that  
18 he will be at the Full Committee meeting tomorrow, and  
19 Mr. Denton expects to be able to make that.

20 At the moment, I am assuming that since we have  
21 written statement from Mr. Lave, and I think we are going to  
22 have a copy of the handwritten statement by Mr. McClain, that  
23 the Full Committee can get the essence of what they think  
24 without them having to be here.

25 Does that sound reasonable? So we don't have to



1       burden them with a double --

2               MR. KERR: Let them get back to the academic  
3       atmosphere as soon as possible.

4               MR. OKRENT: I should note that when Mr. Remick  
5       left, he gave me a note, and I will read it. He says: I am  
6       not sure whether I will be present at the summary conclusions  
7       and anticipated future actions because of the meeting of the  
8       other subcommittee that he has to attend.

9               Recommendation on future actions.

10              "First, I do not think that we should write a  
11       letter until we know what the Staff recommends to the  
12       Commission. Two, a letter before then would be  
13       counter-productive and would dilute our possible contribution  
14       to the Commission's decision."

15              MR. LEWIS: Dave, do you want this part to be  
16       recorded?

17              MR. OKRENT: It doesn't have to be, I think.

18              MR. KERR: Why don't we decide no.

19              MR. OKRENT: All right, we can decide no. So at  
20       this point we will conclude the recorded part.

21              [Whereupon, at 4:40 p.m. the reported meeting was  
22       concluded.]

23

24

25

1 CERTIFICATE OF OFFICIAL REPORTER

2  
3  
4  
5 This is to certify that the attached proceedings  
6 before the United States Nuclear Regulatory Commission in the  
7 matter of: ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

8  
9 Name of Proceeding: Subcommittee on Safety Philosophy,  
Technology and Criteria

10  
11 Docket No.:

12 Place: Washington, D. C.

13 Date: Wednesday, July 10, 1985

14  
15 were held as herein appears and that this is the original  
16 transcript thereof for the file of the United States Nuclear  
17 Regulatory Commission.

18  
19 (Signature)

(Typed Name of Reporter) Suzanne B. Young

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22  
23 Ann Riley & Associates, Ltd.  
24  
25

# The NRC's Quantitative Safety Goals

Lester B. Lave

Carnegie-Mellon University

July 9, 1984

**Recommendation:** The fourth or benefit-cost safety goal is useful and, after being corrected, should be retained. If the NRC is to arrive at an efficient allocation of resources for reactor safety, it must take account of all benefits and costs, both public and private, in deciding on safety standards, including backfit. The \$1,000 per person rem parameter is one way of quantifying the health benefits of lowering emissions from mishaps. This benefit must be supplemented by the estimated cost of repairing the reactor (if that is to be done) or disposing of it, as well as the costs of replacement power.

## Introduction

The NRC is charged with safeguarding the public safety with regard to power reactors. The agency might choose to play a very active role by mandating all actions that are in the public interest, including those that normally would be considered operating decisions of the utility. At the other end of the spectrum, the Commission might attempt to provide the operators with information, to ensure that they consider public costs and benefits properly, but leave all safety decisions to the utilities. Either of these approaches, as well as intermediate ones could, in theory, properly allocate economic resources in achieving safety. How active a role the NRC decides to undertake will depend on (a) their philosophical approach to the role of government, (b) the competence of the utilities in implementing policies in their own interest, and (c) the ease of translating public costs into concrete charges the utilities can use in their decision making. I will try to address the first and last of these issues.

## Optimizing Safety

To optimize safety, the safety of reactors must be enhanced up to the point where the marginal social benefit of an incremental increase in safety is just equal to the marginal social cost of achieving it. Both parts of the calculation have to include the full effects, public and private. For example, the cost side of a more elaborate reactor design or retrofitting an existing reactor must include not only the monetary costs but also expected occupational disease and trauma and environmental damage. The benefits of increasing safety include less health damage to the public, but also to workers, less need to repair damaged equipment or dispose of radioactive materials, including disposing of a crippled reactor, and less need to buy replacement power.

As long as the full social benefits and full social costs are calculated, it makes no difference in theory whether the actual decision is made by a regulatory agency or the operator. In practice, however, it is nearly impossible to quantify the social benefits associated with less health damage, lower electricity costs, and decommissioning a contaminated reactor. If there is no agreement on how to quantify and monetize these costs, or if that can only be done incompletely, then the safety decision is far from straightforward and might be entrusted only to a governmental body.

### Public or Private Safety Decisions

For example, if \$1,000 per person rem and the market costs of decommissioning a reactor and buying replacement power were deemed to be the appropriate social values, the social benefits and costs could be calculated completely and safety decisions would be conceptually simple, however difficult it might be to get the specific estimates. While \$1,000 per person rem implies a social cost of \$5-\$10 million per cancer, the public might regard these values as low when, for example, childhood leukemia is concerned. The public generally regards cancer as a worse than average way of dying and is willing to expend large amounts of resources to help groups such as children. Compared to safety decisions made by other federal agencies, \$1,000 per person rem implies more stringent safety goals. However, it is not without controversy.

The problem with the current NRC benefit-cost guideline is that it is only partial and thus can be shown to lead to too little safety. It attempts to balance the public health implications of a reactor mishap against the private cost (which is essentially the social cost) of a mishap. This calculus will lead to some changes in design and some retrofits, but far too few. It excludes the benefits associated with less need for repair, decommissioning, and replacement power.

But aren't these private costs precisely what the utility uses to decide on safety goals (in addition to those set by the NRC)? Certainly they are, and occasionally they would lead private utilities to set higher safety goals than those mandated by the NRC. However, using the public benefits in one calculation and the private benefits in another splits the benefits rather than summing them. The correct level of safety is arrived at by comparing the sum of private and public benefits with the costs. This criterion requires that the NRC consider the full panoply of benefits, from public health to replacement power, in arriving at safety decisions. Excluding any category will lead to too little safety.

But suppose the public benefits are very small compared to the private benefits, should the NRC still make a regulatory judgment? In theory, the answer is still yes, since even small public benefits add to total benefits and should be included. However, given the scarce resources of the NRC, one might be tempted to leave such decisions to the utilities.

Is it possible to devise a way to get utilities to make socially optimal decisions, instead of having the NRC order them? In theory this can be done by making sure that the utilities realize they will pay the full social costs of a mishap. However, as TMI demonstrates, the utility stockholders will absorb only a small fraction of the social cost of the mishap. Thus, unless the rules are changed to require insurance that would make the utility stockholders responsible for the entire social costs, the NRC has the responsibility of protecting the public from utility incentives that put too little weight on safety.

An ancillary issue concerns the cost penalty to be placed on nuclear power as a result of this criterion. Is the increase in electricity costs justified? What if this criterion winds up promoting coal fired plants? The answer to the first question is that, assuming the calculations are done properly, this criterion would have nuclear power reflect its correct social cost. The answer to the second question is that as long as the other electricity generation technologies are correctly regulated (using the same criterion of marginal benefits equal to marginal costs for safety), then there is no bias. However, if greater safety is imposed on nuclear reactors then on other technologies, resource will be misallocated. However, the best solution is to get the correct safety level for all technologies rather than to have less than optimal safety for reactors.



*Rowsome*

NRR COMMENTS ON SAFETY GOAL EVALUATION REPORT

- ° THOUGHTFUL, WELL WRITTEN.
- ° ONE SERIOUS DIFFICULTY:  
  
CORE MELT FREQUENCY GUIDELINE OF  $10^{-4}$ /RY IS TOO LENIENT:
  - 50% CHANCE OF SERIOUS REACTOR ACCIDENT NEXT 20 YRS.;
  - 10% CHANCE OF 2 OR MORE SUCH ACCIDENTS.
  
  - CONTAINMENT SYSTEMS MUST FUNCTION BEYOND DESIGN CONDITIONS;  
TOO MUCH RELIANCE ON KNOWLEDGE OF FP BEHAVIOR, CONTAINMENT PERFORMANCE.
  
  - PROPOSED ALTERNATIVE:  
LARGE-SCALE FUEL & FP RELEASE FROM RCS  $<10^{-5}$ /RY.
- ° CANCER RISK GUIDELINE IS TOO LENIENT AS SURROGATE FOR SOCIETAL RISK.
  - CONSIDER AN AGGREGATE SOCIETAL RISK GOAL.
- ° INCLUSION OF AVERTED ON-SITE LOSSES: NRR AGREES.
  - STRENGTHEN SUPPORTING DOCUMENTATION.
  
  - TREAT AS FAVORABLE COST IMPACTS, TO ARRIVE AT NET COST.



NRR COMMENTS, CONTINUED

- ° PROVISIONAL IMPLEMENTATION GUIDANCE: TWO PROBLEMS:
  - EXCLUDES SAFETY IMPROVEMENT AT CORE MELT FREQUENCIES OF  $3 \times 10^{-5}$  TO  $10^{-3}$  UNLESS MORTALITY RISK QDOs ARE NOT MET.
  - TOO SIMPLISTIC: FAILS TO ADDRESS PRA OMISSIONS, BIASES, EXTENT OF DIFFERENCES BETWEEN ESTIMATES AND QDOs, ETC.
- ° ALARA DISMISSAL CONFLICTS WITH SEVERE ACCIDENT POLICY, STANDARDIZATION POLICY.
- ° COMMISSIONER ASSELSTINE'S PROPOSED SAFETY GOAL: REJECTION FLAWED.
  - GREATER EMPHASIS ON PREVENTING TMIs IS WARRANTED: REDUCE CM FREQUENCY GUIDELINE.
  - SHOULD NOT SEEM TO SHIFT PRIMARY SAFETY RESPONSIBILITY FROM LICENSEE TO NRC.

*Spec*

NRR COMMENTS ON SAFETY GOAL EVALUATION REPORT

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10% CHANCE OF 2 OR MORE SUCH ACCIDENTS.
- CONTAINMENT SYSTEMS MUST FUNCTION BEYOND DESIGN  
CONDITIONS; TOO MUCH RELIANCE ON KNOWLEDGE OF FP  
BEHAVIOR, CONTAINMENT PERFORMANCE.
- THE  $10^{-4}$ /RY GUIDELINE NOT WELL DEFINED (I.E., WHETHER  
IT REPRESENTS SEVERE CORE DAMAGE OR EVEN EXTENSIVE  
CORE MELT WITH NO RCS PENETRATION, OR EXTENSIVE CORE  
MELT WITH RCS PENETRATION AND CONTAINMENT CHALLENGE).
- PROPOSED ALTERNATIVE:  
LARGE-SCALE FUEL & FP RELEASE FROM RCS  $< 10^{-5}$ /RY

### OTHER COMMENTS

- ° INCLUSION OF AVERTED ON-SITE LOSSES: NRR AGRESS
  - STRENGTHEN SUPPORTING DOCUMENTATION
- ° PROVISIONAL IMPLEMENTATION GUIDANCE:
  - EXCLUDES SAFETY IMPROVEMENT AT CORE MELT FREQUENCIES OF  $3 \times 10^{-5}$  TO  $10^{-3}$  UNLESS MORTALITY RISK QDOs ARE NOT MET.
  - FAILS TO ADDRESS PRA OMISSIONS, BIASES, EXTENT OF DIFFERENCES BETWEEN ESTIMATES AND QDOs, ETC.
- ° ALARA DISMISSAL CONFLICTS WITH SEVERE ACCIDENT POLICY, STANDARDIZATION POLICY.
- ° COMMISSIONER ASSELSTINE'S PROPOSED SAFETY GOAL: REJECTION FLAWED.
  - GREATER EMPHASIS ON PREVENTING TMIs IS WARRANTED; REDUCE CM FREQUENCY GUIDELINE.
  - SHOULD NOT SEEM TO SHIFT PRIMARY SAFETY RESPONSIBILITY FROM LICENSEE TO NRC.

LIKELIHOOD OF CORE MELT

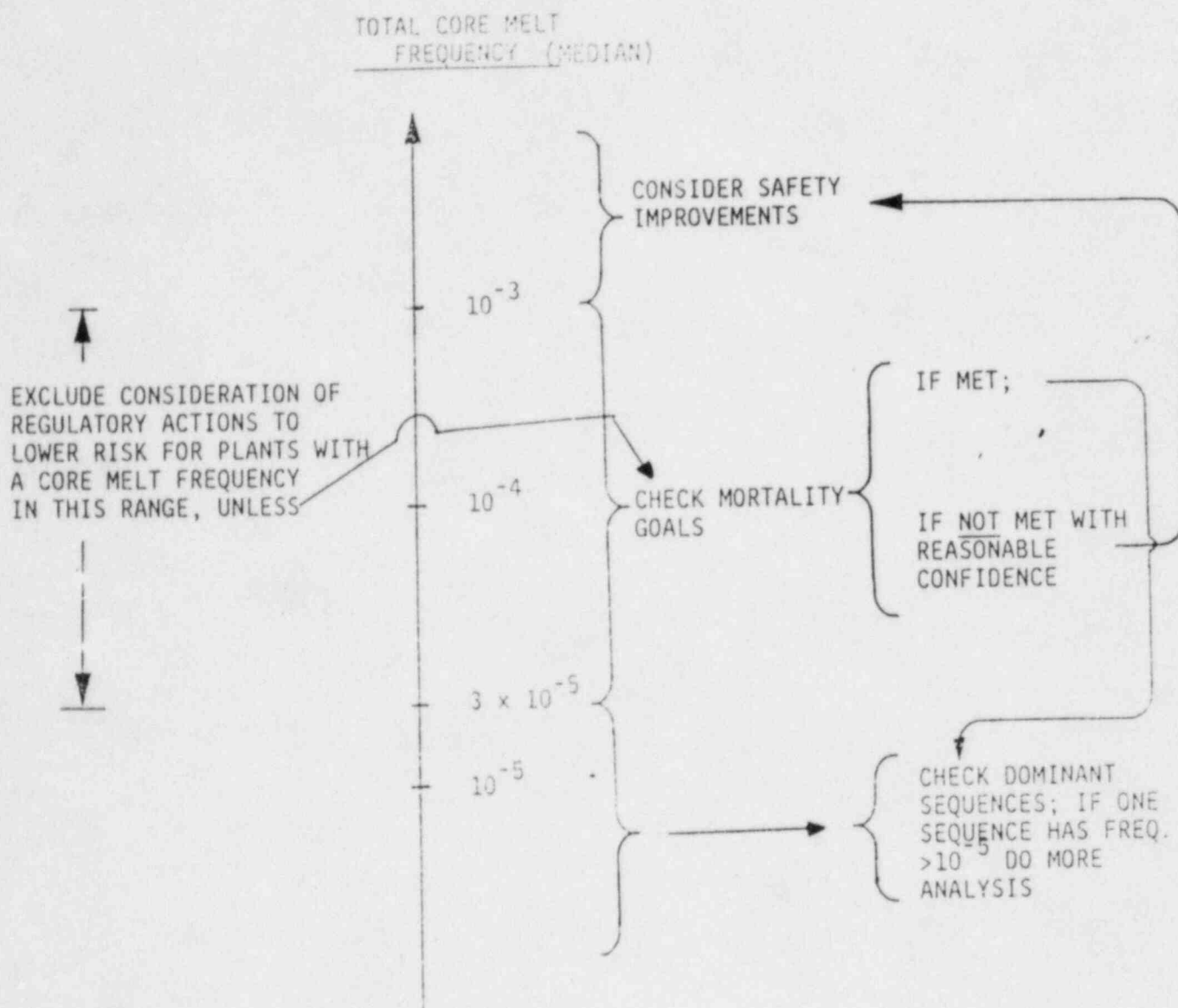
MEAN CORE MELT PROBABILITY (A)/RY

ACCIDENT PROBABILITY IN  
NEXT 20 YRS IN POPULATION  
OF 100 PLANTS, PA

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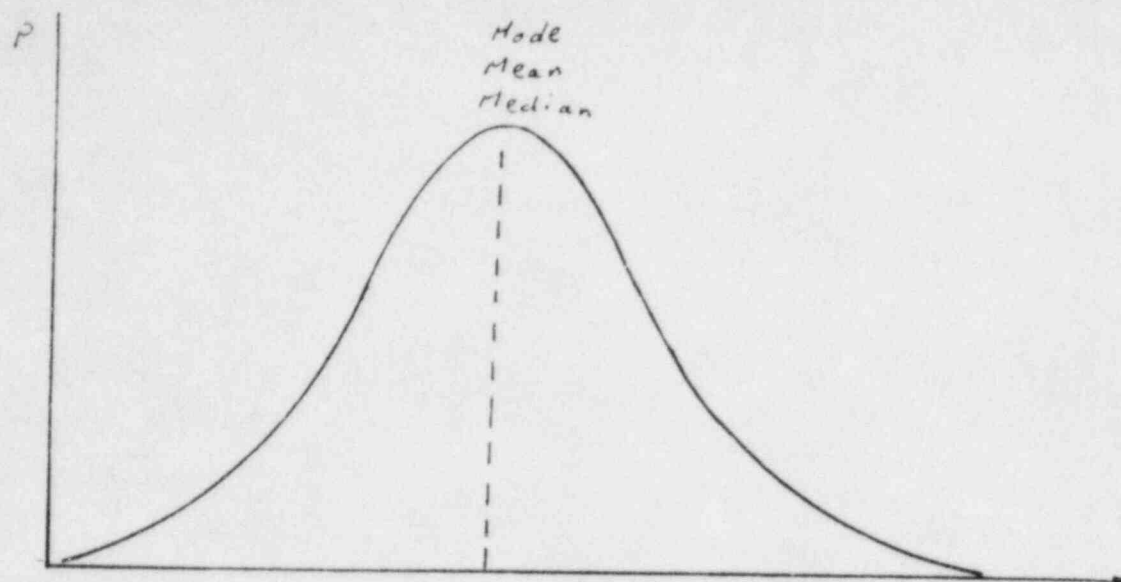
$3 \times 10^{-4}$	45%
$1 \times 10^{-4}$	20%
$3 \times 10^{-5}$	6%
$1 \times 10^{-5}$	2%

# SAFETY GOAL IMPLEMENTATION DIAGRAM

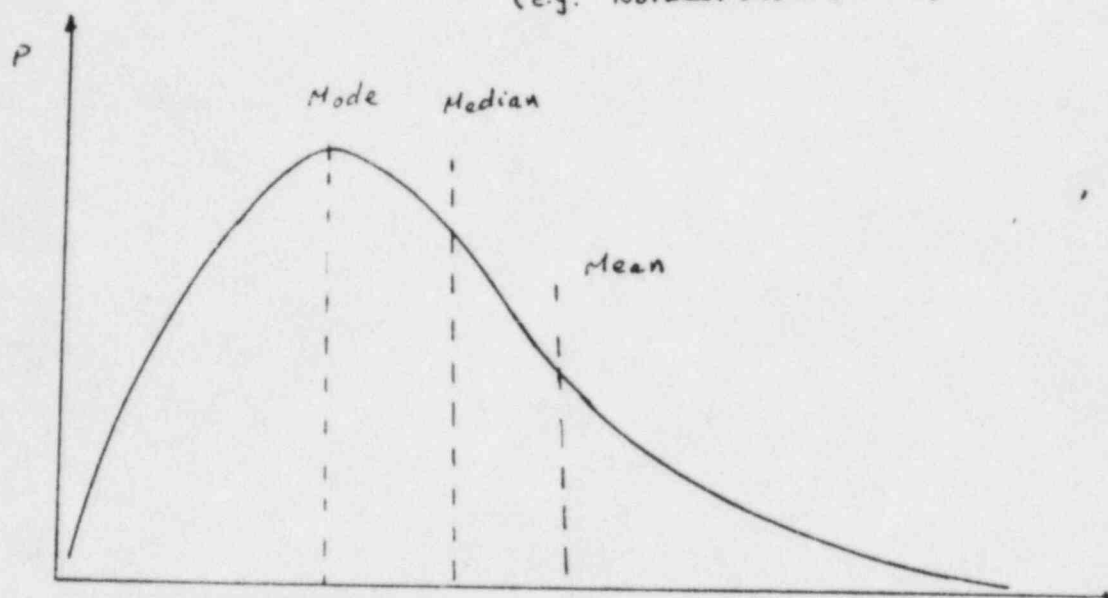


$9 \times 10^{-4}$

100 SEQ @  $9 \times 10^{-6}$



Symmetric Distribution  
(e.g. Normal distribution)



Skewed Distribution  
(e.g. Log-normal distribution)

